Human Activities, Pressures and Impacts Steering Group EGs Resolutions

Resolutions approved in 2021

Working Group on Bycatch of Protected Species (WGBYC)

Only experts appointed by national Delegates or appointed in consultation with the national Delegates of the expert's country can attend this Expert Group.

2021/OT/HAPISG01 The **Working Group on Bycatch of protected species (WGBYC**), chaired by Allen Kingston, UK; and Guðjón Már Sigurðsson, Iceland; will meet in La Rochelle, France, 26–30 September 2022 to:

a) Review and summarize information submitted through the annual data call and other means, and data assembled by other ICES WGs to describe and evaluate the quality of current monitoring efforts for the collection of protected species bycatch;
b) Collate and review information from WGFTB national reports, other ICES WGs and recent published documents relating to implementation of protected species bycatch mitigation measures and summarize recent and ongoing bycatch mitigation trials;
c) Collate and use available data on protected species bycatch rates to direct and underpin assessments on the range of (minimum/maximum) impacts of bycatch on affected populations, and where possible, to identify likely conservation level threats;
d) Review ongoing monitoring of different taxonomic groups in relation to spatial bycatch risk and fishing effort, to inform coordinated sampling plans;
e) Coordinate with other ICES WGs to ensure complete compilation of data on protected species bycatch from multiple sources and to develop and improve on methods for bycatch monitoring, research and assessment;
f) Continue, in cooperation with the ICES Data Centre to develop, improve, populate and maintain the WGBYC database on bycatch monitoring and fishing effort in ICES and Mediterranean waters through a formal data call (Intersessional);
g) Produce first drafts of the advice for the i) recurrent advice request, and ii) relevant Fisheries Overviews, based on templates provided by ACOM.

WGBYC will report by 24 October 2022 (via HAPISG) for the attention of ACOM.

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.
Scientific justification	a–b) This is essential to use in answering part of the European Commission annual request to "provide any new information regarding the impact of fisheries on marine mammals, seabirds..."; c) ICES Member Countries are required to reduce levels of bycatch under several pieces of legislation; the response to this ToR will help meet that aim; d-e) Bycatch monitoring and assessment is fundamental to the work of the group; in light of significant changes in legislation that will impact monitoring programs for PETS any improvements in coordination and methods will help the group and other workers in this field;

	f) An operating database allows for more efficient response to future advice requests and an audit trail for information used in the Group's reports; remaining intersessional ToR's all aim to increase effeciency of WGBYC's tasks in providing advice to various groups; g) WGBYC operational input is required to consolidate the new proposed templates as new evidences becomes available.
Resource requirements	Standard EG support.
Participants	15–25 participants
Secretariat facilities	Secretariat support with data call and meeting organization, database maintenance, and final editing of report
Financial	No financial implications.
Linkages to advisory committees	ACOM
Linkages to other committees or groups	JWGBIRD, WGFTFB, WGMME, WGEF, WGCATCH, WGSFD, SCICOM, WGHARP, HAPISG, WKEMBYC2
Linkages to other organizations	NAMMCO, ASCOBANS, ACCOBAMS, GFCM, OSPAR, HELCOM, RCGs

ICES/NAFO Joint Working Group on Deep-water Ecology (WGDEC)

Only experts appointed by national Delegates or appointed in consultation with the national Delegates of the expert's country can attend this Expert Group.

2021/OT/HAPISG02 The **Joint ICES/NAFO Working Group on Deep-water Ecology** (WGDEC), chaired by Rui Vieira*, UK; David Stirling*, UK; and Ana Colaço*, Portugal; will meet in Lisbon, Portugal (hybrid meeting), 16–20 May 2022 to:

a) Collate, validate and QA/QC-check new information on the occurrence and distribution of vulnerable marine ecosystems (VMEs), VME indicator taxa and VME elements in the North Atlantic and adjacent waters, archive appropriately using the ICES VME Database, and disseminate via the Working Group report and ICES VME Data Portal;
b) Review, validate and update new information on the occurrence and distribution of VMEs, VME indicator taxa and VME elements in the NEAFC Convention Area, including subareas of the Regulatory Area that are closed to fishing for other purposes than VME protection;
c) Review, validate and update information of areas where VMEs are known to occur or are likely to occur, bottom fishing footprint, and depth limits in EU waters in relation to the EU Deep-sea access regulation;
d) Review the evidence base for existing NEAFC bottom fishing closures for the protection of VMEs, through collaboration with ICES WGSFD and follow procedure documented by WKVMEBM for recurring VME advice;

e) Prepare generic ecoregion-specific assessments as well as requester-specific advice presented in a self-contained HTML document and based on most recent quality assured data and procedures documented by WKVMEBM for provision of recurring VME advice;
f) In line with the outcome of WKVMEBM, consider known limitations, identify and trial approaches to improve the VME index method, and continue to explore alternative options for identifying areas where VME are likely to occur, including scripting and reporting where necessary and appropriate.
g) In line with the outcome of WKVMEBM 2022, the WGDEC intersessional VME index developments, WKPHM 2020, WGMHM 2021 and WGDEC ToR e) from 2021: assess the outcomes and proposed next steps made by WKPHM (including the report review) on the use of predictive habitat models in ICES advice and identify a roadmap of what role WGDEC could have over the next few years in implementing these steps and furthering the use of predictive habitat models to support ICES advice.

WGDEC will report on the ToRs a)-g) by 30 June 2022, and will submit the whole report by 29 July 2022 for the attention of ACOM and SCICOM.

Supporting information

Priority	The current activities of this Group will enable ICES to respond to advice requests from a number of clients (NEAFC/EC). Consequently, these activities are considered to have a high priority.
Scientific justification	ToR [a] The Joint ICES/NAFO Working Group on Deep-water Ecology undertake a range of Terms of Reference each year; the scope of these cover the entire North Atlantic, and include aspects such as ocean basin processes. Therefore, collating information on vulnerable habitats (including important benthic species and communities) across this wide geographic area (and adjacent waters) is essential. To this end, a VME data call will be run in 2022, facilitated by the ICES Data Centre. Data will be quality checked/prepared at least one month in advance of WGDEC 2022 by the ICES Data Centre and a newly formed intersessional subgroup of WGDEC. New data will be incorporated into the ICES VME database and data portal. This ToR includes any development work on the ICES VME database and data portal, as identified by WGDEC, with support from the ICES Data Centre. ToR [b] This information and associated maps are required to meet the NEAFC request "to continue to provide all available new information on distribution of vulnerable habitats in the NEAFC Convention Area". WGDEC together with WGSFD is requested to contribute towards carrying out an annual assessment of required NEAFC areas. The location of newly discovered/mapped sensitive habitats is critical to this NEAFC request. ToR [c] as well as part of the European Commission MoU request to "As per article 9(4) Regulation (EU) 2016/2336, called the "Deep-sea access regulation", WGDEC together with WGSFD is requested to contribute towards carrying out an annual assessment of areas where VMEs are known to occur or are likely to occur in EU waters. This recurring advice that WGDEC together with WGSFD contribute towards, should be based on the ICES advice provided on 5 January 2021, which established a list of VMEs occurrences and likely occurrences for regulatory purposes. Revision or update of this advice shall be made in light of new data reported to ICES. ICES is requested to establish a process developing a general update for all sea-basins for which ICES provides advice. The location of newly

	discovered/mapped sensitive habitats is critical to this EU request. ToR [d] This information and associated maps are required to meet the NEAFC request "Appropriateness of bottom fishing closures to be reviewed in 2022". The NEAFC Recommendation 19:2014 (as amended) on the protection of vulnerable marine ecosystems in the NEAFC Regulatory Area includes regulations prohibiting bottom fishing activities in the following areas according to Article 5, within the coordinates as defined in Annex 2 of that Recommendation: (a) Northern MAR Area; (b) Middle MAR Area (Charlie-Gibbs Fracture Zone and sub-Polar Frontal Region); (c) Southern MAR Area; (d) Altair Seamount; (e) Antialtair Seamount; (f) Hatton Bank 1; (g) Rockall Bank; (h) Logachev Mounds; (i) West Rockall Mounds; (j) Edora's bank; (k) Southwest Rockall Bank; (l) Hatton-Rockall Basin; and (m) Hatton Bank 2. On the basis of technical work done by WGDEC and WGSFD, ICES is requested to consider whether significant adverse impacts on VME are still considered likely in all the closed sub-areas (a) - (m). According to Article 10, second paragraph the closures shall be in force until 31 December 2022. Before that time, the measure shall be reviewed by NEAFC with the intention of extending the period that the closures are in force, unless the conclusion of the review is that the continued application of the measure or parts of the measure is not required. It is noted that the closures to be reviewed were implemented on the basis of previous ICES advice confirming that they would be appropriate and protect VMEs from significant adverse impacts. It is assumed that any new advice on modifications or advice on additional closures relevant for Rec. 19:2014 will be provided as responses to the recurrent request for scientific advice. ToR [e] The ICES Benchmark Workshop WKVMEBM on the occurrence and protection of VMEs (vulnerable marine ecosystems) will occur 7-10 March 2022. The workshop will review existing methods used by ICES for the provision of vulnerable marine ecosystems (VMEs) advice, and based on this review develop and document an operational evidence-based procedure for the production of recurrent ICES advice on VMEs. As part of this work a format for the advice will be established, including how the data is presented in text, tabular and map formats. WGDEC is requested to prepare draft advice sheets based on the operational evidence-based procedure documented by WKVMEBM for recurring advice. Following a peer-review, this draft advice will be used at advisory committee's advice drafting group for further work and processing. ToR [f] In line with the outcome of WKVMEBM 2022, consider known limitations, identify and trial approaches to improve the VME index method, and continue to explore alternative options for identifying areas where VME are likely to occur, including scripting and reporting where necessary and appropriate. ToR [g] In line with the outcome of WKVMEBM 2022, in collaboration with WGMHM, the implementation of predictive habitat modelling (PHM) to determine likely VME occurrence, standards for data and modelling approaches for PHMs need to be developed for use in supporting ICES advice, together with a set of criteria for model outputs that would be most useful in communicating ICES advice.
Resource requirements	Some support will be required from the ICES Secretariat.
Participants	The Group is normally attended by some 15–20 members and guests.
Secretariat facilities	None, apart from WebEx and SharePoint site provision
Financial	No financial implications.
Linkages to advisory committees	ACOM is the parent committee and specific ToRs from WGDEC provide information for the Advice Committee to respond to specific requests from clients.
Linkages to other	While there are currently no direct linkages to other groups, WGDEC should develop stronger links (ideally through the establishment of joint Terms of Reference) with WGSFD,

committees or groups	WGMHM, WGDEEP and WGFBIT.
Linkages to other organizations	As a Joint ICES/NAFO group, the work of this group links to work being undertaken by Working Groups under the NAFO Scientific Council; specifically, WGESA.

Working Group on the Ecosystem Effects of Fishing Activities (WGECO)

Only experts appointed by national Delegates or appointed in consultation with the national Delegates of the expert's country can attend this Expert Group.

2021/OT/HAPISG03 Resolution placeholder

Working Group on Marine Litter (WGML)

2021/FT/HAPISG04 The **Working Group on Marine Litter** (WGML), chaired by Lisa Devriese*, Belgium; Christopher Pham*, Portugal; and Bavo De Witte*, Belgium; will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	25–29 April	Trondheim, Norway		
Year 2023	May (tbc)	Azores, Portugal		
Year 2024	May (tbc)	TBD	Final report by DATE to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Internal and external cooperation and response to any advice requests as passed from ACOM (e.g. EU, Regional Seas Conventions, ICES Data Centre/Secretariat, ICES expert groups).	Science or Advisory Requirements. Follow-up on future needs is key to constructively guiding and supporting the development process for monitoring, threshold development and impact assessment. Additionally, improve governance of marine litter and microplastic across ICES and its working groups and stakeholders. Assess the relevance and current status of plastic additive chemicals as a pollutant and how this is	2.1; 3.1; 6.3	3 year	Review publication focused on the release of additives from plastics and their effects in the marine environment. In collaboration with MCWG and WGBEC. Follow-up on requests from other groups.

		considered across all related ICES WGs.			
b	Review and propose guidance for ongoing and future monitoring of marine litter and microplastic to support ICES data collection and assessment	Provide guidance in solving problems related to sampling, data comparability and ICES data submissions. Prospecting innovation in new monitoring technologies and approaches. Check possibility to organise a ringtest for seafloor litter monitoring based on the work previously initiated by WGML. Evaluate the relevance of different matrices (water, sediment, biota) for use in microplastic monitoring and determine the best available techniques for sampling, processing, analysis, reporting and assessment.	3.1; 3.2; 3.5	3 year	ICES ASC session on innovative methods for macro- and microlitter monitoring Macrolitter idenfication exercise between labs, reported in the EG report. Other reporting platforms will be discussed. SWOT analysis of current monitoring approaches and prospectives for future monitoring for macro- and microlitter, reported in the EG report.
c	Report new developments in quality assurance in marine litter and microplastic monitoring in Europe, and provide information on other proficiency testing schemes with relevance to WGML.	Availability of high quality proficiency testing is vital to produce reliable results. Improve QA/QC of seafloor litter and microplastic data.	4.1; 6.3	3 year	Finalisation of seafloor litter monitoring guide as ICES TIMES publication. Yearly updates on outputs from other groups working on marine litter and from ongoing research projects, reported within the EG report
d	Align WGML with key international expert groups by collaborating with EMODNET regarding marine litter and microplastic data assessment and quality assurance.	Improve data streams to/from DOME and DATRAS. Evaluate the current simplified format for microplastics data and its future needs. Facilitate the interoperable flow of microplastic data between databases and organisations.	3.1; 3.5	3 year	WGML alignment with international partners Evaluation of data formats for microplastic and litter data submission, reported within the EG report.
e	Establish a national or regional reporting system on abandoned, lost or otherwise discarded fishing gear	ICES is ideally positioned to address this issue based on its historical expertise with stock assessments and surveys using a range of equipment. ICES WGML	2.1; 2.6	3 year	Assessment on ALDFG loss in the marine environment.

(ALDFG)	could assess the sources, distribution, trends and impacts of specific ALDFG (Abandoned, lost or otherwise discarded fishing gear).

