Integrated Ecosystem Assessment Steering Group EGs Resolutions

Resolutions approved 2020/2021

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 Erik Olsen, 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	ICES Scientific Report by 31 May to IEASG	
Year 2022	TBD April/May	ICES HQ	ICES Scientific Report by 31 May to IEASG	
Year 2023	TBD April/May	ICES HQ	Final ICES Scientific Report by 31 May to IEASG	

ToR descriptors[1]

ToR	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 WGECO, 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

[1] 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, WGSHIP, 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' indcators 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 asessment 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 initaite 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 wil 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 partcipants, 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 groups 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, WGSHIP, 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 Lisa L. Colburn, United States, 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.)
Year 2021	30 March	Online meeting	E-evaluation	
	17 May	Online meeting		
	10,11,15,17,18 June	Online meeting		
Year 2022	TBD	USA	E-evaluation	
Year 2023	TBD	Europe	Final ICES Scientific report by (TBD) 2021	

ToR descriptors 2021 – 2023

ToR	Description	Background	Science Plan codes	Duration	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 Eosystem 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 contibute 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

Year 1	Continue the current work and identification of ongoing needs for social science in ICES (ToR a). Continu 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.
Year 2	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.
Year 3	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	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. 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). 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. 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.

Resource requirements	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.
Participants	41 participants, from 15 countries
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	In the longer term the EG will be ready to support ACOM in addressing advisory requests from ICES clients if these are forthcoming.
Linkages to other committees or groups	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. 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.
Linkages to other organizations	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), Organistation 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

WKCCMM - ICES/EUROMARINE Workshop on Common Conceptual Mapping Methodologies

2020/WK/IEASG03 The **ICES/EUROMARINE Workshop on Common Conceptual Mapping Methodologies** (**WKCCMM**), chaired by Debbi Pedreschi, Ireland, Maria Cristina Mangano, Italy, and Marcos Llope, Spain, will be established and will meet in Galway, Ireland, 1 – 5 November, 2021 to:

a) Develop a common understanding across ICES working groups on conceptual mapping methodologies, their key uses and limitations, and processes for effective conceptual modelling with stakeholders. This will help to identify commonalities, differences and issues encountered, and standardise methodological approaches useful for a variety of applciations (e.g. developing food-webs, socio-ecological modelling, rapid/initial management action and/or impact evaluations). (Science Plan codes: 3.6, 6.1, 7.5)

b) Develop semi-standardisted conceptual mapping approaches and guidelines that can be used by those interested in using conceptual mapping as a tool in a variety of contexts, including in ICES Working Groups involved in Integrated Ecosystem Assessment (IEA) (Science Plan codes: 6.3, 6.4).

c) Investigate how the methodologies can be best used to contribute to Ecosystem Overviews (e.g., via foodweb and/or socio-ecological system modelling), Integrated Ecosystem Assessment, and to inform/underpin wider trade-off analyses relevant to ICES and the wider scientific community. (Science Plan codes: 2.2, 6.5, 6.6, 7.3, 7.4, 7.6)

d) Dissemination of workshop outputs to wider ICES and scientific community via online webinar and/or talk at the ICES Annual Science Conference.

WKCCMM will report by December 17th, 2021 for the attention of SCICOM.

Supporting information

Priority	This workshop specifically addresses a rapidly developing area within ICES IEA groups, and as such has been proposed (and awarded EuroMarine funding) via a collaborative effort of six different ICES groups, including the outgoing and incoming IEASG Chairs, and a Chair of the SIHD. Multiple IEA groups are currently advancing conceptual mapping methodologies in support of IEA/EO work, and as a method to engage with stakeholders (see WKCONSERVE). A common understanding across groups would not only help to eliminate redundancy in effort, but ensure improved transparency and consistency between groups and between EOs in line with TAF. Finally, as a potential vehicle for advancing identification of regionally relevant social and economic aspects/indicators, and as a format for advancing foodweb understanding, it is relevant to the priorities specified by WKEO3 and WKTRANSPARENT, to groups such as WGSOCIAL, WGCOMEDA and WGECON, and to progressing the SIHD.
Scientific justification	IEAs are a key tool enabling us to manage ocean complexity. Conceptual modelling facilitates and informs the scoping steps of IEA by identifying key drivers (economic, social, cultural, ecological) and priorities of stakeholders, including policy-makers. Understanding priorities and perceptions is critical to identifying risks and opportunities for action to instigate lasting change and provide the evidence required to protect the ocean commons. Social science integration into marine ecosystem assessment has been flagged by EuroMarine, ICES, and at the UN Decade of Ocean Science preparatory meetings as a key research need. WKCCMM tackles this need by bringing together social and natural scientists for knowledge exchange and skills-sharing on conceptual mapping methodologies to inform IEA. WKCCMM builds on current and ongoing IEA work in ICES and NOAA, with scaleable methods capable of focusing on multiple human uses of marine systems. The cross-collaboration of ICES, NOAA and EuroMarine scientists and standardisation of methodologies (adaptable to specific circumstances/needs) across IEA groups will benefit interested parties both within and beyond ICES.
Resource requirements	Funding has been secured via EuroMarine subject to acknowledgement of the funding in th Workshop report. This funding will cover the hosting off the workshop and attendance of key participants.
Participants	Expected participants include Chairs or nominated attendees from IEASG groups, EuroMarine Network attendees, others interested in conceptual mapping methodologies, tc a maximum of 20 individuals
Secretariat facilities	Online meeting coordination (if online or hybrid required)
Financial	No financial implications.
Linkages to advisory committees	There are no obvious direct linkages with the advisory committees, although later outputs may be of interest.
Linkages to other committees or groups	Highly relevant to all IEASG groups and the SIHD.
Linkages to other organizations	Joint ICES/EuroMarine workshop.

WKSHOES - Workshop on Stakeholder Engagement Strategy

2020/WK/IEASG04 **Workshop on StakeHOlder Engagement Strategy (WKSHOES)**, chaired by Alan Haynie, USA, and Vera Köpsel, Germany, will meet online **22-24 June 2021**. WKSHOES will examine stakeholder interactions across ICES expert groups, assess needs and opportunities, and develop elements for a strategy to formalize stakeholder involvement in ICES groups. Specifically, WKSHOES will:

a) Characterize potential ICES stakeholder interaction goals as well as the key elements of a stakeholder engagement strategy to achieve these goals, to be developed by ACOM/SCICOM following WKSHOES. (Science Plan codes: 3.6)
b) Further describe these key elements of the strategy, e.g. objectives, roles, principles, boundaries, monitoring, evaluation, etc. (Science Plan codes: 3.6)
    1. Consider relevant stakeholder interaction documents including the framing document developed by Ballesteros and Dickey-Collas. Building on the Ballesteros and Dickey-Collas framing document, summarize the approaches taken by other similar and relevant international organisations.
    2. Develop and propose a table of contents for a Stakeholder Engagement Strategy to be developed by ACOM/SCICOM that clearly links the potential objectives with guiding principles.
    3. Discuss gaps, identify risks and opportunities that arise from the challenges identified.
    4. Consider the best means to effectively and transparently communicate with the ICES community about stakeholder engagement to ensure trust in the process.
c) Research and report current stakeholder activities taking place *within* ICES, to inform the deliberations of ACOM/SCICOM, especially with regards to monitoring and evaluating the impact of stakeholder engagement against the goals of a strategy. (Science Plan codes: 3.6)
    1. Prior to the workshop, survey ICES expert group chairs to characterize current stakeholder involvement, perceived barriers and challenges, and goals for improving stakeholder engagement.
    2. Summarize current stakeholder monitoring / tracking processes and consider alternatives.
    3. Discuss future social science training needs related to different stakeholder strategies.
d) Propose alternative approaches (with associated risks) to improve and secure further inclusion and engagement by ICES with stakeholders, such as future hybrid meetings. (Science Plan codes: 3.6)

ICES WKSHOES will report to the attention of ACOM / SCICOM by **31 July 2021.**

Supporting information

Priority	High; this WK is essential for clarifying the role of stakeholders in ICES. The WK will produce the context for ACOM/SCICOM to create a stakeholder engagement policy that will guide stakeholder interaction in diverse ICES expert groups and workshops.
Resource requirements	Assistance of the Secretariat in maintaining and exchanging information and requirements and data to potential participants. Technical assistance scheduling and running an online workshop.

Participants	Various experts across ICES groups with knowledge and expertise of stakeholder participation in ICES and beyond.
Secretariat facilities	SharePoint site, secretariat support for reporting. Assistance with online workshop functioning and online meetings prior to the workshop and operation of the online workshop.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	All ACOM/SCICOM groups will be impacted by this workshop.
Linkages to other committees or groups	ACOM, SCICOM, WGSOCIAL, WGMARS, WGECON, WGBESEO, Others.
Linkages to other organizations	All current and potential future stakeholders.

WKCLIMAD - Workshop on pathways to climate-aware advice

2020/WK/IEASG05 The Workshop on pathways to climate-aware advice (WKCLIMAD), chaired by Kirstin Holsman, USA, Michael Rust, USA and Mark Dickey-Collas, ACOM, will be established on 15 June 2021 to start intersessional work and will meet online, 29–30 September 2021 and 18-20 October 2021 to develop a proposal for an advisory framework that accounts for the influences of climate change on aquaculture, fisheries, and ecosystems. The framework should address the short, medium and long term influence of climate. The workshop will do this by:

a) Work intersessionally (via correspondence prior to and between meetings) to review the evidence base of recent and emergent analyses of key climate hazards to aquaculture, fisheries, and ecosystems. The review should include the probability of risk and the severity of the key climate hazards, the assessment of variability and uncertainty, identifying best practice for the consequences of both temporal and spatial scales (Science Plan codes: 1.3, 2.5).

b) Outline actionable strategies and approaches (including socio-ecological adaption and mitigation) to promote resiliency in aquaculture, fisheries, and ecosystems; frame and identify the key steps to "on-ramp" climate information and tools to management advice. (Science Plan codes: 6.6).

c) Scope the next steps for an operational approach, expanding the relevant aspects of climate change that impact management decisions in aquaculture, fisheries, and ecosystems (Science Plan codes: 6.6).

WKCLIMAD will report by 15 November 2021 for the attention of IEASG.

Supporting information

Priority	The overall aim of this workshop is to develop a broad framework for climate-related advice taking into account that different types of ICES Advice will have both common and distinct scope and priorities. Managers, decision makers, and other stakeholders are increasingly aware that they need to consider climate impacts, but they often are not clear on how this can be effectively achieved. As climate impacts become more pervasive, there is a need for ICES to evaluate its own plans for providing climate-related advice. Climate-enabled tools and predictive tools are increasingly available and deployed to improve management, and various frameworks have been proposed to integrate climate information into advice, yet an overarching synthesis is needed to categorize and summarize this wealth of information. This

	workshop will launch from the position that much information and many tools are already available, and the challenge to ICES is how to incorporate this evidence and provide credible and relevant advice to managers.
Scientific justification	Three components form the workshop: 1. Common understanding of best available evidence and expert opinion on climate change and influence of fisheries and aquaculture. 2. Actionable strategies and approaches that are appropriate for advice to managers of fisheries and aquaculture. 3. Bringing together the evidence and strategies together in a proposed advice framework. Identification of climate change hazards and impacts should include consideration of the temporal scales (near, medium and long term) and spatial scales relevant to ICES ecoregions (including regional aspects such as environmental and ecological hotspots that are particularly vulnerable to climate impacts). Climate change forcing includes sudden climate events (marine heatwaves, low oxygen events, declining pH, changes in circulation, altered oceanographic conditions) resulting in long-term hazards (e.g., shifting distributions or declines in productivity, changes in marine HABs and pathogen distributions/impacts, etc.). Climate change hazards also result in social and economic impacts (e.g. job loss in fisheries, altered access to food and nutritional resources, cascading impacts on human health and wellbeing). The review of the evidence-base related to identified hazards ideally includes identification of key risks from hazards to ecological and social systems and associated estimations of confidence (qualitative or quantitative) in terms of attribution and probability of occurrence. Identifying best practices for testing, selecting, and implementing climate advice tools that can help estimate risk, including tools to facilitate the assessment of variability and to identify and evaluate uncertainty. The review could also consider: • Approaches for bias correction, skill testing, and quantification of uncertainty for climate-enhanced tools and products, and gaps in knowledge or technology • Approaches and examples of cumulative impact assessments including cascading impacts and interactions with other natural or anthropogenic pressures. • Methods of scenario analyses and management strategy evaluation for testing the performance of climate advice under future climate change scenarios. • The potential for a harmonized approach to reporting impacts, responses, and tools between aquaculture and fisheries and identify shared tools and needs (e.g. Risk Communication) and discuss unique challenges and solutions. Actionable strategies and approaches to promote resiliency or mitigation and to provide advice should consider: • Nested scales of management approaches: dynamic management (short-term), adaptive (medium spatial and annual/biannual scale), to fixed management measures (long-term, basin-scale). • Climate products and strategies associated with various scales of management (e.g., now-casts for dynamic management, forecasts for adaptive management, and long-term projections for fixed management measures like protected areas and ecosystem-based limits on harvest). When building the draft framework, the following issues should be considered: • Climate-informed advice given actual and counterfactual management responses to sudden climate events. • Operational now-casts in dynamic management, forecasts in adaptive management/ stock assessment, and long-term projections used in fixed measures and strategic advice.