Summary of the Work Plan

Year 1	Development of the outlines of a review document on plastic additives, task division between working groups
	Follow up on requests from other groups
	Start session preparation for ICES ASC on innovative methods
	Development of macrolitter identification exercise
	List of current monitoring approaches and knowledge gaps
	Dissemination of seafloor monitoring guide
	Yearly updates on outputs from other groups working on marine litter and from ongoing research projects
	Intersessional meetings with relevant actors on marine litter monitoring
	Evaluation of currently used litter data formats
	Check data availibility on ALDFG
Year 2	Finalisation of review document on chemical additives
	Follow up on requests from other groups
	Stock take on innovative methods
	Executing macrolitter identification exercise
	SWOT analysis on current monitoring approaches for macro- and microlitter
	Yearly updates on outputs from other groups working on marine litter and from ongoing research projects
	Suggestions for changes in current litter data formats
Year 3	ICES ASC session on innovative methods
	Follow up on requests from other groups
	Data assessment of macrolitter identification exercise
	Yearly updates on outputs from other groups working on marine litter and from ongoing research projects
	Assessment on the rate of gear loss in the marine environment
	Final report

Supporting information

Priority	The current activities of multiple WGs and external representatives will lead ICES into issues related to monitoring and fundamental research of marine litter. Consequently, such monitoring and research activities are considered to have a very high priority with respect to the issue of seafloor litter and MPs.
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	ICES Data Centre – data extractions. Standard EG support.
Financial	No financial implications.

Linkages to ACOM and groups under ACOM	There are currently no linkages with ACOM, but the EG will be ready to address advisory requests if these are forthcoming.
Linkages to other committee or groups	There will be close working relationships with HAPISG EG. The planned work is especially relevant to MCWG, WGBEC and IBTSWG.
Linkages to other organizations	PICES, CIESM, EU, JPI Oceans, GESAMP, UN, RSC, G7, G20

Working Group on Marine Benthal and Renewable Energy Developments (WGMBRED)

2021/FT/HAPISG05 The **Working Group on Marine Benthal and Renewable Energy Developments** (WGMBRED), chaired by Jan Vanaverbeke, Belgium; and Joop Coolen, the Netherlands, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	28 November - 1 December	Den Helder, Netherlands		
Year 2023				
Year 2024				

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Review the methods for non-invasive imagery benthic data collection and interpretation methods.	WGMBRED recognises the fact that use of non-invasive assessment of the benthos of marine renewable energy devices is a valuable addition to integrated analyses of the effect of such devices on the benthos on wider spatio-temporal scales. Development of a non-invasive data (visual, acoustic) interpretation framework that promotes incorporation into ecosystem models will provide expansion of existing efforts to wider application, facilitating joint	3.2, 3.3, 4.4	Year 1–3	Report to ICES, reviewing existing imagery data collection, including who is collecting what data, what techniques are used, for what purposes, challenges and options for further streamlining.

		analyses and international collaboration.			
b	Review the existing methods assessing the effects of energy emissions from benthal marine renewable energy devices (MRED) to make recommendations for addressing knowledge gaps.	The present knowledge base informing the effects of MRED energy emissions on the benthos is either lacking or patchy. The derived knowledge comes from a variety of methods (e.g. free-ranging, mesocosm, aquarium-based studies) with a diverse range of energy emission exposure characteristics which makes informed impact assessments for the receptive species difficult. Focussing on the understudied aspects of MRED energy emissions (e.g. EMF, particle motion, vibrations, heat) the group will assess the suitability of study methods used to date and their outputs. Critical reviews of methods used to assess responses to energy emissions will identify the best approaches to address the existing knowledge gaps.	2.1, 2.2, 2.7	Year 1–3	Manuscript to be submitted to peer-reviewed journal.
c	Develop the scientific basis to support decision making processes with regard to decommissioning of marine benthal renewable energy installations.	It is now clear that arrays of marine renewable energy installations affect structural and functional aspects of the marine environment, at both the local and regional scale. These effects largely stem from of organisms colonising the structures in large densities. Decisions on full or partial decommissioning will hence lead to a full or partial removal of these	2.1, 2.2, 6.1	Year 1–3	Manuscript to be submitted to peer-reviewed journal.

		colonising organisms, and hence will modify the effect on the environment. As some of these effects are considered as 'positive', understanding the consequences of different decommissioning scenarios will be important to inform future decision-making processes.			
d	Review the methodology to assess the role of benthos associated with benthal marine energy devices on the provisioning of ecosystem services to society	Marine benthal renewable energy devices serve the desire of society to combat climate change. The presence of the structures themselves, and the numerous marine organisms associated with these devices affect a set of ecosystem functions at various spatial scales, including biogeochemical cycling and food production, cascading into the provisioning of ecosystem services. WGMBRED will review the available methodology to assess the role of organisms in the biodiversity-ecosystem functioning-ecosytem services linkage and use the available knowledge base from previous	1.3, 7.2	Year 1-3	Report to ICES on the methodoloy to assess the effct of marine benthal energy devices on the biodiveristy-ecosytem services link.

		WGMBRED cycles to test selected assessment frameworks.			
e	Review available literature on biological traits for application in assesments of the functional effects of renewable energy devices on the marine ecosystem	The functional effects of the introduction of renewable energy devices in the marine environment are channeled through the activities of the fauna associated with these devices. Assessing the generality of these effects in space and time requires research based on functional biological trait analysis. While structural response traits are available, this is not the case for functional effect traits.	1.3, 2.1	Year 1-3	Report to ICES on the use of functional traits to investigate the effect of benthal renewable energy installations on ecosystem functioning

Summary of the Work Plan

Year 1	Literature compilation for all ToRs
Year 2	Structure review of compiled literature for all ToRs
Year 3	Finalise reviews and produce reports/manuscripts for all ToRs

Supporting information

Priority	The activities of the EG will provide a structural and functional understanding of how the marine benthal community of marine renewable energy devices contribute to the functioning of the marine ecosystem, and how they can act as areas where benthal biodiversity can be promoted or maintained after the lifetime of the devices. The objectives addressed for this group are therefore considered of high relevance in the context of ecosystem-based management of coastal areas where an increasing number of marine renewable energy devices are planned, while some need to be decommisioned and will be of direct use in marine spatial planning initiatives. Hence, the activities can be considered to be of very high priority. The WGMBRED work and ToRs are aligned with the ICES Science Programme and are of high priority. The WGMBRED are active contributors and aim to report their outcomes directly to ICES in their final report, Ecosystem Overviews, ICES ASC, and in parallel as peer reviewed literature.
Resource requirements	No specific resource requirements beyond the need for invited members to prepare for and resource their participation in the meeting.

Participants	The Group is normally attended by 20-30 members and guests working with the effects of marine renewable energy developments on the marine benthal communities (i.e. algae, invertebrates, and demersal fish). Participation from current ICES member countries and also from countries where marine renewable energy developments have started recently (Spain, Portugal) to develop knowledge on these activities.
Secretariat facilities	None
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages. However, some contributions could be made to 'pressures' section of ICES Ecosystems Overviews
Linkages to other committees or groups	There is a very close working relationship with Benthos Ecology Working Group (BEWG), the Working Group on Offshore Renewable Energy (WGORE), and the Working Group on Offshore Wind Development and Fisheries (WGOWFD)
Linkages to other organizations	OSPAR ICG-CUM

ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV)

2021/FT/HAPISG06 The **ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors** (WGBOSV), chaired by Okko Outinen*, Finland, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	2–4 May	Online meeting		Meeting in association with WGITMO
Year 2023				
Year 2024				

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Conduct strategic planning (identify and develop collaborative activities, advance and standardize methods, etc.) to advance research and address knowledge gaps by reviewing national activities and responding to new requests for advice.	ICES strategic plan Goal 2: understand the relationship between the impact of human activities (e.g., shipping) and marine ecosystems to estimate pressures and impacts and develop science-based sustainable pathways	2.1, 2.5, 4.4	3 years	Report to ICES. Respond to advice requests, as applicable.
b	Provide support to the IMO Ballast Water Management Convention	The BWMC aims to minimize the transfer of harmful aquatic	2.7, 4.1	3 years	Input on the general applicability or otherwise of such

	(2004, BWMC) Experience-Building Phase (EBP) by providing input on the validation of compliance monitoring devices, the use of indicative or detailed analysis tools (including the quantification of harmful/target species), or other aspects of the EBP.	organisms with the ballast water from ships. To assess the Convention's implementation, the EBP is underway. In addition to gauging the logistics of the implementation, there are science needs related to the validation of methods and tools that need to be addressed.			conditions or methods to IMO or national regulators through meeting participation, correspondence group and/or technical paper or peer-reviewed manuscript.
c	Investigate and evaluate the potential effects of shipping on biodiversity in a world transformed by climate change, and provide recommendations regarding the disperal of organisms by ships, particularly in areas of high biological value (e.g., the Arctic, Baltic, and Mediterranean Seas)	This work will contribute to the ICES/PICES Strategic Initiative on Climate Change Impacts on Marine Ecosystems (SICCME); address the Convention on Biological Diversity (CBD) and priority actions identified in the Arctic Council Arctic Invasive Alien Species (ARIAS) Strategy and Action Plan; and be relevant to the ICES high-priority action area of 'Arctic research'.	2.1, 2.5, 4.4	3 years	Contribution to symposium or conference, and a peer-reviewed manuscript.
d	Investigate and evaluate relatively understudied aspects of vessel biofouling, such as the effect of microfouling (including species contributing to microbially induced corrosion [MIC]), the release of organisms (including larval stages) from ships during normal operations, and biofouling on recreational or fishing vessels.	This work will be carried out jointly with WGITMO. Ships' biofouling is, with ballast water, a primary vector of non-native species. As management of such vectors is the only effective way to reduce risks of new introductions, addressing biofouling issues is of high priority in non-native species management.	2.7, 4.1, 4.4	3 years	Strengthen ties to the IMO GloFouling partnerships through meeting participation and increased discussion of research aims, report to ICES, and/or publish a technical paper or peer-reivewed manuscript.
e	Evaluate the development of DNA- and RNA-based molecular tools for surveillance and monitoring of ship-borne non-native species,	This work will be carried out jointly with WGITMO. Robust monitoring efforts for vessel-borne biodiversity (including non-native species) is critically	1.6, 4.4	3 years	Input on the general applicability or otherwise of such methods to IMO or national regulators through meeting participation,

	including harmful species.	important, as is the application of reliable and accurate methods to assess compliance to regulations (e.g., BWMC). RNA- and DNA-based molecular tools have been proposed as complementary approaches to traditional monitoring and compliance testing methods, and although some challenges remain, these tools warrant close scrutiny.	correspondence group and/or technical paper, peer-reviewed manuscript, or workshop.

Summary of the Work Plan

Year 1	Working on all ToRs, but with special focus on ToRs a, b, e, and d.
Year 2	Working on all ToRs, but with special focus on ToRs a, b, c, and d.
Year 3	Report on all ToRs.

Supporting information

Priority	The work of the Group forms the scientific basis for essential understanding of the movement of non-native aquatic organisms and pathogens via ballast water and other shipping vectors. As a joint working group, it also follows and supports related work within the IMO and IOC.
Resource requirements	The research programmes which provide the main input to this group are already underway, with resources provided by national governments and scientific funding agencies. The additional resources required to undertake activities in the framework of this group are negligible.
Participants	The Group is normally attended by some 30-40 members and guests, but has 86 members in total.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	The group will serve as primary respondent to incoming advice requests on various issues related to ship-mediated introductions.
Linkages to other committees or groups	There is a very close working relationship with WGITMO and regular linkage to WGSHIP. Potential or occasional linkage with WGBIODIV, WGHABD, WGPDMO, WGIMT, WGPME and WGZE.
Linkages to other organizations	International Oceanographic Commission (IOC), International Maritime Organization (IMO), North Pacific Marine Science Organization (PICES). In addition, the outcomes are relevant to other national and international organizations involved in the development of regulatory policies.

Working Group on Biological Effect of Contaminants (WGBEC)

2021/FT/HAPISG07 The **Working Group on Biological Effects of Contaminants** (WGBEC), chaired by Juan Bellas, Spain; and Steven Brooks, Norway, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	4-8 April	Kristineberg, Sweden		
Year 2023				
Year 2024			Final report by DATE to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Review and report on new developments and innovative methods of the effects of contaminants, and review guidelines for biological effects monitoring.	For 20 years, WGBEC has maintained a list of recommended methods for marine monitoring. These methods require evaluation and development. Additionally, new techniques for monitoring contaminant effects are constantly being developed. The EU new chemicals strategy for sustainability will be considered. Furthermore, the protocols and guidelines for the biological effects methods require review and updates where necessary. Evaluate the current ICES TIMES documents and identify requirements for the production of new protocols.	4.4	3 years	Report to ICES, TIMES manuscript
b	Initiate and report on quality assurance programmes for biological effects methods, coordinated with BEQUALM.	Quality assurance (QA) of biological effects methods are important to ensure that the data collected are of the highest quality and comparable to other leading laboratories. The Biological Effects QUALity assurance in Monitoring (BEQUALM) has been established to provide a framework for QA programmes. The biomarker component of BEQUALM is used to perform intercalibration exercises for the more commonly used biomarkers, which are performed and reported by members of the expert group.	3.1	3 years	Report to ICES, BEQUALM report
c	Review and evaluate both direct and indirect environmental effects of natural and	Particles are critical to understand the behaviour of contaminants in marine ecosystems. Some anthropogenic activity leads to increased input of particles, some of which are associated with chemicals, others	3.1; 3.2; 6.1	3 years	Report to ICES, Scientific paper

	synthetic particles on marine biota.	providing surfaces for adsorption. The particles themselves will also affect organisms. Anthropogenically derived particles include micro- and nanoplastics, nanoparticles, mining discharges and discharges from offshore drilling. WGBEC will consider new approaches for the assessment of the effects of particles. WGBEC will collaborate with MCWG and WGML on the risk assessment of plastic additives.			
d	Investigate and synthesise the direct and indirect effects of ocean contamination to human health.	Contaminants/pollution provide an anthropogenic pressure to marine ecosystems, resulting in human health impacts. In addition to direct effects, chemical pollutants can decrease the resilience of marine ecosystems, affect sea food security production/ resources, and may ultimately contribute to a loss of biodiversity. Several analytical and biological effect methods suggested by the ICES community can be used to establish links with human health.	5.8; 6.1; 6.4	3 years	Report to ICES
e	Update and summarise national activities on effect-based monitoring, evaluate approaches and identify gaps and future directions.	WGBEC members have contributed significantly to the development and implementation of effect-based monitoring programmes in European countries, as well as within OSPAR and MSFD. Monitoring is being harmonised throughout Europe as a result of WFD and MSFD, but there are still differences in take-up and implementation. Through its membership, WGBEC is uniquely placed to maintain an overview of national programmes and discuss pros and cons for different approaches, as well as develop new directions.	3.1; 3.2; 6.1	3 years	Scientific paper
f	Review and assess effects of contaminants of emerging concern.	WGBEC originally requested MCWG to provide information on contaminants of emerging concern (CECs), since they are liable to appear in chemical analyses. The definition of “emerging” has been broad and important effects have been observed in marine organisms following exposure to e.g. pesticides.. MCWG has requested WGBEC collaboration to review the effects of a prioritized list of CECs. WGBEC will review effect methods for identification of CECs, combining a “mode of action” approach with a ”risk assessment” approach.	2.1; 2.2; 4.5	3 years	Scientific paper
g	Review and evaluate	The highest concentrations of contaminants	2.2	3 years	Report to ICES