	• "on-ramps" for climate information and tools for management advice and the required level of integrative climate advice The workshop will also partially use a modified Delphi approach to develop a degree of prioritized consensus around climate forced hazards, the risk (probability) those hazards pose, and mitigation approaches for fisheries and aquaculture at different temporal scales and management intensities. A series of remotely administered exercises will be used prior to the actual workshop to frontload the discussion at the workshop. First, a scoping exercise to gather a diversity of input from a broad population of experts in environmental, social and economic sciences will be conducted. This information will then be synthesized into a second remotely administered exercise (intersessionally) to further prioritize hazards, refine estimation of risk, and increase the pool of opportunities for mitigation. Economic, social and environmental experts from both industries that are most prolific and engaged from the two exercises will be invited to the workshop. The workshop time will be used to finalize the information from the exercises, and, in accordance with the ICES guiding principles, to develop a proposed format to consistently include climate information into ICES advice. *Two outcomes/products:* A **workshop report** to ACOM and SCICOM An **ICES guideline** for incorporating climate in ICES advice (possibly 10 key principles on how to and not to address the climate context).
Resource requirements	No major resourcing.
Participants	Scientists, stock assessment authors, climate and ocean modellers, ecosystem and food web modellers, social scientists, economists.
Secretariat facilities	Assistance with surveys and online meeting support.
Financial	No financial implications.
Linkages to advisory committees	ACOM, SCICOM
Linkages to other committees or groups	-
Linkages to other organizations	-

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 and 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	March/April	Brussels, Belgium	ICES scientific report by 4 July	Ute Daewel, Gernmany, 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	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	Improve model interaction between trophic levels by: - Investigating the importance of spatio-temporal scales for trophic match-mismatch - Assessing human activities on effects on ecosystems, including cumulative impacts	Fundamental science lying behind the structural and parametric needs for these types of model. Important for IEA groups and WKEWIEA. Linked to Marine Ecosystem Research Program	2.2, 2.5	Annual	Report or paper on how human activities affecting marine ecosystems can be described in models. 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. Further develop contact to the social science EG's. Where appropriate peer reviewed publications are endorsed.
b	Improving lower trophic level models by investigating: - Parameterization of functional diversity (community structure, traits) and adaptations - Patterns and drivers of plankton phenology and productivity across models and ecosystems - Bentho-pelagic coupling in models	More research is needed to improve model description of diversity, adaptation and traits in lower trophic level models. The bentho-pelagic coupling is important for nutrient and energy fluxes and should be better described in the models. IEA groups, WGZE and BEWG.	1.3, 1.9	Annual	Collaborative paper on productivity and drivers across models and ecosystems. Collaborative paper on productivity across ecosystems. Report on impacts of human pressures on ecosystem components assessed by dynamic modelling. Where appropriate peer reviewed publications are envisioned.
c	Improve higher trophic level models by investigating: - Effects of connectivity, climate and habitat on emerging species distribution, to	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	1.3, 1.4	Annual	Report on impacts of human pressures on ecosystem components assessed by dynamic modelling. Collaborative report or paper on movement algorithms used in modelling.

	support management and fisheries - Key process formulation (mortality, physiological rates, etc.) - Movement algorithms	understanding of the recruitment process. Fundamental research is needed to improve the description of key physiological processes in models. Important for IEA EG's, spatial planning EG's, BWEG, WGBIOP and for advice.		Appropriate peer reviewed publications are envisioned.
d	Assessment of model skill evaluation methods by: - 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 weakness - Investigate uncertainty analysis (structural, parameters, scenarios) including model ensembles - Exploring representativeness and use of observations for ecosystem model validation	The lack of systematic evaluation of ecosystem model performance and sensitivity currently limits their use in an operational and management context. 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. Links to all EGs using multi-species and ecosystem modelling (e.g. WGSAMS, WGIMM, working groups on integrated assessments).	1; 3, 5.3	Annual	Collaborative report or paper on representativeness. Appropriate peer reviewed publications are envisioned.

Summary of work plan

Year 1	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.
Year 2	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.
Year 3	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

Priority	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.

Resource requirements	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.
Participants	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.
Secretarial facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages, but discussion and/or workshops with other groups are envisioned.
Linkages to other committees and groups	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.
Linkages to other organisations	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 and Debbi Pedreschi, Ireland, 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	
Year 2022		Canaries (TBD)	Final ICES Scientific Report by (TBD) to IEASG	

ToR descriptors

ToR	Description	Background	Science Plan codes	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	Linked to WKEWIEA, WKIRISH, ToR B and previous group ToRs. Investigation of scaling issues related to summarising	1.3, 2.4, 6.5	3 years	Inform IEAs/EO. Results in the final report or/and as a collaborative paper.

	relevant at these scales in support of ecosystem-based management.	information from locally relevant scales/models.			
d	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	**Ecosystem overviews. Collaborative network with improved workflow.**
e	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	**Regional modelling prodcuts**

Summary of the Work Plan

Year 1	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. 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).
Year 2	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).
Year 3	Continue with Year 2 activities while liaising with relevant ICES WG membership. Finalise papers.

Supporting information

Priority	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. 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).
Resource requirements	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.
Participants	The Group is normally attended by some 8 members plus guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	Direct link to IEA steering group, ICES advice.
Linkages to other committees or groups	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.
Linkages to other organizations	DC- MAP- DG MARE, MSFD DG ENV, OSPAR.

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, Germnay incoming
Year 2021	3-7 May	Online meeting	ICES Scientific report by TBD	Jennifer Bailey incoming additional Chair
Year 2022	TBD	TBD - Europe	Final ICES Scientific report by TBD	

ToR descriptors

ToR	Description	Background	Science plan codes	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

Year 1	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

Priority	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.
Resource requirements	Resource requirements are covered by WGMARS members, including through already funded projects and in some cases with institutional support.

Participants	The Group is normally attended by some 10-15 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	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.
Linkages to other organizations	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	4-8 October	University of Palermo, Italy	No reporting	
Year 2022	TBD May	TBD	Final ICES Scientific report by July 2022	

Tor descriptors

TOR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	Assess the **functional biodiversity** 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 **core functional traits** across different taxonomic groups in order to integrate the current approaches 2. **Compile trait data** for phytoplankton, zooplankton, fish and invertebrate species to standardize the use of traits

		B) The tor 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 **dynamic traits on space and time**, i.e. Those which are demographic (e.g. Fecundity) or ontogenetic (e.g. Diet) dependent 4. Understand spatio-temporal dynamics and patterns of **functional diversity and respective drivers** (trait biogeography; co-occurrence of traits) 5. Understand functional changes to different human pressures and **predict the vulnerability and stability of Mediterranean and Atlantic ecosystems** (resilience indicators).
b	Integrate the complexity of marine biota to understand how **ecosystem structure and connectivity** 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 **food webs models** across Mediterranean and Atlantic systems 2. Identify possible methods to **predict species interactions from traits** and extend multi-trophic interaction network in data-poor regions 3. Understand spatio-temporal dynamics of food webs and identify the **link between structure and stability** across ecosystems 4. Understand past and **predict future vulnerabilities** of communities to fishing disturbances or biological invasions.
c	Investigate **resilience and mechanisms of change** in complex	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 **temporal development of ecosystems** in the

	marine systems impacted by anthropogenic and environmental drivers	Mediterranean to uncover synchronies and analogies across them. 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.			NE Atlantic and the Mediterranean. 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. B) The tor will be organised around 3 main activities and expected deliverables: scooping and systematic review, evidence mapping and synthesis, comparative analysis of case studies.	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). 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 multitrophic 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.