	methods to address the bioavailability and effects of contaminants on sediment-dwelling organisms.	in marine ecosystems are found in sediments, but only a fraction is available for uptake by organisms. The standardised toxicity tests for sediments are not very sensitive to contaminant exposure, both because of low bioavailability and because the organisms that are used are robust. Review and update/provide sediment quality guidelines, including assessment of bioavailability, the selection of and sublethal endpoints in organisms. MCWG requested WGBEC to provide a list of simple methods for sediment toxicity testing. WGBEC will investigate different taxonomic groups in order to find more sensitive test species and sublethal endpoints.			
h	Evaluate species differences in biological effects monitoring.	It is not possible to monitor all organisms in an ecosystem and the species chosen should be representative with regard to contaminant-related responses. There is need for more knowledge about species differences in contaminant-sensitivity between e.g. different fish species or different bivalve species. This is also relevant to enable comparison between different geographical regions.	2.3, 2.4	3 years	Report to ICES
i	Effects of mixtures of chemicals on marine organism.	In the current reality of chemical pollution there has been a distinct shift from very high concentrations of few contaminants to low concentrations of an extensive number of them. Thus, the emphasis is now shifting towards mixture effects for which the application of effect-based methods is considered a key research and risk assessment approach. This is also indicated in the new EU Chemicals Strategy for Sustainability. WGBEC will address mixture effects on marine organisms and review developments in current risk assessment strategies in regard to mixtures.	2.1; 2.2; 4.5	3 years	Report to ICES
j	Contribute to ICES Ecosystem Overviews as requested by IEASG Expert Groups.	Ecosystem overviews have been advanced significantly during the past years and several ICES EGs have been very active to provide input. However, there is a room for further development through adding new components on issues where ICES have expertise, such as the biological effects of contaminants, and which are essentially relevant in marine ecosystem management and policy context.	6.5	3 years	Contribution to Ecosystem overviews according to the provided guidelines/ template.

Summary of the Work Plan

Year 1	Update and review new developments and innovative methods
Year 2	Review and update guidelines and protocols in biological effects monitoring
Year 3	Perform quality assurance programmes for biological effects methods
	Review effects of natural and synthetic particles
	Review progress with concepts regarding the oceans and human health
	Update and review national monitoring programmes
	Review effects of contaminants of emerging concern
	Review effects of contaminants and their bioavailability on sediment-dwelling organisms
	Evaluate species differences in biological effects monitoring
	Review the effects if mixtures on marine organisms

Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the biological effect of contaminants, especially with regard to the activities of the Regional Seas Conventions and to the EU legislation. 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 15–20 members and guests.
Secretariat facilities	Standard EG support
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 working relationship with WGMS, WGEEL, WGIBAR, WGML and MCWG. During this 3-year term specific collaborative work will be carried out with WGML and MCWG.
Linkages to other organizations	OSPAR MIME/HASEC, HELCOM, EEA

Marine Chemistry Working Group (MCWG)

2021/FT/HAPISG08 The *Marine Chemistry Working Group (MCWG)* will merge with the *Working Group on Marine Sediments with respect to pollution (WGMS)*, will retain the name **Marine Chemistry Working Group (MCWG)**, chaired by Koen Parmentier, Belgium; Claire Mason, United Kingdom; and Maria Jesus Belzunce-Segarra, Spain; 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 2023	6–10 March	Ghent, Belgium		
Year 2024				
Year 2025			Final report by DATE to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
A	Assemble and synthesise new information on chemical sub-stances of emerging concern (CECs) in ICES area and be-yond, for pharmaceuticals and per- and polyfluoroalkyl substances (PFAS); platinum group and rare earth elements. Consider residuals of CECs in higher trophic level marine species (ToR K). Evaluate/risk assess CECs using toxicological data (with WGBEC) in development of EQSs.	Previously information on CECs has been collated. This valuable dataset can be turned into a widely accessible database, with enormous potential to aid understanding of future monitoring requirements for the marine environment.	2.1; 4.1; 4.5; 6.1	year 2-3	Publication, CECs database with ICES data centre, Final report to ICES.
B	Assess the relevance and the potential chemical, physical and biological risk impact of microplastics (additives for plastics) to the marine environment.	Migration, release, fate and environmental im-pact including biological effects of plastics additives, (contained in all plastic products for improving polymer properties) is a major concern Leaching, sorption and effects of inorganic as well as organic additives linked to plastics as an environmental source are to be determined. Further research of the different characteristics of microplastics compared to natural particles will help future monitoring and assessments.	2.1; 4.1; 4.5; 6.1	year 2-3	ICES Viewpoint publication (in consultation with ACOM leadership) Final report to ICES
C	Encourage application of passive sampling as a novel monitoring strategy for compliance and screening tools.	Passive sampling (PS) is proven as a useful monitoring tool. Review and update developments including working with regulators to utilise passive sampling for monitoring of contaminants especially in harbour water bodies (linking to ToR J), for temporal trend monitoring and in general for using passive samplers in the context of WFD compliance checking.	2.3; 2.5; 3.1; 3.2; 3.3;4.4; 6.1	years 2-3	TIMES guidelines for passive sampling of organics in sediments, CRR review on passive sampling techniques, Database to provide information of use

		Initially, plan to evaluate methods to rate PS against other matrices (biota, sediments, water) and how to use these for converting EQSs between matrices and will involve ICES data centre). Continuing to build evidence for use of passive sampling as a method to help understanding trophic magnification in the marine environment.			in developing assessment criteria for passive sampling techniques, Final report to ICES.
D	Report new developments in QUASIMEME (Quality Assurance of Information on Marine Environmental Monitoring) and provide information on other proficiency testing schemes with relevance to MCWG.	QUASIMEME and other proficiency testing schemes provide high quality proficiency testing to ensure reliable results and confidence in monitoring assessments.	3.1; 3.3	3 years	Reporting to ICES, provide guidance for proficiency testing, development of test materials for new compounds. Final report to ICES.
E	Review and report of availability of new data, analytical methods, and QA/QC on Ocean Acidification (OA) in coastal/shelf seas and establish link with eutrophication. Review methods for determining carbon stock assessments in sediments.	OA and understanding its importance, quantification of its impact in relation to climate change is crucial for a variety of scientific disciplines, and for ocean health. OA is a voluntary paremeter in OSPAR CEMP but developments in QC support are required. Reviewing information on how carbon data is used to determine carbon stock in marine sediments and its role as a measure of blue carbon.	1.2; 2.1; 3.2; 4.1, 6.1	years 2-3	TIMES guidelines, Final report to ICES.
F	Update and summarise on recent advances in nutrient analysis technique and observed nutrients trends in the marine environment.	Eutrophication reductive measures need to be followed; recent improves in techniques allow better QA for low concentrations. Determining potential influence of SPM and humic substances on nutrient analysis.	1.3; 2.1	years 2-3	Final report to ICES.
G	Review and analyse QUASIMEME assessment of chlorophyll data, in particular, regarding comparability of data and potential implications for existing measurement guidance.	Finalise guidance drafted to solve problems for chlorophyll measurement data comparability.	1.2; 1.3; 2.1; 3.3	year 1	TIMES guidelines, Final report to ICES.
H	Review emerging issues, and international and national regulations related to contaminants and biotoxins in seafood.	Seafood is an important dietary source of both essential additives and contaminants. Several EQS are derived for human health risks. Finalise review paper on contaminants and toxins in seafood and algae, based on data collected from 19 out of 20 ICES countries. The publication will focus on national and regional difference in legislation, focused on (1) contaminants in seafood, (2) contaminants in algae and (3) toxins.	2.1; 5.6; 6.1; 6.3	years 1-2	Publication, Final report to ICES.

I	Review chemical (for example, corrosion, anti-corrosion agents, etc.) and physical (for example, sediment scouring) evidence of impacts caused by man-made structures (such as platforms, wind farms, buoys, pipelines, cables and shipwrecks) and shipping (such as exhaust gases, spills and scrubbers) on the marine environment.	Human pressures caused by use of the seabed (for construction, resource extraction) and shipping activity is ever increasing. Some protective compounds used are new to the marine environment, as well as development of new technologies (scrubbers, etc). These applications often constitue direct input into the marine systems and require follow-up and identification of knowledge gaps. Specifically for offshore windfarms, continued review of chemicals and different legislation between countries, (in coopertation with WGMRE); research on shipwrecks and their impact on the marine environment including contamination by oil (PAHs), explosives (TNT), metals, impact by fishing, identification of the present microbiome and its impact on biodegradation; use of scrubbers working with WGSHIP; collecting information on monitoring of munition dumping sites (influence of TNT and other products); and deep-sea mining.	2.1; 2.2; 2.7; 4.5; 6.1	years 2-3	Publications, contributions to joint WG reports, Final report to ICES.
J	Review and report developments in international legislative acts (incl. Marine Strategy Framework Directive (MSFD) and WFD), in particular regarding emerging and high-priority hazardous substances and associated EQS values, conversion factors and other related issues. Development of sediment quality guidelines including their use as action levels for management of dredging activities, and monitoring approaches used for disposal site assessment.	Review legislation for consistent application of environmental quality criteria in monitoring programmes. Focus on dredge material assessment, based on chemical action level thresholds including ecotox testing; management approaches vary between different countries. Comparison of contaminant thresholds is useful to improve understanding of benefits/disadvantages. Derivation of sediment quality guidelines. The use of ecotox testing and derivation of EQSs (and SedNet Sediment Quality) to include mixtures, and how Action Level 2 thresholds are derived and how biological effects are assessed as part of disposal site assessments with WGBEC; use of passive sampling in dredge material assessment, including effects on water quality caused by resuspension of and dredge disposal site monitoring (see ToR C); use of modelling to determine regional thresholds.	2.1; 2.2; 2.5; 4.1	year 2-3	Publications, Final report to ICES.
K	Collect regional-level information to determine Trophic Magnification Factor (TMF) and Trophic Level (TL) b	The use of generic TMF and TL, as required by MSFD to calculate concentrations to compare with EQS_{biota} gives rise to unacceptable inflation of uncertainty. Work with WGEEL, JWGBIRD, WGMME to determine how this issue is best resolved. Review stable isotope measurements and how these link with passive sampling (C);	2.1; 3.1; 3.2; 6.1; 6.4	3 years	Support OSPAR PCBs trend and status in marine mammals indicator development; Final report to ICES.

		and provide inputs to Ecosystem Overviews (J).			
L	Contribute to ICES Ecosystem Overviews as requested by IEASG Expert Groups and respond to potential advice requests as passed from ACOM.	Ecosystem overview has advanced significantly during the past years and EGs should provide input to help improve marine ecosystem management.	2.1; 6.1; 6.3; 6.5	3 years	Ecosytem Overview input as required. Response to advice requests as required.

Summary of the Work Plan

Year 1	Refine ToRs. Respond to requests. Progress work towards completion of the remaining ToRs.
Year 2	Progress work towards completion of the remaining ToRs.
Year 3	Complete work towards completion of the remaining ToRs and produce final report.

Supporting information

Priority	This group maintains an overview of key issues in relation to marine chemistry, both with regard to chemical oceanography and contaminants. MCWG provides input across the field of marine chemistry, which underpins the advice given by ICES, and also supports the work of national and international collaborative monitoring programmes, e.g. within OSPAR.
Resource requirements	The research programmes which provide the main input to this group are ongoing, and resources committed. The resources required to undertake additional activities in the framework of this group is negligible.
Participants	There are usually between 20 and 30 participants but last year ~50 participants contributed due mainly to the meeting being more accessible (virtual). Important to keep virtual element to meetings going forward.
Secretariat facilities	Participation using electronic means should be examined and encouraged.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	WGBEC, WGML, WGSHIP, WGORE, WGEEL, JWGBIRD, WGMME ICES Data Centre
Linkages to other organizations	NORMAN, QUASIMEME, SedNet, OSPAR, HELCOM, MEDPOL, BSC, EPA, EFSA, JRC, etc.

Working Group on the Value of coastal Habitat for Exploited Species (WGVHES)

2021/FT/HAPISG09 The **Working Group on the Value of coastal Habitats for Exploited Species** (WGVHES), chaired by Benjamin Ciotti*, UK; and Elliot Brown*, 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 2022	20–24 June	Plymouth, UK		
Year 2023				
Year 2024			Final report by DATE to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Review and evaluate different methods for assessment of juvenile/nursery coastal habitat.	Many field methods have been used to assess juvenile habitat quality and quantity. The WG will continue its investigation of the usefulness and practicality of these different methods using a systematic literature review assembled in the previous WG term.	2.3, 3.2, 4.4	1, 2 year	Finalize paper started in previous WG term; Follow-on papers that use the assembled literature dataset on methods.
b	Review the nursery role of hard bottom habitats.	A critical gap in our knowledge of juvenile habitat is the lack of information on the value of hard bottom habitats	2.3, 3.2, 4.4	1 year	The WG will resubmit the review and synthesis paper on the distribution, measurement, and functional role of hard bottom habitats.
c	Review and report on lessons learned concerning Essential Fish Habitat (EFH) management and restoration.	Many countries are defining essential fish habitat and incorporating this concept into management with mixed success. Habitat restoration is also proceeding, often with high monetary investments. Issues include non-standard definitions and methods for quantification, socio-political and policy challenges, uncertainties in the underlying science, and confusing communication.	1.3, 6.4, 4.4	1, 2 year	The WG will prepare a Perspectives paper that uses the US experience, and other past and ongoing examples, to compile "lessons learned."
d	Review the role of nursery habitats under climate change & novel ecosystems.	How the nursery role of many habitats will be modified with climate change and under novel ecosystem conditions continues to be an important issue.	1.9, 2.3, 2.5	2, 3 year	The WG will prepare a review and synthesis paper on the possible roles of nursery habitat going into the future.
e	Review and synthesize findings from WGVHES relevant to fisheries	The WG will celebrate 10 years at the end of the requested new 3-year term. To facilitate the transfer and uptake of WG outcomes and outputs to management, a short	4.4, 5.2, 6.4, 6.6	3 year	The WG will prepare a short communication or outreach document that outlines the key findings and insights produced by the WG over its existence and

management.	synthesis of the work realized since 2012 (i.e., everything in one place) would be an effective communication tool.	highlight how these results have management implications. The group will report directly to ACOM on these findings.

Summary of the Work Plan

Year 1	Continue the work on ToR a and c. Finalise a first paper on ToR a. Finalise the paper on the review of hard-bottom habitats (ToR b).
Year 2	Continue the work on ToR a and c. Initialize the work on ToR d
Year 3	Continue the work on ToR a, d. Finalise a paper on ToR c. Achieve ToR e by writing a short synthesis of the work realized since 2012, to facilitate the transfer and uptake of WG outcomes and outputs to management.

Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the importance of coastal habitat for fisheries management.
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 10-15 members and guests.
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	This work could be relevant to WGMPCZM. We will try to connect our groups by inviting the Chairs to make a short presentation at each others' meetings and/or to participate in meetings, as may be appropriate.
Linkages to other organizations	There are no obvious direct linkages.

Methods Working Group (MGWG)

2021/FT/HAPISG10 The **Methods Working Group** (MGWG), co-chaired by Christopher Legault, USA; and Anders Nielsen*, 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 2022	14-18 November	Lowestoft, UK		Incoming chair: Anders Nielsen, Denmark
Year 2023				
Year 2024			Final report by DATE to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Evaluate technical details of stock assessment models	At typical EG meetings (benchmark and assessment) there is often insufficient time and expertise to evaluate the inner workings of the applied models. The focus is on input and output (black box). This ToR addresses the need for a forum where model developers "open the box" in front of fellow model developers. The goal is to find better solutions and avoid accumulating unfortunate hidden ad-hoc "fixes".	5.1; 5.4	3 years	Report on details examined and why they are important. Report specifically to the expert groups that could be affected by examined details (and connected benchmarks). Scientific publications when possible.
b	Share new techniques for use in stock assessment	Increased awareness of new techniques (e.g. modelling software or statistical innovations) can be enormously beneficial and improve efficiency for model developers. This ToR promotes such sharing across EG's and regions and can serve as early notification of techniques that may become useful or problematic to a number of EGs.	5.1; 5.4	3 years	Report on techniques examined with pros and cons of each for specific situations. Scientific publications when possible.
c	Validate new methods	Model developers are in short supply. The inherent conservatism and non-technical focus	5.1; 5.4	3 years	Report on steps taken to validate each method examined and any

		in the advice process can leave young model developers demotivated. This ToR creates a forum where fellow experienced model developers evaluate new methods through a combination of simulation study, empirical application, theoretical basis examination, and by comparing to existing methods. This will both motivate talented developers and promote the take-up of actual improvements by providing a quality assurance check on new methods.			caveats. Write clear conclusions in report (e.g. as: "method X is a valid alternative when …"). Scientific publications when possible.
d	Identify need for ices training courses	Identify if new courses are to be proposed for the ICES training program based on new tools or methods presented at the WGMG	5.1; 5.4	3 years	Report the need in the WGMG report and pass suggestion to the training group
e	Prioritize and address modeling questions supplied by ICES EGs	As time allows and interests/expertise of MGWG members overlaps, address one or more modeling issue supplied by other expert groups. The MGWG would not be expected to address every issue raised every year. ICES HAPISG leadership would help with prioritizing issues.	5.1; 5.4	3 years	Report on MGWG response to concerns addressed

Summary of the Work Plan

Year 1	Address all ToRs.
Year 2	Continue working on all ToRs.
Year 3	Finalise manuscripts. Reporting to parent organisations. Plan for continuation of the EG.

Supporting information

Priority	Single-species stock assessment methods, for estimating stock size and harvest rate, are a well-defined topic of central importance for managing fisheries around the world. The activities of this Group will ensure visibility of ICES in the international arena in the field of fish stock assessments. 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	Standard EG support
Financial	No financial implications
Linkages to ACOM and groups under ACOM	EGs under Fisheries Resources Steering Group (FRSG)
Linkages to other committees or groups	ICES Training Group
Linkages to other organizations	CAPAM, ICCAT, WFC, other RFMOs to be included in GAMe

Working Group on Multispecies Assessment Methods (WGSAM)

2021/FT/HAPISG11 The **Working Group on Multispecies Assessment Methods** (WGSAM), chaired by Valerio Bartolino Sweden; and Michael Spence*, UK, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	10-14 October	Woods Hole, USA (alt. Edinburg, UK)	Reports on keyrun reviews to be provided after each review is complete	Incoming co-chair: Michael Spence (UK) Outgoing co-chair: Sarah Gaichas (USA)
Year 2023			Reports on any keyrun reviews that are completed	
Year 2024			Final report by Date to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Regional updates: Review further progress and deliver key updates on multispecies modelling and	This ToR acts to increase the speed of communication of new results across the ICES	5.1; 5.2; 6.1	3 years	Report on further progress and key updates. Review and collaborate

	ecosystem data analysis contributing to modeling throughout the ICES region	area			with appropriate EGs to revise sections on "species interactions" in the Fisheries Overviews
b	Key-runs: Parametrisation of multispecies and ecosystem key-run models for different ICES regions. This includes standard update (limited to inclusion of recent data), extensive update (incl. new data and processes), and new key-runs.	Key-runs are models checked against high quality criteria, which are developed to contribute to a variety of operational objectives as part of the ICES advice, i.e. provide information on natural mortality for inclusion in single species assessments, estimates of multispecies reference points, large operating ecosystem models for MSE, etc.	5.1; 5.2; 6.1	3 years	Report on output of multispecies models including stock biomass and numbers and natural mortalities for use by single species assessment groups and external users.
c	Skill assessment: Establish and apply methods to assess the skill of multispecies models intended for operational advice	This work is aimed at assessing the performance of models intended for strategic or tactical management advice. Evaluation will require work towards standardisation for cross-model comparison. This ToR will also deal with evaluation of methods for model calibration and data weighting in the context of multispecies modelling.	5.1; 6.1; 6.3	3 years	Report on technical requirements for cross-models standardisation and comparison. Manuscript(s) on skill assessment of wide array of multispecies models based on a large simulation study.
d	Multi-model advice: Evaluate methods for generating advice by comparing and/or combining multiple models	This work is aimed at addressing structural uncertainty in advice arising from multiple models	5.1; 6.1; 6.3	3 years	Report on methods for comparing models and for constructing model ensembles. Report on case examples from both simulation testing and real studies
e	MSE: Evaluate methods and applications for multispecies and ecosystem advice, including evaluation of	This ToR looks for multispecies and ecosystem approaches to understand the resistance and resilience	2.5; 5.2; 6.1	3 years	Review methods to evaluate populations and ecosystem resilience.

	management procedures and estimation of biological reference points under the uncertainties of climate change.	of ecosystems to a warming environment and to perturbations related to the effects of climate change. Through the use of simulations, alternative management strategies and exploitation regimes can be evaluated for robustness to uncertainties related to climate change.	Review of methods for management strategy evaluation which incorporate the effects and uncertainties of climate change

Summary of the Work Plan

Year 1	All ToRs, update keyrun Baltic Sea (coupled with data preparation workshop for the Baltic Sea benchmark), keyrun Georges Bank multi-model (dedicated workshop)
Year 2	All ToRs
Year 3	All ToRs

Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries under multiple sources of uncertainties incl. climate change. The activities will provide information (e.g., natural mortality estimates, performance of indicators, multispecies reference points) and tools (e.g., multi-model ensembles, keyrun models) valuable for the implementation of an integrated advice and the application of a precautionary approach in several North Atlantic ecosystems. Consequently, these activities are considered to have a 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. Expertise in ecosystem dynamics, trophic interactions, modelling and fish stock assessment from across the whole ICES region.
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	ACOM, assessment Expert Groups.
Linkages to other committees or groups	WGMIXFISH, WGDIM, WGBIFS, IBTSWG, WGECO, all IEASG groups, WKCLIMAD.
Linkages to other organizations	None

Working Group on Shipping Impacts in the Marine Environment (WGSHIP)

2021/FT/HAPISG12 The **Working Group on Shipping Impacts in the Marine Environment** (WGSHIP), chaired by Cathryn Murray, Canada; and Ida-Maja Hassellöv, Sweden, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	4 May 9 May 11 May	Online meeting		
	14–17 November	Gothenburg, Sweden		
Year 2023				
Year 2024				

ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
a	Conduct strategic planning through review of national research on shipping interactions with the environment and report on priorities, knowledge gaps and opportunities for further collaboration.	ICES strategic plan Goal 2: understand the relationship between the impact of human activities (e.g., shipping) and marine ecosystems to estimate pressures and impacts and develop science-based sustainable pathways.	2.1; 2.2;	3 years	Report to ICES. Respond to advice requests, as applicable.
b	Review data to represent environmental shipping pressures at regional and global scales.	The distribution and intensity of commercial shipping is increasing and there is a growing need to assess and mitigate the impacts of vessel activities on the marine environment, especially in areas of enhanced protection.	2.1; 2.2; 2.7	3 years	Technical paper or peer-reviewed manuscript. Pipeline proposal for inclusion of shipping pressures metric in Ecosystems Overviews.
c	Develop a framework to represent the impacts of shipping on the marine environment, which can be used to guide science advice on the development and implementation of ecosystem-based management.	A framework of the many shipping pressures and effects is needed to structure assessments and communicate the full suite of shipping-related pressures.	2.1; 2.2; 6.1	2 years	Technical paper or peer-reviewed manuscript

d	Identify current and emerging shipping pressures, review state of knowledge and explore possible mitigation strategies for decreasing impacts.	While regulation of air emissions from shipping has gradually been strengthened, the corresponding impacts on the marine environment have received less attention. The environmental impacts of shipping noise and the use of scrubbers have been the topic of recent discussion at the Environment Committee (IMO).	2.1; 2.7; 6.1	3 years	Input on the general applicability or otherwise of such strategies to IMO or national regulators through meeting participation, correspondence group and/or technical paper or peer-reviewed manuscript.
e	Review and identify methods for holistic management of shipping impacts, considering possible trade-offs across impact types.	Vessel activities can have transboundary impacts and successful mitigation efforts require coordination and collaboration between trade partners. Methods for holistic management are urgently needed to balance the benefits of industry with environmental impacts.	6.1; 6.2; 6.3	3 years	Peer-reviewed manuscript on tradeoffs and synergies associated with management of underwater noise

Summary of the Work Plan

Year 1	Working on all ToRs, but with special focus on ToRs a, c, e
Year 2	Working on all ToRs, but with special focus on ToRs b, d,
Year 3	Report on all ToRs

Supporting information

Priority	The work of the Group forms the scientific basis for advancing knowledge related to the impacts of shipping on the environment. As ICES and advice requestors are striving for more holistic ecosystem based management, the need for metrics and greater understanding of impacts of shipping on the marine environment is growing. The WGSHIP ToRs are aligned with the ICES Science Plan and aim to report their outcomes directly to ICES in their final report, as well as contribute to Ecosystems Overviews and ICES Annual Science Conference, where relevant. Thus, the activities of WGSHIP can be considered to be of high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, with resources provided by national governments and scientific funding agencies. The additional resources required to undertake activities in the framework of this group are negligible.

Participants	The Group had participation from more than 30 members in its first term, and is expected to grow during this second term. Participation has included experts from ICES member countries and also from countries with similar scientific expertise (e.g. Australia).
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are currently no obvious direct linkages.
Linkages to other committees or groups	There has been a close working relationship with MCWG/WGMS and WGBOSV. Potential or occasional linkages with WGCEAM, WGSFD, WGMHM, WGMPCZM, WGBEC.
Linkages to other organizations	Occasional linkage with the Arctic Council PAME Shipping Expert Group and potential linkages with the Baltic Marine Environment Protection Commission (HELCOM), European Maritime Safety Agency (EMSA), International Maritime Organization (IMO), National Oceanic and Atmospheric Administration (NOAA), North Pacific Marine Science Organization (PICES), OSPAR Commission and UNEP Oceans and Seas Program. In addition, the outcomes are relevant to other national and international organizations involved in the development of regulatory policies.

Benchmark Workshop on the occurrence and protection of VMEs (WKVMEBM)

2021/WK/HAPISG13 A **Benchmark Workshop on the occurrence and protection of VMEs** (WKVMEBM) chaired by Eugene Nixon (ACOM Leadership, ICES Chair, Ireland) and chaired and reviewed by Pierre Pepin (External, Canada) will be established and meet at ICES HQ, Copenhagen, Denmark, 7–10 March 2022 to:

a) Review existing methods used by ICES for the provision of vulnerable marine ecosystems (VMEs) advice

b) Based on this review (TOR a) develop and document an operational evidence-based procedure for the production of recurrent ICES advice on VMEs.

Prior to involving reviewers, working documents describing the operational procedure will be prepared by WKVMEBM and provided for external review (15–25 February). The working documents and reviewer's reports will form the basis of hybrid workshop 7-10 March 2022. WKVMEBM will report by 28 March 2022 for the attention of ACOM and SCICOM.

Supporting information

Priority	Certain habitats and species of deep-sea bottom living organisms are defined as VMEs, including seamounts, hydrothermal vents, cold-water coral reefs and aggregations of deep-sea sponges. VMEs can be extremely long lived and are particularly vulnerable to bottom-fishing activity as they are easily disturbed and slow to recover. VMEs are thus protected from bottom fishing under several international treaties that stem from United Nations General Assembly Resolution 61/105 (UNGA, 2006). In this context, ICES provides recurring annual advice on th occurrence and protection of VMEs to NEAFC and the EU. In 2022, ICES will be required to review the appropriateness of all NEAFC VME closures and will start to provide recurring advice to the EC under EU Regulation 2016/2336 on the protection of VMEs below depths of 400m. This benchmark is both timely and a priority.