	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).
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.

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 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.
Resource requirements	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.
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. - Francoise 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 (Thuenen, 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
Secretariat facilities	None

Financial	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.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or group	There is a very close working relationship with all the groups IEASG, and especially – Working Group on Integrated Assessments of the Baltic Sea (WGIAB) – Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS) – Working Group on SOCIAL indicators (WGSOCIAL) (especially tor d) – Working Group on Maritime Systems (WGMARS) (especially tor d) It is also very relevant to the Working Groups: – Working Group on the Integrated Assessments of the Barents Sea (WGIBAR) – Working Group on Integrated Assessments of the North Sea (WGINOSE) – Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA) – Working Group on the Northwest Atlantic Regional Sea (WGNARS) – Working Group on Biodiversity Science (WGBIODIV) (especially tor b) –
Linkages to other organizations	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	Meeting online	ICES Scientific Report by 31 May 2021	
Year 2022	TBC	TBC	Final ICES Scientific Report by TBD	

ToR descriptors

ToR	Description	Background	Science Plan codes	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

Year 1	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. Perform an integrated analysis of multivariate data sets and other relevant information including model outputs 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 Evaluate the current monitoring of the Barents Sea ecosystem Provide support to ongoing ecosystem assessments and evaluations in the Barents Sea
Year 2	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. Perform an integrated analysis of multivariate data sets and other relevant information including model outputs

	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
	Evaluate the current monitoring of the Barents Sea ecosystem
	Provide support to ongoing ecosystem assessments and evaluations in the Barents Sea
Year 3	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.
	Perform an integrated analysis of multivariate data sets and other relevant information including model outputs
	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
	Evaluate the current monitoring of the Barents Sea ecosystem
	Provide support to ongoing ecosystem assessments and evaluations in the Barents Sea
	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

Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries, especially with regard to the application of the Precautionary Approach. Consequently, these activities are considered to have a very high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities (ToR c and e) is needed.
Participants	The Group is normally attended by some 20–25 members and guests.
Secretariat facilities	SharePoint site, secretariat support for reporting
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	Stock assessment groups in particular AFWG and WGWIDE.
Linkages to other committees or groups	There is a very close working relationship with all the groups WGINOR and WGICA. It is also very relevant to the groups WGSAM, WGOH, WGECO.
Linkages to other organizations	The Joint Russian-Norwegian Fisheries Commission, in charge of joint fisheries management in the Barents Sea. The Joint Russian-Norwegian Environmental Commission, in charge of joint environmental management in the Barents Sea. The Norwegian Ministry of Climate and Environment, in charge of Norwegian holistic ecosystem-based management plan for the Norwegian part of the Barents Sea. Relevant groups within the Arctic Council. PAME/ICES workshop, PICES/ICES workshops. Norwegian monitoring group under the Norwegian Management Plan

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	January TBD	Copenhagen, Denmark	Final ICES Scientific report by 30 November	

ToR descriptors[2]

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
a	Assemble relevent 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 produse 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

[2] Avoid generic terms such as "Discuss" or "Consider". Aim at drafting specific and clear ToR, the delivery of which can be assessed

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

Summary of the Work Plan

Year 1	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. Develop Ecosystem Overview (as advice request). Start discussions on methodological approaches and analytical tools for conducting integrated ecosystem assessment. Identify additional scientists/partners and invite them to join the EG.
Year 2	Continue assembling relevant datasets and update the database. Continue discussions on methodological approaches and analytical tools for conducting integrated ecosystem assessment. Prepare first analysis on the ecosystem status and trends.
Year 3	Finalise the database. Prepare manuscript on the status and trends of the Greenland Sea ecosystem. Identify knowledge gaps and priority research items that can improve future integrated ecosystem assessments and provide recommendations to improve the monitoring.

Supporting information

Priority	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.
Resource requirements	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 intiative 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. The research initivatives that may arise from the activity have the opportunity to align with EU framework funding.
Participants	Initiated by DTU and GNIR participation will be seeked from Iceland and Norway, with experise spanning oceanography and fisheries. Participants from other nations are also welcomed.
Secretariat facilities	SharePoint site. Support for meetings at ICES HQ, when appropriate
Financial	No financial implications
Linkages to ACOM and groups under ACOM	Link to ACOM through development of Ecosystem Overview, NWWG and WGWIDE.

Linkages to other committees or groups	All ICES IEASG expert groups, several EGs under HAPISG (human pressures) and EPDSG
Linkages to other organizations	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 Sean Lucey, USA and Jamie Tam, Canada, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2020	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	TBD	Woods Hole, USA	Final ICES Scientific Report by (TBD) to IEASG	New USA Chair will be appointed

ToR descriptors

ToR	Description	Background	Science plan codes	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)	• Refined understanding of the system through conceptual models • Exploratory application of risk assessment to a Canadian region • Analysis of cumulative effects including, for example, offshore energy
c	Increase the cross disciplinary capacity of IEAs in the region by engaging with scientists and stakeholders from under-represented disciplines and research		2.7, 6.6, 7.5	3 years (2020, 2021, 2022)	• List of research products developed from reaching out and including members of under-represented disciplines and research communities (e.g. papers, reports, indicators)

	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)	• Tested and evaluated new indicators that are responsive to a changing environment or other conditions (e.g. SMART indicators) • Completed threshold analysis of existing indicators • Framework for developing spatial indicators
e	Improve management advice by developing decision support tools that reconcile multiple ocean uses by explicitly addressing tradeoffs within an ecosystem context (e.g. structured decision making, management strategy evaluation, scenario planning)	2.7, 6.1, 6.4	1 year (2022)	• Worked example of a decision support tool
f	Develop best practices for increasing efficiency in product development that can lead to improved responsiveness to management requests	4.1, 4.2, 4.3	1 year (2020)	• Workshop on best practices for improving efficiency, transparency, and workflow • Timely provision of information to managers (e.g. annual SOEs, Risk assessment) • Improved data accessibility • Manuscript on best practices
g	Develop best practices for communicating with a diverse group of stakeholders (i.e., managers, scientists, public), recognizing that effective communication tools may differ across audiences	1.1, 4.2, 6.4	1 year (2021)	• Examples of effective communication tools for various audiences

Summary of the Work Plan

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

Supporting information

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

WKTRANSPARENT - Workshop on methods and guidelines to link human activities, pressures and state of the ecosystem in Ecosystem Overviews

2019/WK/IEASG07 Workshop on methods and guidelines to link human activities, pressures and state of the ecosystem in Ecosystem Overviews (WKTRANSPARENT) chaired by Henn Ojaveer*, ICES, Debbi Pedreschi*, Ireland, and Gerjan Piet*, Netherlands, will be established and will meet by correspondence for three days 7 - 9 December 2020 to:

a) Explore ways to link the identified high-priority pressures to ecosystem functions and processes;

b) Review relevant approaches and frameworks (risk assessment, mental modeller and others) used by the working groups for assessing and prioritizing the main ecoregion pressures/stressors and human activities with direct impacts to ecosystem components, and propose revisions to the current guidelines;

c) Review and revise technical guidelines for ecosystem overviews, including the pipeline process to incorporate new science, the process to update the Overviews and outputs from ToR b).