Scientific justification	Term of Reference a) This ToR will review existing methods used by ICES for the provision of VME advice, and will include: 1) ICES Technical Guideline on the current basis of ICES VME advice (link); 2) ICES Technical Guidelines on Spatial distribution of fishing effort and physical disturbance of benthic habitats by mobile bottom trawl fishing gear using VMS (link); 2) Methods described in the ICES/NAFO Joint Working Group on Deep-water Ecology (WGDEC), in particular Section 5 and 6 of WGDEC 2017 Report (link) and Section 5, 6 and 7 and of the WGDEC 2020 Report (link) and methods used in similar advisory processes e.g. NAFO: 3) ICES advice (link) to the EU on the deep-sea access regulation and the report of the workshop on EU regulatory area options for VME protection (WKEUVME, link) 3) Recent ICES advice to NEAFC; 4) ICES Data flow schematics for VME, VMS and logbook data (link); 5) Experience gained through the application of the WKEUVME method in other areas e.g. NAFO. Term of Reference b) Based on the review (TOR a) this TOR b will develop and document an operational evidence-based procedure for the production of recurrent ICES advice on VMEs. This procedure should: 1) Be aligned with the ICES Advisory Principles (link) and consistent with the FAO 2009 Guidelines (link); 2) be consistent with requestors' VME policies and advice requests; 3) ensure all relevant information available on significant adverse impacts and on the consequences, e.g. biological, ecological, social and economic consequences of the VME management options using the different regulatory scenarios is presented in the advisory product; 4) apply best practices for data and assessment, i.e. the ICES transparent assessment framework (TAF) principles and ICES data management guidelines (including the FAIR principles); 5) establish a format for the advice, including how the data is presented in text, tabular and map format and update the ICES Technical Guideline on the current basis of ICES VME advice (link). Upon completion of WKVMEBM (TOR a and b) the report will describe the evidence-based procedure that ICES will use for the provision of recurrent advice on the occurrence of VMEs and fishing activity in the vicinity of VMEs as well as advising management options, including closures.
Resource requirements	ICES Secretariat and data centre.
Participants	Particpation WKVMEBM will be limited to a total of 35.
Secretariat facilities	Meeting room + hybrid meeting equipment and support.
Financial	No financial implications.
Linkages to advisory committees	ACOM
Linkages to other committees or groups	The workshop WKVMEBM will build on the work done by WGDEC and WGSFD to prepare advice in previous years, and is also linked to the work being done in WGMHM and WGFBIT, as well as the recent workshop WKPHM
Linkages to other organizations	The work of this group is closely aligned with similar work in FAO, and management organizations such as NEAFC, EU (DGMARE and DGENV) and OSPAR.

Working Group on Spatial Fisheries Data (WGSFD)

2021/FT/HAPISG14 The **Working Group on Spatial Fisheries Data** (WGSFD), chaired by Patrik Jonsson, Sweden; and Neil Campbell, Scotland, UK; will work on ToRs and generate deliverables as listed in the table below.

	Meeting dates	Venue	Reporting details	Comments
Year 2022	7–8 June	Online meeting		Meeting to quality check the data submitted. Output: Quality checked aggregated (all countries) data set.
	26–30 September	ICES HQ, Copenhagen, Denmark		
Year 2023	tbc	tbc		**Outgoing chair**: Neil Campbell, Scotland, UK **Incoming chair**: to be confirmed
Year 2024	tbc	tbc	Final report by DATE to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	During this session, WGSFD (in consultation with WGFBIT and ICES Secretariat will identify a habitat layer or layers which meets the needs of advice requesters, and investigate the incorporation of this layer into the data call, document implications for work flow, provision of advice and anonymity issues.	Impact of fishing gear on the seabed varies from habitat to habitat. Maps of fishing effort are available at a relatively coarse c-square resolution while habitat data is available at much finer scale, meaning that a c-square may contain several habitat types. There has been a long-standing interest from end-users of WGSFD products in seeing impacts by habitat type. By joining a habitat layer to the VMS points before their aggregation in the data call, this issue can be ameliorated.	3.5, 4.2, 6.1 – 6.6	3 years	Section in WG report (Years 1 – 3). Recommendation to WGSFDGOV regarding the identification and use of habitat layers in data call (Year 1) Updated workflow script to facilitate the inclusion of this layer (Year 2) Guidelines on the integration of other sources of spatial data into the data call process (Year 3)
b	Review the VMS datacall workflow to ensure it is	Members of WGSFD developed a workflow to process the ICES		3 years	Section in WG report

	adequate for the existing data requirements	VMS and logbook data call. The workflow needs regular revisions to update with changing datacall requirements.			(Years 1 – 3). Recommendation to WGSFDGOV on updates required Updated workflow script (if needed) for the attention of WGSFDGOV (Years 1 – 3)
c	During this session, WGSFD will: - Review case studies on the use of spatial electronic monitoring of small scale and static gear fisheries to produce recommendations on mapping of fishing effort for small scale fisheries and static gears. - Examine and apply best practices for handling and analysing spatial data and electronic monitoring systems, quality checking, data pre-processing protocols and statistical analysis, to ensure common and consistent approaches are applied when processing electronic vessel tracking data. - Evaluate how metrics of effort can be estimated for static gear and small-scale fisheries using higher frequency data, and link to other available information, e.g. logbook spatial information, sales notes, fleet characteristics, landings and observer data, in order to describe fishing events for different gear categories.	Current regulations mean our knowledge and understanding of fishing activity is insufficient and unrepresentative, both because of a lack of data for vessels which do not carry spatial tracking information, and because of the long interval between VMS polls for vessels which carry such equipment. There is a desire to offer advice on patterns of fishing activity at a fine spatial scale and an integrated approach to these problems is needed. Small scale fisheries (SSF, boats <12 m) represent about 80% of EU fleet. Most of these fisheries either do not have an AIS/VMS system, or the data collected has insufficient temporal or spatial resolution for accurate mapping. Data sources recording position at higher frequencies such as AIS, electronic loggers, etc. have been shown to be able to overcome the spatio-temporal aspects of this issue. There are a number of pilot trials and case studies available, particularly from small scale fisheries. The recent ICES workshop on small scale fisheries and geo-spatial data (WKSSFGEO) provides a collection of case studies across the EU and progress on how to infer fishing activity and estimation of fishing effort.	3.5, 5.4, 6.1	3 years	Section in the WG report. Peer review paper (Year 3) Proposal for workshop with WGCATCH and WGBYC(Year 2). ICES ASC session (Year 3).
d	Document national polling frequencies over time and for different fisheries, highlighting where higher temporal resolution data may be available and make finer spatial resolution of data products possible	The current resolution used in the ICES data call is a consequence of the two-hour maximum polling interval for VMS defined in European legislation. The size of the c-squares used relates directly to the distance a vessel travelling at fishing speeds is likely to	3.5, 5.4, 6.1	3 years	Section in WG report describing what information will be requested from data submitters. (Year 1). Section in WG report describing median polling frequencies

		travel in two hours. In its previous term, WGSFD noted this hindered a move towards higher spatial resolution in the ICES VMS data calls. In practice, polling frequencies in national data sets are often higher, however, how much so and how widespread this is, is typically undocumented. Bringing together documentary evidence of realised polling frequencies will identify any areas where a higher resolution may be feasible.			by fleet for respondents to the data call. (Year 2) Recommendations to WGSFDGOV regarding future changes to the spatial resolution of the data call. (Year 3).
e	Improve the utility of WGSFD outputs to the ICES community.	To date, WGSFD has focussed on fisheries with quantifiable impacts to the seabed. The data products produced by WGSFD map fishing activity at levels of aggregation which are not sufficiently resolved for the purposes which some groups within ICES wish to use them Specific issues which have been raised include: WGSCALLOP have requested maps of scallop fishing grounds, which cannot currently be provided due to aggregation of king scallops, queen scallops and mussels into DRB_MOL. To support studies of seabird bycatch, WGBYC are seeking maps of distribution of pelagic trawl and longline fishing effort.	1.5, 4.4, 5.4	3 years	Section in WGSFD report identifying fisheries where this issue is seen and how it can be resolved (Year 1). Recommendations to WGSFDGOV regarding future changes to data fields required in the data call (Year 1). Updated workflow script to facilitate the inclusion of this information (Year 1). Section in WGSFD report describing findings (Year 2). Provide section for WGSCALLOP report describing spatial extent of scallop fisheries. (Years 2-3). Provide support to WGBYCdescribing spatial extent and temporal patterns in pelagic fisheries. (Years 2-3).
f	i) Analyse and produce maps of bottom contacting	WGDEC has used effort data produced by WGSFD using	3.5, 4.2, 6.1	3 years	Maps provided annually to WGDEC

	fishing activity in NEAFC areas using the VMS and logbook information provided by NEAFC. ii) Investigate the use of ICES VMS data to refine the advice provided to NEAFC	VMS and logbook data provided by NEAFC to provide advice for several years. While there have been issues with the quality of the data in the past, these seem to be resolving. The degree of overlap between the data products produced from the NEAFC data and those from the WGSFD data call are unexamined, but would hopefully be high. Examination of this would highlight any issues in either data set and serve to improve the quality of advice provided, and simplify the quality assurance process.			(Years 1-3). Section in WG report comparing NEAFC VMS data product with ICES data call outputs (Year 1)
g	Identify drivers of change in fisheries spatial temporal trends and their relation to other uses of the marine space (in accordance with regulations) coupled with the development of a common spatial data framework (to be developed in consultation with the ICES data centre) for the integration of different marine layers.	Fisheries territories are defined by operating conditions and fish availability. Fish resources displacement due to climate change, management measures and other human uses (MPA, marine traffic, gravel extraction, wind farms, oil rigs, seismic survey etc.) may result in displacements of activities when competition occurs for a given space. Through the ICES datacall on VMS and logbook data we now have the information available to identify the spatial variability of fisheries over time. In order to integrate other marine data layers responsible for fisheries displacement and be able to advise on the implications of human activities on management systems and marine industries, a common spatial framework suitable for marine data layers needs to be developed.	5.4, 6.1, 6.2	3 years	Peer reviewed paper. Section in the WG report on drivers of fisheries displacement. Section in the WG report on the development of a common ICES spatial data framework for fisheries and other key marine data layers for ICES expert WG. This spatial data framework would consist of a set of global referenced nested spatial grids (ICES statistical rectangles, c-squares) at different resolution that can be both adaptable to specific data collection requirements and support the integration into a common grid suitable for the required assessment or advisory product.

Summary of the Work Plan

Year 1	Linked to ToRs: a) Refine data call, produce fishing activity layers, highlight and address issues. b) Identify suitable habitat layers and incoroporation into data call c) Spatial displacement paper d) Comparison of NEAFC and ICES fisheries spatial data f) Provide report on fishing activity around VME areas in the NEAFC RA, with WGDEC f) Development of proposal for ASC theme session on small scale fisheries g) Establish links with WGSCALLOP, WGBYC and with regular communications.
Year 2	Linked to ToRs: a) Refine data call, produce fishing activity layers, highlight and address issues. b) Review incorporation of identified habitat layer in data call c) Report on spatial distribution of pelagic fisheries d) Provide report on fishing activity around VME areas in the NEAFC RA, with WGDEC e) Document differences in polling frequency and implications for spatial resolution f) Organise a join workshop with WGCATCH and WGBYC.
Year 3	Linked to ToRs: a) Refine data call, produce fishing activity layers, highlight and address issues. b) Review incorporation of identified habitat layer in data call c) Report on spatial distribution of TBB/PUL/PUK fisheries d) Provide report on fishing activity around VME areas in the NEAFC RA, with WGDEC e) Deliver ICES ASC theme session on spatial data in small scale fisheries

Supporting information

Priority	The current activities of this Group support work across ICES understanding issues related to the spatial distribution of fisheries, and any effects on ecosystems which they may have. Consequently, these activities are considered to have a very high priority.
Resource requirements	VMS/Logbook/AIS data requested in ICES data calls
Participants	The Group is normally attended by 15–20 members and guests.
Secretariat facilities	Assistance from ICES Data Centre in hosting VMS/logbook/AIS data as well as quality checking and implementation of methods developed by WGSFD. Possibly meeting facilities.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	The WG itself does not currently provide advice, but provides data products and analysis to a number of groups which feed into ACOM.
Linkages to other committees or groups	WGDEC, DIG, WGBYC, WGCATCH, WGECO, WGSCALLOP, BEWG, WGFBIT, WGSFDGOV.
Linkages to other organizations	OSPAR, HELCOM, NEAFC

Working Group on Cumulative Effects Assessment Approaches in Management (WGCEAM)

2021/FT/HAPISG15 The **Working Group on Cumulative Effects Assessment Approaches in Management** (WGCEAM), chaired by Roland Cormier, Canada; GerJan Piet, Netherlands; and Vanessa Stelzenmüller, 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 2022	24-28 October	Online meeting		
Year 2023	25-28 September	DFO, Canada		
Year 2024	23-26 September	ICES HQ, Copenhagen, Denmark	Final report by 1 November to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Demonstrate the application of the ICES CEA framework in one or more regional case studies	To advance the development of a generic CEA methodology and identify real research gaps one or more case studies will be used as a proof of concept. Next to the North Sea and Canadian bioregion, the Celtic Sea will be one of regions where the CEA is conducted with the available knowledge base.	6.1, 6.2	Year1-3	Scientific paper describing the application of the CEA framework in one or more regional case studies.
b	Review the scientific advancements and current management practice in addresing cumulative effects to identify data and knowledge needs	The ICES framework provides practical guidelines on how to priorise and identify key pressures and human activities. A better understanding of the quantification of risk of adverse effects of current and future management scenarios is still lacking. This ToR aims to identify how methodological advancements are linked to actual stakeholder needs. Link to WGMPCZM.	6.1, 6.2	Year 2	Review paper
c	Identify linkages	The assessment of cumulative	6.2, 6.4, 6.5	Year 1-3	Identification of

	between CEA framework and other ICES products and liaise with other fora and/ or expert groups both within ICES (i.e. Secretariat, Data Centre or expert groups) as well as outside ICES. Investigate the development of a cumulative effects estimate for potential inclusion in the Ecosystem Overviews (EOs).	effects is a central element for integrated marine management. Numerous ICES working groups and ICES products such as the ecosystem overviews are cross-referring this need. Under this ToR synergies and direct linkages will be identified. Further, the consolidation of a common CEA framework requires a continous collaborationa and exchange of expertise with other groups and fora working on CEAs.	action points and linkages. Index of cumulative effects.