WKTRANSPARENT will report by 18th of December for the attention of the ACOM/SCICOM.

Supporting information

Priority	High priority. Ecosystem overviews are part of the recurrent advice in the Administrative Agreement signed between the EU and ICES, and key mechanism for ICES to deliver its advice on ecosystem based management.
Scientific justification	This is a direct follow-up from WKEO3 to further advance and develop ecosystem overviews, which includes both conceptual/guidance developments as well as consider incorporating ecosystem functions/processes.
Resource requirements	The national research programmes and ICES EGs which provide the main input to this group are already underway, and resources are already committed.
Participants	The WK will be attended by experts covering the areas of knowledge related to the ToRs, with a wide range of area coverage.
Secretariat facilities	Setting up webex calls.
Financial	No financial implications.
Linkages to advisory committees	Direct link to ACOM.
Linkages to other committees or groups	WGCEAM, WGICA, WGINOSE, WGINOR, WGIBAR, WGEAWESS, WGCOMEDA, WGIAB, WGIEAGS, WGIAZOR, WGITMO, WGMME, WGZE, WGSAM, BEWG, JWGBIRD, WGSFD, WKCONSERVE, WKINTRA2, WGECO.
Linkages to other organizations	OSPAR, HELCOM, NEAFC, PICES, etc.

WGIAZOR - Working Group on Integrated Assessment of the Azores

2019/FT/IEASG08 **Working Group on Integrated Assessment of the Azores** (WGIAZOR) chaired by Mario Pinho*, Portugal, and Maria de Fatima Borges*, Portugal, 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	25-29 May	Online meeting	No reporting	
Year 2021	24-28 May	Online meeting	No reporting	
Year 2022	TBC	TBC	ICES Scientific Report deadline June 2022	

ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
a	Providing input for the Fisheries Overviews in	Linked to ICES advice.	5.3, 5.4, 6.6	2020	Fisheries Overviews draft

	2020 (see Summary of the Work Plan)				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 prodcuts

Summary of the Work Plan

Year 1	For the aim of providing input for the Fisheries Overviews, consider:

	i) descriptions of ecosystem impacts of fisheries 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;
Year 2	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. 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.
Year 3	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.

Supporting information

Priority	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. The WGIAZOR will focus on the Azorean seas
Resource requirements	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.
Participants	The Group is normally attended by some 8 members plus guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	Direct link to IEA steering group, ICES advice.

Linkages to other committees or groups	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.
Linkages to other organizations	DC- MAP- DG MARE, MSFD DG ENV, OSPAR.

WKINTRA3 - The third workshop on integrated trend analyses in support to integrated ecosystem assessment

2019/WK/IEASG09 **The third workshop on integrated trend analyses in support to integrated ecosystem assessment (WKINTRA3)**, chaired by Saskia Otto, Germany, and Benjamin Planque, Norway, will meet in 20-24 September 2021 online.

The general objective of the workshop series is to develop good practices in the application of integrated trend analyses (ITA) and interpretation of their results for integrated ecosystem assessment. The third workshop will:

a) Review the simulated multivariate ecological datasets prepared during and following WKINTRA2 (Science plan codes 1.3 and 1.9)

b) Evaluate a selection of Integrated Trend Analysis (ITA) methods (Science plan codes 1.3 and 1.9).

   For this:

   - a set of ITA methods will be selected,
   - the R code to run the analyses will be provided,
   - method-specific qualitative or quantitative criteria will be defined that allow for an objective comparison across simulated datasets
   - the ITA methods will be applied on relevant simulated datasets outcomes will be assessed on a case study- and approach-specific basis

c) Develop guidelines for IEA groups to evaluate ITA methods, including a comprehensive documentation of data generation and method application using the R environment (Science plan code 6.5)

WKINTRA3 will report by 29 October 2021 for the attention of IEASG.

Supporting Information

Priority	The use of ITA is widespread in the ICES integrated ecosystem assessment community, and recent publications have challenged the interpretation of its results. Thus, the priority should be considered medium to high.
Scientific justification	The first workshop on integrated trend analyses in support to integrated ecosystem assessment (WKINTRA) recognized some of the limitations in the ITA methods currently used as a standard tool by ICES IEA groups. It was recommended to approach the evaluation problem through simulation studies, in a way similar to that used earlier in ICES for stock assessment models (ICES, 1993). The second workshop (WKINTRA2) developed and compared numerical simulation protocols and algorithms, with the aim of simulating few contrasted ecosystem datasets. These

	will form the basis of ITA methods evaluation for the intended WKINTRA-3 workshop.
Resource requirements	No major resourcing
Participants	Statisticians and researchers from across the IEASG network.
Secretariat facilities	None.
Financial	No financial implications for ICES.
Linkages to advisory committees	Link to ACOM through the development of ecosystem overviews
Linkages to other committe or groups	Links across all ICES IEA working groups
Linkages to other organizations	Links to IEA groups in the Arctic and PICES Working Groups working on similar topics.

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 Goldsborough, 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	ICES Scientific Report by October 2021	
Year 2022	April 2022	ICES HQ, Copenhagen, Denmark	Final ICES Scientific Report by October 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[3].

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.

[3] 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[4]. 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	Science Plan Codes	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	1st – 2nd year	Overview Report: description of most relevant trade-offs identified and the associated SEE objectives.

[4] 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	1st – 2nd 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	2nd and 3rd 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	3rd 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

Priority	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.
Scientific justification	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.
Relation to Strategic Plan	The group will directly feed the work of the IEA working groups as well as feed into the ecosystem, fisheries and aquaculture overviews.
Resource requirements	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.

Participants	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, JAKFISH, MEFEPO, ODEMM, MESMA, SOCIOEC, MYFISH, AQUACROSS, CERES), ICES Secretariat
Secretariat facilities	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.
Financial	None
Linkages to advisory committees	ACOM
Linkages to other committees or groups	IEASG, SIHD, all IEA groups, WGIMM, WGSA, WGMARS, WGSEDA, WGHIST, WGRME, SICCME, WGSOCIAL, WGECON.
Linkages to other organizations	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	Interim e-evaluation	Extension granted to start 2021 instead of 2020
	October TBD	Qingdao, China		
2022	September (ICES ASC)	Copenhagen, Denmark	Interim e-evaluation	
	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	Science plan codes	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 these conceptual models be done in close	1.1, 1.3, 7.1	Year 2	Reports submitted to ICES and PICES and/or paper(s) submitted to peer-reviewed journal

		collaboration with Indigenous Peoples and relevant stakeholders, using Indigenous/Traditional and Local knowledge (TLK) along with knowledge from physical, biological and social sciences.			
g	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
h	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

Year 1	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.
Year 2	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.
Year 3	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

Priority	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.
Resource requirements	No resource requirements from ICES
Participants	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.
Secretariat facilities	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.
Financial	No financial requirements from ICES
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	There is a very close working relationship with all the groups 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.
Linkages to other organizations	• Joint partnership between ICES and PICES: the proposal has been approved by PICES; • International Arctic Science Committee (IASC), interest in co-sponsorship has been expressed • Arctic Council Protection of the Arctic Marine Environment (PAME), interest in co-sponsorship has been expressed • NOAA Integrated Ecosystem Assessment Program, interest in co-sponsorship has been expressed • Bering Sea Elders Group

Resolutions approved in 2018

WGIAB - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea

2018/MA2/IEASG03 The **ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea (WGIAB)**, chaired by Saskia Otto, Germany, Martin Lindegren, Denmark, Lauréne Pécuchet, Finland, and Matilda Valman, Sweden, will generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2019	8-12 April	Palma de Mallorca, Spain	ICES Scientific Report by 29 May 2019 to IEASG	
Year 2020	30 March – 2 April	by correspondance	No reporting	
Year 2021	8-9 November	To be decided	Final ICES Scientific Report by 25 October 2021 to IEASG	

ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
a	Conduct an ecosystem indicator analysis (combining natural and social sciences) across a number of Baltic Sea sub-systems including (i) robustness testing with respect to confounding multiple stressor effects and management suitability, (ii) threshold determination, and (iii) ecosystem trend and state evaluations.	This ToR will provide sub-system-specific suites of ecosystem indicators and respective thresholds to support the development of Integrated Ecosystem Assessments and Ecosystem-based Fisheries Management. The work relies on previous and ongoing work across HELCOM and ICES EGs, including WGSOCIAL, WGCERP, and SICCME	1.9, 6.6, 7.1,	1 year	-Research article(s) on ecosystem indicator testing and ecosystem state assessments - Report cards displaying the state of Baltic Sea sub-systems using selected indicator suites - Intermediate results reported in interim reports 2019 and 2020 as well as the final report.
b	Conduct vulnerability analyses for the combined social – ecological system of Baltic Sea sub-systems to the cumulative effects of climate change, fisheries and eutrophication using an exposure – sensitivity approach.	This ToR will investigate the consequences of cumulative external threats on the Baltic Sea ecosystems, identifying vulnerable components of both the social and ecological sub-systems as a basis for model-based management strategy evaluation	6.5	2 years	- Research article(s) on the vulnerability of Baltic Sea subs-systems to cumulative drivers - Intermediate results reported in interim reports 2019 and 2020 as well as the final report.

		exercises. This ToR relies on previous and ongoing work across ICES EGs, includiing WGSOCIAL and SICCME			-output to Ecosystem Overview
c	Conduct a multi-model exercise exploring management strategies that best adapt vulnerable social – ecological system components of Baltic Sea sub-systems to the cumulative effects of multiple external drivers.	This ToR will provide important context to management and decision making processes within the Baltic Sea ecosystem-based management landscape.	6.4, 6.5, 7.1	2 years	-Research article(s) on management strategy evaluations of social – ecological systems components to multiple external drivers, - Intermediate results reported in the final report.

Summary of the Work Plan

Year 1	Annual meeting, intersessional work on social- ecological indicator suites development.
Year 2	Annual meeting, intersessional work on vulnerability analyses to multiple external drivers.
Year 3	Annual meeting, intersessional work on management strategy evaluations of vulnerable social-ecological system components.

Supporting information

Priority	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.
Resource requirements	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.
Participants	The Group is normally attended by some 20 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	WGBFAS
Linkages to other committees or groups	WGINOSE, WGNARS, WGEAWESS, WGINOR, WGIBAR, WGCOMEDA, WGSOCIAL, WGMARS, SICCME, WGCERP

Linkages to other organizations	HELCOM

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

2018/MA2/IEASG04 The **Working Group on Integrative, Physical-biological, and Ecosystem Modelling (WGIPEM)**, chaired by Marie Maar, Denmark, Solfrid Sætre Hjøllo, Norway, and Sonja van Leeuwen*, 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 2019	25-29 March	Bergen, Norway	ICES Scientific Report by 3 May 2019	
Year 2020	by correspondence	-	No reporting	Marie Maar will stop end 2020 and a new chair Sonja van Leewen will take over during 2020
Year 2021	22-25 March	Online meeting	Final ICES Scientific Report by 25 May 2021	

ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
a	Improve model interactions between trophic levels by: -investigating the importance of spatio-temporal scales for trophic match–mismatch -assessing human activities effects on ecosystems, including cumulative impacts	Fundamental science lying behind the structural and parametric needs for these type of models. Important for IEA groups and WKEWIEA. Linked to Marine Ecosystem Research Program	2.2, 2.5	Annually	Report or paper on how human activities affecting marine ecosystems can be described in the models Report on knowledge gaps related to improving lower-to-higher trophic level models couplings Seek to establish contact to the social science EGs Where appropriate peer reviewed publications are envisioned
b	Improve lower trohic level models by investigating: - parametrization of functional diversity	More research is needed to improve model description of diversity, adaptation and traits in lower trophic level models.	1.3, 1.9	Annually	Collaborative paper on productivity and drivers across models and ecosystems

	(community structure, traits) and adaptations - patterns and drivers of plankton phenology and productivity across models and ecosystems - bentho-pelagic coupling in models	The bentho-pelagic coupling are important for nutrient and energy fluxes and should be better described in the models IEA groups, WGZE and BEWG.			Where appropriate peer reviewed publications are envisioned
c	Improve higher trophic level models by investigating: -effects of connectivity, climate and habitat on emerging species distribution, to support management and fisheries - key process formulation (mortality, physiological rates...) -movement algorithms	Understanding the connectivity between networks of MPA under unfluence of climate change is vital. Connectivity is also essential to defining the spatial structure of stocks and better understanding of the recruitment process. Fundamental research is needed to improve the description of key physiological processes in models Important for IEA EGs, spatial planning EG, BEWG, WGBIOP, and for advise. In E2E models, movement are essential, and there is a need to assess the characteristics and impacts of each algorithm in different environments (theoretical and/or realistic)	1.3, 1.4	Annually	Collaborative report or paper on the influence of climate on connectivity Collaborative report or paper on movement algorithms used in modelling Appropriate peer reviewed publications are envisioned
d	Assessment of model skill evaluation methods by: -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 lack of systematic evaluation of ecosystem model performance and sensitivity currently limits their use in an operational and management context. Evaluation is challenged by the complexity of the models themselves, as well as model vs. sparse datasets comparisons,	1.3, 5.3	Annually	Review paper on model skill assessments methods together with WGSAM Appropriate peer reviewed publications are envisioned

the feasibility of the currently existing approaches and identify possible weakness - investigate uncertainty analysis (structural, parameters, scenarios) including model ensemble	where characterizing different types of variability (mean or trend; interannual or seasonal; rare or extreme events etc.) are needed. Links to all EG using multispecies and Ecosystem modelling (e.g. WGSAM, WGIMM, Working Groups on Integrated Assessment).