Summary of the Work Plan

Year 1	Ongoing work will focus on the application of the CEA framework in case stuy areas such as the North Sea, Canadian bioregion and Celtic Sea. Those areas will serve as test areas to identify strengths and weaknesses of the framework. These regions are data rich and will allow for a full application of the framework to identify areas with increased risk of cumultative effects as well as data needs.
Year 2	The results of the case study applications will also feed in to a review which aims to synthesis the scientific advacements and map those to current management practice in e.g. marine planning and stakeholder needs. The review will reveal knowledge gaps and guides the development of decision support tools.
Year 3	Emphasis will be on the provision of guidance on data and knowledge needs when applying the common framework. This guidance on the application of the framework together with the identified action points will foster the integration of CEAs as part of ecosystem advice provided by ICES.

Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the ecosystem effects of all marine human activities including 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 10–20 members and guests.
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committee or groups	There is a very close working relationship with all the groups under HAPISG, in particular WGMPCZM, WGORE, WKTRADE. It is also very relevant to WGINOSE, WKTRANSPARENT, WGEAWESS.
Linkages to other organizations	There are strong linkages to the OSPAR and HELCOM work on CEAs.

Working Group on Marine Protected Areas and other Spatial Conservation Measures (WGMPAS)

2021/FT/HAPISG16 A **Working Group on Marine Protected Areas and other Spatial Conservation Measures (WGMPAS)**, chaired by Ryan Stanley*, Canada; Joachim Claudet*, France; and Emma Sheehan*, UK; will be established 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 2022	Spring 2022 (scoping meeting)	Online		Initial meeting and scoping discussion with proposed WG members.
	28 November – 2 December	Paris, France		
Year 2023	Fall 2023			
Year 2024	Fall 2024			

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Explore and develop approaches for the effective evaluation and quantification of potential biodiversity benefits arising from various types of MPAs (e.g., the provision of best-practice guidance, indicator tool box).	There is a need to synthesize, both from expert knowledge and literature reviews, all the pathways through which MPAs can indirectly support increased ecosystem resilience and other benefits (e.g., biomass exportation). This integration would represent a novel synthesis of existing national and international reviews. We propose to develop a novel dashboard of indicators that can be used to assess an MPA's contribution to ecosystems as measured by both structural and functional indicators of ecosystem state using case studies. This review will focus on site-level indicators with some reference to how they could be scaled up to a network evaluation.	6.1,6.5	1 year	Defined pathways and indicators demonstrating MPAs effect on ecosystems. Defined pathways and indicators demonstrating MPAs effect on human activity (e.g. fisheries). Case study assessments.

b	Coordinate and develop assessment methods (including specific tools in line with the ICES EBM framework) to evaluate the potential consequences and trade-offs between various human activities and the biodiversity benefits derived from MPAs.	To understand how MPAs and OECMs integrate within the wider seascape, and on how synergies and/or trade-offs can arise when accounting for (i) multiple and often competing, fishing and other human activities, and (ii) the competition for space between fisheries and other ocean uses (e.g., offshore wind farms and aquaculture).	6.6	1 year	A report detailing an assessment and guidance on how to best optimize protection levels within multi-zone MPAs to achieve conservation objectives while at the same time maintaining human use benefits (e.g., fisheries). A report detailing an assessment and guidance on how to best optimize space allocation within multi-zone MPAs to allow access to multiple users while still delivering positive human use (e.g. fisheries) and conservation outcomes.
c	Develop assessment approaches and guiding principles to inform optimal operational design and monitoring of networks of MPAs in response to climate change by testing the outcomes of ToR (a) and (b) under different MPA network design and climate scenarios.	The conceptual ecological basis for designing MPA Networks is well-established (i.e., representative, connected, resilient), but there remain key gaps in the implementation of these concepts into 'real world' design (e.g., consideration of climate change and the need for adaptive planning). Monitoring program design and scope needs to be optimised and adaptive to ensure effectiveness both now and in a changing future.	6.3, 6.6	1 year	A guidance document on how MPA networks can be best designed to optimize conservation and fisheries (and other activities) benefits while reducing displacement 'costs' as much as possible. Evaluation of shortfalls or gaps in the current knowledge that might limit the assessment of potential climate change impacts (e.g., uncertainty in oceanographic models and/or climate projections) An assessment of how projected climate change could impact MPAs and MPA network effectiveness. Recommendations on how to best design and climate proof MPA networks.

Summary of the Work Plan

Year 1	• Identify potential outcomes for human activities (e.g., fisheries) costs/benefits that arise from the application of MPAs (and other spatial conservation measures) and illustrate the schematic pathway of how MPAs can lead to these outcomes.

	• Develop a dashboard of indicators that can be used to assess these outcomes for human activities (e.g., fisheries, renewable energy). • Illustrate these pathways and demonstrate the application of the indicators using candidate case studies (with at least one in North America).
Year 2	• Assess how to best optimize protection levels within multi-zone MPAs to achieve conservation objectives while at the same time maximizing human use (e.g., fisheries) benefits. • Assess how to best optimize space allocation within multi-zone MPAs to allow access to multiple users while still delivering positive fisheries and conservation outcomes. • Based on these assessments, to make recommendations on how best to integrate conservation planning into marine spatial planning.
Year 3	• Scaling-up from results in year 2, we will assess how MPA networks can be best designed to optimize conservation and human use (e.g., fisheries) benefits while reducing displacement costs as much as possible. • Assess how projected climate change effects on ecosystems and fisheries could impact MPAs and MPA network effectiveness. • Make recommendations on how best to design and climate-proof MPA networks that benefit both ecosystems and human use components (e.g., fisheries).

Supporting information

Priority	The current activities will lead ICES into shaping issues and the provision of evidence related to spatial-based approaches for biodiversity conservation (i.e., MPAs). There is an urgent need to assess the effectiveness of current MPA measures and approaches at the ecosystem level to ensure they are able to meet policy objectives over the long-term in an optimal way – this is particularly needed in light of the increasing usage and development of the marine space. The WGMPAs ToR are closely aligned with the ICES Science Plan and aim to report their outcomes directly to ICES in their final report as well as contribute to ecosystem overviews and the ICES Annual Science Conference as required. The proposed work of the ICES WGMPAs on the design and evaluation of MPAs is considered to have a very high priority.
Resource requirements	Resources attached to national programmes individually related to these ToRs, provide the basis for support in-kind for the work of the group. However, additional funding and support will be investigated to initiate a doctoral candidate to work on targeted data collection and analysis to facilitate the work of this group.
Participants	The Group is expected to be attended by some 20–25 members and guests. Participation includes experts from ICES member countries and also from countries with similar scientific expertise.
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	We anticipate that there will be a close working relationship with working groups that focus on WKTRADE3, WGSOCIAL, WGECON, WGCEAM, WGBESEO, WGMPCZM, WGSFD, WGMHM, WGFBIT, WGOWDF, WGORE, WGMBRED. Specific synergies will be explored with groups working on benthic biodiversity including WGBIODIV and BEWG.

Linkages to other organizations	UNEP-WCMC, NEAFC, NAFO, OSPAR, HELCOM, IUCN, FOS, UN-CBD

Workshop to scope assessment methods to set thresholds and assess adverse effects on seabed habitats (WKBENTH2)

2021/WK/HAPISG17 The **Workshop to scope assessment methods to set thresholds and assess adverse effects on seabed habitats (WKBENTH2)**, chaired by Dave Reid, Ireland; Daniel van Denderen, USA; and Jan Geert Hiddink, UK; will be established and will meet at ICES HQ, Copenhagen, Denmark, 24–26 May and 8–10 June 2022 to:

a) Establish a set of criteria that can be used to evaluate the suitability of regional indicators/assessment methods to assess adverse effects on seabed habitats for MSFD purposes

b) Review methods and criteria to set thresholds of adverse effects on seabed habitats, and suggest operational options that can be illustrated using worked examples

c) Suggest quantitative and qualitative ways to evaluate and compare the suitability and performance of indicators/assessment methods

d) Provide input to a draft compilation of regional indicators/assessment methods to set threshold and assess adverse effects on seabed habitats

WKBENTH2 will report by 24 June 2022 (via HAPISG) for the attention of the ACOM and SCICOM.

Supporting information

Priority	High, in response to the stepwise process of delivering guidance on seafloor integrity for the Marine Strategy Framework Directive (MSFD). The workshop outputs will feed into ICES WGFBIT and the ongoing efforts to provide guidance on assessment methods to set thresholds and assess adverse effects on seabed habitats in the operational implementation of the MSFD.
Scientific justification	Term of Reference a) ICES has previously produced criteria on what makes a good indicator, in general (e.g. WGECO, Rice and Rochet 2005) and specifically for assessing the status of seafloor habitats (WKBENTH 2017). Criteria should faciliate an evaluation on the suitability and shortcomings of any proposed indicators for MSFD assessment purposes, reflecting their performance to assess the parameters specified in Commission Decision (EU) 2017/848 on the condition of seabed habitats and the adverse effects of key pressures. Criteria should take into account the indicators' applicability across MSFD broad habitat types (or subtypes) and their suitability for large sea areas (i.e., all marine waters of MS, marine regions or subregions). Term of Reference b) TOR b will suggest criteria on how to set thresholds and review potential methods that can be used to identify values (or ranges of values) for the indicators which would distinguish a habitat in good condition from the one which is adversely affected or lost (in general or by specific pressures) to set thresholds. This should, for example, reflect on whether there is a linear or non-linear response of the habitat to particular pressures. Options for setting thresholds will take the recent work by EU's TG SeaBed on *threshold values for adverse effects on habitat condition (D6C5) and for the maximum allowable extent of habitat loss (D6C4) and of adverse effects (D6C5)* as far as possible into account. Ref. document GES_26-2022-13. Term of Reference c) Suggest options on how to quantitatively and qualitatively evaluate and compare the suitability and performance of indicators/assessment methods. This may include identifying data sources (i.e. via TG Seabed), in order to evaluate the performance of selected (reviewed) indicators, in relation to their ability to assess the state/condition of

	seabed habitats and adverse effects from specified pressures. Proposed analytical ways to compare methods should ensure that the suitability and shortcomings of the indicator for MSFD assessment purposes at national and regional scales can be evaluated in WKBENTH3 (3-7 October 2022). Term of Reference d) ICES appointed experts will compile a detailed review of indicators that can be or are used in seabed habitat assessments. TOR d gives WKBENTH2 the opportunity to provide input towards this compilation. This detailed review provides an overview of indicators used, or under development, by Regional Sea Conventions (RSC), Member States and ICES, for assessing the state/condition of seabed habitats suitable for MSFD assessments. This should include indicators based on both direct observational data and on models. The indicators considered can also include peer-reviewed indicators which have large-scale application. The review should specify the input data, how it is processed, the parameters of habitat quality used, how quality is quantified, any threshold values used, the applicable seabed (habitat) and pressure types, how the output is expressed, and how confidence and uncertainty are handled.
Resource requirements	ICES secretariat and advice process.
Participants	Workshop with researchers and RSCs investigators. If requests to attend exceed the meeting space available ICES reserves the right to refuse participants. Choices will be based on the experts' relevant qualifications for the Workshop. Participants join the workshop at national expense.
Secretariat facilities	Data Centre, Secretariat support and meeting room.
Financial	Covered by DGENV special request.
Linkages to advisory committees	Direct link to ACOM.
Linkages to other committees or groups	Links to HAPISG and SCICOM.
Linkages to other organizations	Links to RSCs and EC.

Workshop on mitigation measures to reduce bycatch of short-beaked common dolphins in the Bay of Biscay (WKEMBYC2)

2021/WK/HAPISG18 The Workshop on mitigation measures to reduce bycatch of short-beaked common dolphins in the Bay of Biscay (WKEMBYC2), chaired by Hélène Peltier*, France, and Ailbhe Kavanagh*, Ireland, will be established and will meet online on 10-11 October for a data meeting and as a hybrid meeting at ICES HQ, Copenhagen, on 24-28 October 2022 to:

a) consider recent data (2019-2021) on bycatch of short-beaked common dolphins in commercial fisheries and total fishing effort in the Bay of Biscay and off the Iberian coast to estimate bycatch mortality. Estimates will be based in at-sea observer schemes as well as in reverse drift modelling of strandings.
b) evaluate the scenarios that consider the application of specific bycatch mitigation measures and the proposed management objectives as previously recommended in the ICES special request advice *eu.2020.04*. Results from the mitigation trials should be taken into account in scenarios development and recommendations as appropriate.
c) For each scenario tested in the ICES special request advice *eu.2020.04*, revisit and if necessary, update i) relative risk of not achieving the specific management objective, and ii) comment on the scenario risk, as previously documented in the ICES special request advice *eu.2020.04*.

WKEMBYC2 will report by 18 November 2022 for the attention of ACOM.

Supporting information

Priority	The workshop is directly linked to a special request for advice from DGMARE on 'Additional request on mitigation measures to reduce by-catches of common dolphin in the Bay of Biscay (ref. ICES advice of 26.5.2020).'
Scientific justification	Bycatch is the major threat to the common dolphin in the Northeast Atlantic. ICES has previously advised that a combination of temporal closures of all métiers of concern and application of pingers on pair trawlers can mitigate bycatch. The analysis of new available data will help increase precision in bycatch mortality estimates and assess the effectiveness of current management measures.
Resource requirements	None beyond funding for the workshop to be provided by DGMARE.
Participants	The workshop will be attended by approximately 15 experts.
Secretariat facilities	SharePoint access and Secretariat support including assistance from the ICES Data Centre.
Financial	Financed through specific budget linked to a special request for ICES advice.
Linkages to advisory committees	ACOM
Linkages to other committee or groups	HAPISG, WGFTFB, WGMME, WGBYC, WGECO, WGSFD
Linkages to other organizations	OSPAR, ASCOBANS

Workshop on Climate Change Considerations in Marine Spatial Planning (WKCCCMSP)

2021/WK/HAPISG19 A **Workshop on Climate Change Considerations in Marine Spatial Planning** (WKCCCMSP), chaired by Ana Queiros, UK; and Caitriona Nic Aonghusa, Ireland; will meet in Manchester, UK, DATE (tbc) to:

a) Consider how climate change affects MSP. Climate change leads to the redistribution of marine biodiversity and human activities in different ways around the globe. This directly affects the MSP process by posing policy and legal challenges relating to the spatial management of maritime sectors and their interactions. It also leads to impacts on the associated economy and local communities. We will discuss the impacts of those changes on the development and implementation of marine spatial planning.