Summary of the Work Plan

Year 1	ANNUAL MEETING TO REPORT ON THE STATE-OF-THE-ART OF THE TOPICS IN TORA-D, PLANNING OF JOINT PAPERS AND SPECIFIC WORKSHOPS ON SELECTED TOPICS.
Year 2	Annual meeting to report on the state-of-the-art of the topics in ToRa-d and joint meeting with other expert groups. Specific workshop on some of the identified topics.
Year 3	Annual meeting and final report on the state-of-the-art of the topics in ToRa-d, and joint meeting with other expert groups.

Supporting information

Priority	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 (e.g. Atlantis, Osmose, EwE, size-based model). The activities of the group will foster international collaboration and networking amoung established and young scientists in a rapidly evolving science field, and should be given high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	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.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages, but discussion and/or workshop with other groups are envisioned.
Linkages to other committees or groups	There is a very close working relationship with all the groups of IEASG. It is also very relevant to WGSAM, WGBE, WGS2D.
Linkages to other organizations	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.

WGCERP - Working Group on Common Ecosystem Reference Points

2018/MA2/IEASG05 A **Working Group on Common Ecosystem Reference Points (WGCERP)**, 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		By correspondance	No reporting	
Year 2021	2-4 November	To be decided	Final ICES Scientific report by 10 December 2021	Election of new chairs

ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
a	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	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
c	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. WGECO, 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
d	When ecosystem reference points already exist, identify the methodology used for their determination.		1.3, 6.2	Year 1	Report of the review in ICES or as peer reviewed publication. 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 refer-ence 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	Identify ecosystem components that respond rapidly to changes in biophysical drivers and could potentially serve as indicators of loss of resilience and ecosystem change.		1.3	Year 3	
j	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, scientificaly 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

Year 1	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.

Year 2	Develop methodologies to assess the performance of ecosystem indicators and associated reference points.
Year 3	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

Priority	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 prioty are 2 (Understanding ecosystems) and 3 (Impacts of human activities).
Scientific justification	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.
Resource requirements	No major resourcing
Participants	Researchers from across the ICES network.
Secretariat facilities	Support for meetings at ICES HQ, when appropriate.
Financial	No financial implications for ICES.
Linkages to ACOM and groups under ACOM	Link to ACOM through the development of Ecosystem Overviews and advice.
Linkages to other committees or groups	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.
Linkages to other organizations	Links to PICES Working Groups working on similar topics (WG36 WG28, WGCEP, S-CCME WGNPESR).

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

2018/MA2/IEASG06 A Joint **ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment of 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 2019	8-10 May 2019	Sapporo, Japan	ICES Scientific Report by 1 September 2019	
Year 2020	27-29 April	Online meeting	ICES Scientific Report by 1 September 2020	Hein Rune Skjoldal, Norway and John Bengtson, USA as outgoing Chairs. Lis Lindal Jørgensen, Norway as incoming Chair
Year 2021	12-13 April	Online meeting	Final ICES Scientific Report by 31 December 2021	Martine van den Heuvel-Greve, Netherlands, as incoming Chair
	12-14 October	Online meeting		

ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
a	Review and consider approaches and methodologies for conducting an IEA of the CAO ecosystem including Human Activities from the viewpoint of Climate and Vulnerability Assessments.	WGICA has produced a first version IEA report for the CAO. Before producing an updated and extended version, the basic approach and methodologies should again be considered.	2.2, 6.1, 6.5	Year 1	Report outcome in the 2019 interim report.
b	Review and report on ongoing and recent changes and events in the CAO associated with changes in sea ice, oceanographic circulation, and hydrographic properties	There is a need to follow developments in the CAO resulting from the predicted further loss of sea ice and other physical changes associated with global climate change.	1.1, 2.2, 6.5	Years 1-3	New information will be reported in interim reports in 2019 and 2020. A more full account will be given as part of a second version IEA report for the CAO in 2021.

c	Continue to examine effects of climate change on the CAO ecosystem by compiling and reviewing information on changes in response to the ongoing 'Great melt', and assess likely consequences to the CAO ecosystem of projected future changes associated with further loss of sea ice and other climate-related changes (i.e. a climate impact assessment).	This activity was started in the first 3-year period, and some information is included in the 2018 IEA report. There is a need to continue and carry out a more detailed assessment of the documented and/or inferred bological and ecological changes associated with the large physical changes that have already taken place (e.g. loss of half the area and ¾ of volume of summer sea ice).	1.1, 1.3, 6.1, 6.5	Years 1-3	Progress will be reported in interim reports in 2019 and 2020. A more full account will be given as part of the new version of the IEA report for the CAO in 2021.
d	Assess the potential effects on the CAO ecosystem of recent, ongoing and future climatic and oceanographic changes on Human activities (shipping, tourism, possible future fisheries, seabed exploitation of minerals and security) and recent on-going pollution (contaminant, garbage, and micro plastics)	This is a new activity which relates to assessment of pollution in the CAO. Pollution can be expected to be one of the more serious threat to the CAO ecosystem and should be included in an IEA.	2.1, 2.5, 6.1	Years 2, 3	Progress will be reported in interim report in 2020. Aspects of pollution wil be included in the new IEA report for the CAO in 2021.
e	Review and report on new studies on fish of the CAO ecosystem (the High Seas).	The information on many parts of the CAO ecosystem is still limited. New information is expected to come over the next few years as research icebreakers pay more attention and use scientific echosounders and other observation techniques to record fish and other organisms in the water column and at the seafloor.	5.2, 6.1, 6.5, 6.6	Years 1-3	Progress will be reported in interim reports in 2019 and 2020. A more full account will be given as part of the new version of the IEA report for the CAO in 2021.
e	Continue to identify priority research needs and monitor how identified knowledge gaps (needed to improve IEA and management effectiveness) are being addressed and filled.	A by-product of doing the first version IEA of the CAO is a priority list of research needs. It is necessary to monitor how knowledge gaps are filled that will improve new versions of IEA.	1.3, 2.2, 3.1, 6.1, 6.5	Years 2, 3	Progress will be reported in the interim report in 2020 and outcome reported in 2021.
f	Prepare an Ecosystem Overview for the CAO ecosystem	This will be an addition to the series of Ecosystem Overviews prepared by ICES.	6.5, 6.6	Years 2, 3	Draft version will be reported in the interim report in 2020 and final version reported in 2021.

Summary of the Work Plan

Year 1	Review IEA methodologies for IEA of the CAO. Review and report new information and changes in the CAO ecosystem.
Year 2	Review and report new information and changes in the CAO ecosystem. Address pathways and effects of contaminants, make an initial list of research needs, and prepare draft Ecosystem Overview.
Year 3	Prepare a second version IEA eport for the CAO with information on status and trends, including impacts of climate change, pollution, and other relevant human pressures. Report on research needs and prepare final draft of Ecosystem Overview.

Supporting information

Priority	WGICA is one of several groups in ICES that do integrated ecosystem assessments, which is one of the priority action areas for ICES. Being a WG for the central Arctic Ocean, WGICA also contributes to the Arctic research action area. Jointly sponsored by PICES and the PAME working group of the Arctic Council, WGICA represents a collaborative effort that links ICES work in the wider Arctic Mediterranean Sea (the Nordic Seas and the central Arctic Ocean) with expertise on the Pacific Arctic through PICES. The work planned in WGICA will directly address ICES science priority area 6 Developing tools, knowledge and evidence of effective conservation and management and some elements of priority area 2 (Understanding ecosystems) and 3 (Impacts of human activities).
Scientific justification	ICES IEA EGs provide science based assessments of ecosystem status, trends and vulnerabilities to support implementation of the ecosystem approach to management. ToR a – The CAO is a data-deficient system where much of the data and knowledge comes from research activities, while monitoring is a more limited source of information. Based on the first version IEA report for the CAO, as well as experiences from the other IEA WGs in ICES, the approach and methods for IEA for the CAO will be considered prior to producing a second version IEA report in 2021. ToR b – The CAO is on a trajectory of reduction of sea ice with considerable interannual variablity. Trends and events will be reported to draw attention to the ongoing changes in the CAO. ToR c – The purpose and aim of this item is to provide a careful evaluation and summary of what we can say about the biological and ecological effects of climate change over the recent decades up to present. This can in turn be used for projections of likely effects of continued warming and loss of sea ice over next decades. ToR d – This item addresses pollution with focus on contaminant pathways (physical and biological) and potential effects in foodwebs of the CAO. The scale of activity will depend on the expertice available in the WG. ToR e – It is expected that new information will be forthcoming on occurrence of fish and other biota in the CAO from planned research activies. There is for instance increased awareness that scientific echosounders on research ice-breakers can provide valuable information. We will report on developments and include new information in the next IEA report. ToR d – This is an item meant to provide guidance to the research community at large on priority research issues to improve the knowledge base for continued IEA work. ToR e – This will add to the suit of Ecosystem Overviews prepared and published by ICES.
Resource requirements	No major resourcing.
Participants	Experts from ICES, PICES, and PAME
Secretariat facilities	Support for meetings at ICES HQ, when appropriate.
Financial	No financial implications for ICES.

Linkages to ACOM and groups under ACOM	Link to ACOM through the development of Ecosystem Overviews and advice.
Linkages to other committees or groups	Within ICES links across all ICES IEA working groups and to HAPISG EGs on human pressures on marine ecosystems, such as pollution.
Linkages to other organizations	This is a joint ICES, PICES, and PAME WG.

WGINOR - Working Group on Integrated Assessments of the Norwegian Sea

2018/MA2/IEASG13 The Working Group on Integrated Assessment of the Norwegian Sea (WGINOR), chaired by Per Arneberg, Norway and Anna H. Ólafsdóttir, Iceland, 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	25-29 November	Bergen, Norway	ICES Scientific Report by 15 January 2020 to IEASG	New incoming Co-Chair, Anna H. Ólafsdóttir, Iceland
Year 2020	23-27 November	By correspondence	ICES Scientific Report by 15 January 2021 to IEASG	
Year 2021	22-26 November	Reykjavík Iceland	Final ICES Scientific Report by 15 January 2022 to IEASG	

Terms of Reference a) – f):

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Perform integrated assessment of the pelagic ecosystem in the Norwegian Sea and develop a framework for identifying warning signals for management.	Addresses needs in the Science Plan for developing understanding of the ecosystem and its responses to human impact and other challenges. In addition, start developing a framework for ecosystem-based advice that can be used by WGWIDE, OSPAR and similar recipients.	6.5	years 1-3	WG report to SCICOM and ACOM January following each year
b	Utilize multispecies and ecosystem models to evaluate effects of single and multispecies 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 2-3	WG report to SCICOM and ACOM January following year 2 and 3

c	Initiate development of forecast products (1-5 years) for key indices of ocean climate 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	Develop a food-web assessment of the pelagic ecosystem in the Norwegian Sea, including hindcasts and conditional forecasts of the main species or trophic groups.	Aims at providing better understanding of energy flow in the food-web of the pelagic ecosystem in support of integrated ecosystem assessment.	5.2	years 1-3	WG report to SCICOM and ACOM January following each year
e	Establish a dialogue between WGINOR and relevant pelagic fisheries stakeholders and managers in Norway, Faroe Island and Iceland.	Aims at steering 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	Update the ecosystem overview based on the ICES guidelines.	Summarizes key achievements in developing an understanding of the ecosystem and its responses to human impact and other challenges.	6.5	year 3	WG report to SCICOM and ACOM January following year 3

Summary of the Work Plan:

Year 1	Initiate work with ToRs c,d and e and framework for warning signals in ToR a. Do interim IEA as part of ToR a.
Year 2	Continue work on ToRs c,d and e. Start work with the climate change part of ToR f. Start work with ToR b. Do interim IEA and assess warning signals as a part of ToR a.
Year 3	Do full IEA with assessment of warning signals as part of ToRa. Update the ecosystem overview. Continue work on ToRs b, c, d, and e.

Supporting information

Priority	WGINOR aims to conduct and further develop Integrated Ecosystem Assessment for the Norwegian Sea, as a step towards implementing the ecosystem approach, addressing core priorities in the ICES strategic plan.
Resource requirements	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 will be developed with input from relevant projects at the involved institutions. Term of Reference b) This will build on model approaches developed for this ToR during several years within WGINOR. Term of Reference c)

	This will be based on ongoing research projects and oceanographic information collected during cruises in the Norwegian Sea and surrounding waters and supplied by satellite-based monitoring. Resources must be found in the participating institutions to complete development of the forecast system. Term of Reference d) The basis for developing the model-based foodweb assessment is the data from the ecosystem cruises and model work done in the involved institutions. The work will draw on ongoing projects with a similar scope. Some resources must also be found in the involved institutions to complete the work. Term of Reference e) This will be based on experiences made during fishing industry scoping exercise at IMR, Bergen, Norway in 2018 and will not require additional resources. Term of Reference f) Update of the elements of the ecosystem overview established before 2019 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.
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	WGINOR has provided text to the section on "Ecosystem considerations for widely distributed and migratory pelagic fish species" in the WGWIDE report.
Linkages to other committees or groups	-
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.

EGs dissolved in 2020

Res. Code	EG name	Chairs
2018/2/IEASG12	**WKCONSERVE - Workshop on Challenges, Opportunities, Needs and Successes in including human dimensions in IEAs**	Alan Haynie, USA, Jörn Schmidt, Germany, Mette Skern-Mauritzen, Norway, and Eva-Lotta Sundblad, Sweden
2019/WK/IEASG09	**WKINTRA3 - The third workshop on integrated trend analyses in support to integrated ecosystem assessment**	Saskia Otto, Germany, and Benjamin Planque, Norway
2019/WK/IEASG07	**WKTRANSPARENT - Workshop on methods and guidelines to link human activities, pressures and state of the ecosystem in Ecosystem Overviews**	Henn Ojaveer, ICES, and Mette Skern-Mauritzen, Norway