(Science Plan codes: 2.2, 2.7, 6.2, 6.3, 6.4, 6.6, 7.3. 7.4, 7.6);

b) Understand how climate change adaptation and mitigation are being captured by MSP around the world. Marine Spatial Plans around Europe and the globe present an opportunity to address the causes of climate change (mitigation) as well as its impacts (adaptation), and this is being capitalised upon in different ways at national, supra-national, and regional levels. A stocktake of practical examples of relevant approaches and frameworks, for example decision support tools, participatory methods, science-policy communication will be carried out. We will document best practice and stumbling blocks to implementation.

(Science Plan codes: 2.2, 2.7, 6.2, 6.3, 6.4, 6.6, 7.3. 7.4, 7.6)

c) Determine how MSP can contribute to the implementation of climate action (adaptation and mitigation). We will build on the lessons learned in ToR B to make recommendations about how MSP can enable Climate Action. The workshop report and a guidance paper will be prepared, and will identify policy and legal challenges and enablers to implementation.

(Science Plan codes: 2.2, 2.7, 6.2, 6.3, 6.4, 6.6, 7.3. 7.4, 7.6)

WKCCCMSP will report by DATE (tbc) (via HAPISG) for the attention of the WGMPCZM and SCICOM.

Supporting information

Priority	This is a high priority. It supports delivery of EU Green Deal. Linked to the implementation of Marine Plans globally and the MSP Directive. There aree MSP Global (IOC UNESCO and DG MARE) drivers. International objectives for decarbonisation and expansion of marine renewables, biodiversity conservation and restoration and sustainable fisheries and aquaculture.
Scientific justification	This relates to an objective of ToR C of the Working Group for Marine Planning anc Coastal Zone Management (WGMPCZM).
Resource requirements	Need climate scientists involved in workshop (e.g. climate scientists, ecologists working on climate change in various sectors (conservation, fisheries, MSP specifically), IPCC WGII-III), National Planning Authorities, marine planning researchers. Climate and Marine Policy practitioners. ICES Working Groups.
Participants	The workshop is expected to be attended by 15–20 members and guests.
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to advisory committees	There are no obvious direct linkages
Linkages to other committees or groups	H2020 FutureMARES, ICES IEASG, WKCLIMAD, WGCEAM, WGMPAS
Linkages to other organizations	UN Decade of Ocean Science for Sustainable Development. Green Deal, UNEP WCMC, UNESCO Man and Biosphere, IOC UNESCO, PICES, MSPGlobal, EU MSP Platform, DG MARE, COPERNICUS Climate Data Store, National Planning Authorities.

Workshop to evaluate proposed assessment methods and how to set thresholds for assesing adverse effects on seabed habitats (WKBENTH3)

2021/WK/HAPISG20 The **Workshop to evaluate proposed assessment methods and how to set thresholds for assesing adverse effects on seabed habitats (WKBENTH3)**, chaired by Ellen Kenchington, Canada; and Sasa Raicevich, Italy; will be established and will meet at ICES HQ, Copenhagen, Denmark, 3–7 October 2022 to:

a) Evaluate proposed assessment methods and how to set thresholds for assessing adverse effects on seabed habitats produced in WKBENTH2 and peer-reviewed, using the agreed upon criteria, methods and analysis of their performance therein established, with an emphasis on relevance to the MSFD Descriptor 6 (Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected) and associated Annexes III and IV;

b) Prepare worked examples using suitable methods on how to set threshold and assess adverse effects on seabed habitat quality for relevant pressures and impacts listed in Annex III and environmental targets listed in Annex IV of the MSFD;

c) Based on ToRs a and b, prepare an overview of recommended assessment methods for application to MSFD Descriptor 6;

d) Provide higher level guidance on future directions for improvements to the recommended methodology presented in ToR c and for developing scientifically-based 'extent' indicators for assessing adverse effects of human-induced pressures on seabed habitats;

e) Provide higher level guidance as to a set of criteria, and methods to analyse the performance of assessment methods and how to set thresholds for assessing adverse effects on seabed habitats. Documentation should ensure that the excersise to evaluate methods can be redone in the future.

WKBENTH3 will report by 14 October 2022 (via HAPISG) for the attention of the ACOM and SCICOM.

Supporting information

Priority	High, in response to the stepwise process of delivering guidance on seafloor integrity for the Marine Strategy Framework Directive (MSFD). The workshop outputs will feed into ICES WGFBIT and the ongoing efforts to provide guidance on assessment methods to set threshold and assess adverse effects on seabed habitats in the operational implementation of the MSFD.
Scientific justification	Term of Reference a-d) Based on WKBENTH2 and technical service, as well as a peer review of the reports TOR a will evaluate proposed assessment methods and how to set threshold for assessing adverse effects on seabed habitats using agreed upon criteria, methods and analysis of their performance, with an emphasis on the MSFD. Agreed and peer review of criteria on what makes a good indicator, in general (e.g. WGECO, Rice and Rochet 2005) and specifically for assessing the seafloor habitats (e.g. WKBENTH 2017). The evaluation should faciliate production of formal ICES advice on the suitability and shortcomings of any proposed indicators for MSFD assessment purposes, reflecting their performance to assess the parameters specified in Commission Decision (EU) 2017/848 on condition of seabed habitats and the adverse effects of key pressures. Evaluation should also take into account the indicators applicability across MSFD broad habitat types (or subtypes), their suitability for large sea areas (i.e., all marine waters of MS, marine regions or subregions). Quantitative and qualitative analytical approaches, as well as worked examples, should be used to illustrate suitability of methods to set threshold and assess adverse effects on seabed habitats. Options for setting thresholds should take into accouns as far as possible recent work by EU's TG SeaBed on threshold values for adverse effects on habitat condition (D6C5) and for the maximum allowable extent of habitat loss (D6C4) and of adverse effects (D6C5) Ref. document GES_26-2022-13. Options on setting thresholds should identify higher level criteria that can be used to identify values (or ranges of values) for the indicators which would distinguish a habitat in good condition from the one which is adversely affected or lost (in general or by specific pressures) to set thresholds. This should, for example, reflect on whether there is a linear or non-linear response of the habitat to particular pressures. Consolidate a review of proposed assessment methods based on peer review of WKBENTH2 and technical service. The aim of this TOR is to agree for advice production purposes a detailed review of indicators used, or under development, by Regional Sea Conventions, Member States and ICES, for assessing the state/condition of seabed habitats suitable for MSFD assessments. The indicators considered can also include peer-reviewed indicators which have large-scale application. Provide a detailed review of indicators used, or under development, by Regional Sea Conventions (RSCs), Member States and ICES, for assessing the state/condition of seabed habitats and relevant existing literature. This should include indicators based on both direct observational data and on models. Relevant indicators to be reviewed include those of RSCs for quality status assessments, of Member States for MSFD purposes such as under the Water Framework Directive (WFD) and the Habitats Directive (HD), and those used by ICES. The review should specify the input data, how it is processed, the parameters of habitat quality used, how quality is quantified, any threshold values used, the applicable seabed (habitat) and pressure types, how the output is expressed, and how

	confidence and uncertainty are handled.
Resource requirements	ICES secretariat and advice process.
Participants	Workshop with researchers and RSCs investigators If requests to attend exceed the meeting space available ICES reserves the right to refuse participants. Choices will be based on the experts' relevant qualifications for the Workshop. Participants join the workshop at national expense.
Secretariat facilities	Data Centre, Secretariat support and meeting room.
Financial	Covered by DGENV special request.
Linkages to advisory committees	Direct link to ACOM.
Linkages to other committees or groups	Links to HAPISG and SCICOM.
Linkages to other organizations	Links to RSCs and EC.

Resolutions approved in 2020

Working Group on Economics (WGECON)

2020/FT/HAPISG04 The **Working Group on Economics** (WGECON), chaired by Arina Motova, UK; J. Rasmus Nielsen, Denmark; and Olivier Thébaud, France; 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	14–18 June	Online meeting		
Year 2022	9-10 May 19-20 May	Online meeting		
Year 2023			Final report by DATE to SCICOM	Potentially introduce additional chair(s) to ensure transition towards future WGECON

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Build additional capacity for economic science in ICES, giving consideration to research and institutional needs in all ICES member countries, as well as useful connections to international marine/ fisheries economics organisations such as IIFET, NAAFE and EAFE.	This builds on the initial scoping exercise within ICES carried out by WGECON, expands the capacity building efforts, and ensures coordination of activities with other international bodies and links to the wider scoping work in the Strategic Initiative for the Human Dimension (ICES SIHD).	6.3; 6.4; 7.3	Years 1, 2 and 3	Annual e-evaluation and final report sections on coordination activities
b	Identify and report on economic data-related needs and priorities for short and longer-term economic data collection, access and analysis; and where possible propose systems to collect missing data.	To aid prioritisation in data collection, management and analysis, to enable quantitative analyses and estimates of economic issues. The ToR links to ICES Data Centre and National and international economic data collection requirements (e.g. EUMAP).	3.1; 3.2; 4.2	Years 1,2 and 3	Final report section on prioritisation and continued scientific review paper

c	Demonstrate the approaches, methods, tools and information flow needed to provide analysis of trade-offs relating to ecosystem-based management of fishing (EBFM).	To develop toolboxes, expertise and processes to support potential future advice requests and development of ecosystem overviews and integrated ecosystem assessments. This includes collaborations with WGSOCIAL.	5.3; 6.1; 7.6	Years 1,2 and 3	Final report section on developments and potential scientific manuscript
d	Assess and report on economic aspects of commercial fishing and its management for selected regions in the ICES area.	To support future potential advice requests and development of ecosystem overviews, using a case study approach. This requires identification of robust indicators to describe economic status and performance.	6.6; 7.1; 7.2	Years 1,2	Final report section on case-study based identifications and assessments, and potential scientific manuscript
e	Coordinate the provision of economic indicators and analysis as part of integrated socio-ecological evaluations in support of EBFM.	Building on results from ToRs b), c) and d), 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, within ICES.		Year 2, 3	Final report section on economic contribution to integrated assessment framework (case-study based)

Summary of the Work Plan

Year 1	Continue work started by WGECON in 2018-2020 on identifying needs for economic science in ICES, data gaps and opportunities to provide trade-off analysis, building the ICES capacity to integrate economic dimensions in fisheries management advice: - Initiate the case study work identified in 2020, and request data from ICES Member States to address these where necessary; - In collaboration with especially ICES WGSOCIAL, analyse possible ways to introduce human dimensions into Ecosystems Overviews (EOs) by e.g. mapping ports of fishing operation and bringing fisheries at sea to national territories dimentions to identify coastal / fisheries dependent communities; - Continue sharing methodologies of economic data collection / analysis and modelling, and integrated assessment with other ICES working groups and ICES SCICOM and ACOM. Produce e-evaluation report.
Year 2	Progress case study work and inclusion of human dimensions in EOs and develop manuscript(s) presenting results. Continue sharing methodologies of economic data

	collection / analysis and modelling, and integrated assessment with other ICES working groups and ICES SCICOM and ACOM. Produce e-evaluation Report
Year 3	Finalise case study work. Finalize manuscript(s). Discuss and plan strategies and concrete steps for future work. Produce Final Report

Supporting information

Priority	Nations are concerned about fish stocks and marine ecosystems not least of which because of their contribution to human wellbeing and economic welfare. The economic dimension should be an integral part of marine science and scientific advice regarding the use and conservation of marine resources. Demand for science and advice to address economic considerations is increasing, but ICES does not engage many economists or address economic issues in many member countries in its existing work. The efforts of the Strategic Initiative on the Human Dimension (SIHD) with ICES have served to raise the profile of economics and social aspects in relation to fisheries in the last few years, but, with a few exceptions, SIHD efforts are not comprehensively supported and informed by the work of the ICES EG. Further, among the ICES groups addressing economic issues, only WGECON focuses on the development of fisheries economic metrics and core fishery economic analyses that are demanded in parts of the ICES network (e.g. further development of ecosystem overviews) and, in some cases, by clients for ICES management advice. The need to expand the engagement of ICES in economics was also reflected in the outcomes of many recent meetings, especially the "Understanding marine socio-ecological systems" (MSEAS) Conference which ICES co-sponsored in Brest in 2016, as well as the results from the ICES working group on Integrating. Ecological and Economic Models (WGIMM). Other drivers include high level aspirations for Blue Growth in European countries and globally, the interest in accounting for economic objectives such as Maximum Economic Yield as well as for the United Nations sustainable development goals in management advice, and a desire to understand economic consequences of human-induced changes in the sea (WGHIST). There is also recognition in ICES, and from our clients, that it would be desirable to add economic metrics to ICES ecosystem overviews and better recognise people and their livelihoods as part of the ecosystem.
Resource requirements	The group will rely on ongoing international and national research projects with active involvement of WGECON members. The additional resources required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 20–30 members and guests.
Secretariat facilities	Standard support to EG.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are currently no linkages with ACOM, but the EG is working on providing standards for economic advice, on top of the biological advice, which should be relevant to ACOM. The EG will be ready to address advisory requests if these are forthcoming and possible to achieve with available efforts.
Linkages to other committees or groups	The subject area of this EG has close linkage with at least the following ICES groups: WGSOCIAL, WGMIXFISH, WGSEDA,WGIMM, WGSPA, WGSEDA, WGRMES, WGNARS, WGHIST, WGBESEO and the Strategic Initiative SIHD, as well as the ICES IEA groups. The working group has initiated strong cooperation and relationship with WGSOCIAL.

Linkages to other organizations	International Institute of Fisheries Economics and Trade (IIFET), North American Association, of Fisheries Economists (NAAFE), European Association of Fisheries Economists (EAFE), EU Scientific, Technical and Economic Committee for Fisheries (STECF), Food and Agriculture Organisation of the United Nations (FAO), Organisation for Economic Cooperation and Development (OECD).

Working Group on the History of Fish and Fisheries (WGHIST)

2020/FT/HAPISG05 The **Working Group on the History of Fish and Fisheries** (WGHIST), chaired by Bryony Caswell, UK; and Camilla Sguotti, Italy, 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	21–25 June	Online meeting		
Year 2022	6–9 June	Chioggia, Italy		
Year 2023	early Sept	tbc	Final report by 1 December to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Collect, assemble, and, integrate meta-data on marine social-ecological systems through time and develop links with historical data management bodies (within and beyond ICES) to: explore shared interests and compatibilities, and collaboratively develop data products to encourage the use, preservation, and maintenance of historical data.	Data from WGHIST supports the development of tools for marine living resource management and provides a resource of historical and long-term information for the global community via the ICES Data centre. In addition, WGHIST can work with the ICES Data Centre and others to identify further opportunities for promoting and facilitating access to historical and archival resources housed by other institutions (e.g. by collating and digitizing them). WGHIST can also work with other experts to develop guidelines for best practises in using of long-term data for research and management.	6.1, 7.7	3 years	Digital products, such as indexing WGHIST metadata on the ICES Spatial Facility. Guidelines on best practice within ICES and beyond for using and/or applying historical data to contemporary advice for management.
b	Explore the actual or potential synergies between different kinds	Historical data comes in many forms, and often requires an open and	7.7	3 years	Wiki providing resources such as: information on best

	of historical data and provide tools both for communicating, and for bridging disciplinary differences in data usage.	responsive approach to its usage. When 'traditional' (i.e. independently verifiable and/or quantitative) data is missing or incomplete, it may be supplemented by 'non-traditional' (i.e. anecdotal or less easily verified) data. These non-traditional data can be more challenging to integrate into management which predominantly focuses on using modern, quantitative data. However, WGHIST is uniquely placed to facilitate cross-disciplinary discussions on how to overcome these challenges, and on best practices for effective integration of 'traditional' and 'non-traditional' historical data for science and management.			practice and examples of how to understand and the overcome the challenges and constraints of using different kinds of data; with links to other relevant resources that can help to address the integration of different data types for effective and high-quality research.
c	Evaluate long-term changes within marine social-ecological systems, and explore how this knowledge can be applied to contemporary science and management.	The interdisciplinary nature of WGHIST, with expertise in marine ecology, fisheries biology, historical ecology, palaeo-ecology, social and environmental history, offers a unique forum for conducting transdisciplinary research into marine social-ecological systems. It may therefore provide unique data and knowledge that can be leveraged to improve our understanding of social-ecological systems and their dynamics (e.g., scale, direction and drivers of change through time).	2.2, 4.5, 5.4, 7.7	3 years	Submission of (1) manuscript for peer review which might explore the origins or impacts of 'technology creep' in social-ecological systems. OR opinion/perspective piece on the applications of historical data for contemporary science. Provide knowledge that could contribute important context for the ICES fisheries and ecosystems overviews.
d	Explore the utility of historical data for understanding the social-ecological outcomes of emerging management strategies.	WGHIST is unique in bringing together specialists from very different fields who have particular interests in using unconventional resources and approaches, and interdisciplinary methodologies to interpret social-ecological trends over long (decadal to centennial) periods of time. With many new challenges becoming apparent in the 21st Century,	2.2, 2.7, 7.7	3 years	Work towards published outputs addressing the historical implications of subsidies and the political context for social-ecological change over time, and/or resource sustainability.

	so too are new ways of thinking and innovative solutions for how global society may continue to develop, and how we may in turn manage our resource use. WGHIST can provide valuable context on the possible outcomes from these strategies, in particular the response of human societies to past development. For instance, (a) attitudinal and behavioural shifts in effective resource management, and (b) changing patterns of access and use-rights.

Summary of the Work Plan

Year 1	In Year 1, WGHIST will work with the ICES Data Centre and external bodies to explore the opportunities for developing data products that encourage use of and enhance the visibility of historical and long-term data (ToR a). Production of resources on best practice guidelines (ToRs a, b) will also commence during the Year 1 meeting, as will outlining of perspective/opinion pieces on the applications of historical data (ToR b). Potential areas of interest already identified by WGHIST members for ToRs c and d include: quantifying changes in ecosystem services over time, detailing fishing technology change and cumulative impacts upon fishing efficiency, and invoking cross- disciplinary knowledge to expand our understanding of linked social-ecological system change through time. Post-meeting work will involve soliciting contributions from the wider WGHIST membership list and continued development of manuscripts. The WGHIST 2021 meeting will discuss re-establishing links with the ICES SIHD and other WG with expertise relevant to WGHIST aims, through invitation of SIHD and WG Chairs to the WGHIST meeting, whether in person or remotely. These efforts aim to strengthen cross-disciplinary ties and enhance communication and learning among ICES WGs. Links with external groups will also be maintained (e.g. Oceans Past Initiative) and expanded (e.g. PICES, and the Ocean Biogeographic Information System) to enhance interdisciplinary learning and collaboration.
Years 2 and 3	In years 2 and 3 WGHIST will continue to develop digital tools for historical metadata, explore opportunities for improving the accessibility of historical data for use by the scientific community, and develop protocols for best practise when using historical data, potentially in collaboration with the ICES Data Centre and other WGs. While these tools will be finalised in year 3, it is our hope that progress will be ongoing throughout years 1 and 2, including the provision of digital updates to the ICES community during this time. Years 2 and 3 will also see progress on the proposed manuscripts and perspective pieces, and the WGHIST chairs will work to maintain and enhance connections with other relevant WG, and external bodies as above. Year 2 will forward manuscript and guidelines in our ToRs, specific research from WGHIST members will be used to expand this work. Deliverables will then be completed in Year 3.

Supporting information

Priority	The value of historical marine ecology and historical data for evaluating current ecosystem health has been well established in the literature. Understanding social-ecological change – and in particular, long-term trends in social-ecological interactions

	and their current impacts – has great potential for informing decision making and management of ecosystems and marine service industries in the future. **Scientific Scope:** WGHIST will continue to operationalize historical data for addressing contemporary scientific questions and future management needs. This iteration of WGHIST will prioritise the capture, assembly, and integration of data on ecosystem changes resulting from interactions between social and ecological systems over time, and it will conduct interdisciplinary research based on this data. In this way, it may inform the future management and decision-making of marine resource use.
Resource requirements	WGHIST will continue to consult with ICES Data Centre staff, as well as informally with data management experts and gatekeepers beyond ICES, in order to facilitate (and refine best-practice for) the assembly and integration of metadata within and beyond the organisation. New WGHIST Chairs will contact SIHD chairs to broaden still further the scope for intra-ICES collaboration on the collation, integration and best use of historical data in management and future decision-making. The lessons from this year's remote WGHIST meeting, and the broader lessons to be taken from the impact of COVID-19 on organisational and administrative paradigms, suggest the high value in the future of operationalising remote meetings, conferences and consultations. Any assistance that ICES can offer for supporting remote consultation and meetings would be very much appreciated.
Participants	The chairs will review, and seek to enhance, group membership early in the new iteration of WGHIST. Currently, the members include ecologists, historians, social scientists, economists, policy experts and data analysts working in or connected to historical marine ecology, and we will seek to ensure that this diversity is maintained throughout the next group iteration. Past experience predicts attendance of 8-15 group members and guests at face-to-face annual meetings. However, the experience of this year's remote meeting suggests that this core group could potentially be greatly enhanced with the further use of remote technologies – either for individual participants who are unable to attend in person, or for the organisation of the meeting as a whole.
Secretariat facilities	Standard support (potentially meeting rooms & remote capabilities).
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	WGHIST will actively seek out connections within ACOM for the application of historical ecology work into scientific advice (e.g. stock baselines, change through time, context for IEAs, etc).
Linkages to other committee or groups	Potential links to ACOM, EPDSG, HAPISG, IEASG, SIHD as well as WGBIODIV, WGBFAS, WGECO, WGMARS, WGMIXFISH, WGRMES, WGSAM, DIG, WGSEDA, WGECON and WGSOCIAL depending on interest and availability of committee and group members to join in person or remotely.
Linkages to other organizations	Participants in the Oceans Past Initiative (OPI) will be interested in our work and outcomes, and WGHIST will further enhance existing links with this group. WGHIST has an international participation beyond ICES member countries (including Australia, South Africa and Italy) and these will be maintained and, where possible, further enhanced. We intend to work together with the Ocean Biodiversity Information System (OBIS) executive to make historical data (metadata as a minimum) on fish and fisheries available through the OBIS portal.

Working Group on Marine Habitat Mapping (WGMHM)

2020/FT/HAPISG11 The **Working Group on Marine Habitat Mapping (WGMHM)**, chaired by Julian Burgos, 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 2021	24–28 May	Online meeting		
Year 2022	29 August - 2 September	Hafnarfjordur, Iceland		
Year 2023			Final report by DATE to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Report on progress in international mapping programmes (including OSPAR and HELCOM Conventions, EMODnet, EC and EEA initiatives, CHARM, Mesh-Atlantic and other projects).	Capturing the presence and work of large international mapping projects is important because (i) the WGMHM report becomes a useful 'state of the art' summary of marine habitat mapping activity, (ii) the presentations from these projects helps spread best-practice, standardisation and collaborative working within the group, and (iii) other presentations highlight relevant mapping work that may benefit the large international programmes.	1.3, 1.4, 1.5 3.2, 3.4	Years 1–3	Meeting reports
b	Review and synthesise key results from national habitat mapping during the preceding year, as well as new on-going and planned projects focusing on particular issues of relevance to the rest of the meeting. Provide National Status Report updates in geographic format in the ICES webGIS.	The current extent of marine habitat mapping and modelling means that maps are meeting at international boundaries. It is important that maps are joined internationally and in a standardised manner. This requires an understanding of the extent and distribution of habitat mapping within nation states. Equally, WGMHM are often interested in specific habitats and wish to be kept informed of specific mapping exercises on these habitats, e.g. deepwater habitats or cold water corals. The reporting of national mapping is also the primary mechanism for encouraging	1.3, 1.4, 1.5, 3.2, 3.4	Years 1–3	Meeting reports

		WG members to submit survey metadata files to the various data archiving centres. The National Progress reports also states whether member countries have purchased significant survey items, such as ships, AUVs and sonars. This provides a good opportunity for others to identify useful resources for international colloboration.			
c	Review recent advances in marine habitat mapping and modelling techniques, including field work methodology, and data analysis and interpretation	This ToR provides the main avenue for mappers to communicate new or improved techniques to the other scientists present (and captured in the report). As such, this ToR is essential for spreading best practice and developing new methods.	1.3, 1.4, 1.5, 3.2, 3.4	Years 1–3	Meeting reports
d	Review use of habitat maps, for example mapping for the MSFD, marine spatial planning, and management of MPAs; and assess the ability (e.g. through the monitoring of the MSFD indictor 'extent') to use habitat maps for monitoring of the environment.	To encourage the diversification of the WGMHM, the group also consider how marine habitat maps are used for scientific and management purposes. Members of the group are often the creators of these maps and have important insights into how the maps can be used. Equally, it gives marine managers an opportunity to suggest how maps are best presented to support clarity and value for management purposes.	1.3, 1.4, 1.5, 3.2, 3.4	Years 1–3	Meeting reports
e	Identify sources of information (e.g. bathymetry, oceanography, fisheries or socio-economic) that can be used for the production and enrichment of marine habitat maps.	Many of the remotely sensed and modelled outputs that are of value to marine habitat mappers is available online. Although much of this information is centralised in large data archives, other information remains dispersed on the web. This ToR seeks to collate the important data soueces that are of value for marine habitat mapping into one database.	1.3, 1.4, 1.5, 3.2, 3.4	Years 1–3	Meeting reports
f	Identify and advance theoretical aspects of	This ToR is to provide an opportunity for EG members	1.3, 1.4, 1.5,	Years 1–3	Meeting reports and scientific

	habitat mapping (e.g. landscape ecology, supplyside ecology, implications of scale etc.).	to address the theoretical aspects of marine habitat mapping. As a science in its infancy, it is important that underpinning concepts are challenged and re-evaluated.	3.2, 3.4	papers

Summary of the Work Plan

Year 1	Cover ToRs A-E. Support the 'Benchmark Workshop on the Use of Predictive Habitat Models in ICES Advice (WKPHM)' workshop to be held jointly by Working Group on Deep-water Ecology (WGDEC) and WGMHM.
Year 2	Focus on a specific ToR for in-depth analysis
Year 3	Focus on a specific ToR for in-depth analysis

Supporting information

Priority	Supporting the Benchmark Workshop on the Use of Predictive Habitat Models in ICES Advice (WKPHM). The WGMHM may choose to address some of the topics that are highlighted as necessities for further work in 2021 and 2022. Much of the initial work will feed into the work of WGDEC. Further work will also provide support for the species and habitat predictive models that are required for WGDEC advice.
Resource requirements	Other than the support for the Benthmarking Workshop, WGMHM do not need additional resource at this moment.
Participants	The Group is normally attended by some 10–15 members and guests.
Secretariat facilities	Standard support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	Linkage to WGDEC (advice legacy group).
Linkages to other committees or groups	There is a very close working relationship with WGDEC. It is also very relevant to the Benthos Ecology Working Group (BEWG).
Linkages to other organizations	

Working Group on Fisheries Benthic Impact and Trade-offs (WGFBIT)

2020/FT/HAPISG14 The **Working Group on Fisheries Benthic Impact and Trade-offs (WGFBIT**), chaired by Gert van Hoey, Belgium; Jan-Geert Hiddink, UK; and Marija Sciberras, UK, 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	22–26 November	Palermo, Italy		
Year 2022	21–25 November	Sete, France		

Year 2023	DATE September	Final report by DATE to SCICOM

ToR descriptors

ToR	Description	Background	SCIENCE PLAN TOPICS ADDRESSED	Duration	Expected Deliverables
a	**REGIONAL ASSESSMENTS** Apply and improve theseafloor assessment framework developed by WGFBIT (2018–2020) to produce (sub-) regional assessments for the North, Celtic, Baltic, Arctic (Icelandic, Norwegian Barents sea), Mediterranean Seas and the Bay of Biscay and the Iberian Coast.	Produce a worked example of how science can operationalize EBM (ecosystem based management) and contribute towards IEAs (intergrated ecosystem assessment) as ICES advice products. I.e. develop an EU MSFD D6/D1 assessment with management options that can be applied also by non-EU ICES countries. Links (avoiding overlaps) will be established with key experts also attending WGECO, WGDEC, WGSFD, BEWG, MHWG, WGIMM, WGMBRED, and WGMPCZM.	1.9; 2.1; 2.4; 6.3	3 years	Year 1: a worked example for all regional seas, based on the preliminary achievements in the period 2018–2020. Initiating the 'pipeline process' for inclusion of relevant outputs to ecosystem overviews, starting with North and Baltic Sea. Year 2: Updating of the regional and sub-regional assessments for the different regions. Year 3: Final regional assessments of the impact of bottom abrasing fisheries for all regions in the ToR, which can feed into the ICES fishery and ecosystem overviews.
b	**UPDATES FOR ASSESSMENT FRAMEWORK** Explore and potentially implement options to improve the parameterisation of the WGFBIT seafloor assessment framework components, in shallow waters and deep-sea areas.	These updates can focus on following aspects: E.g. through; i) standardisation of benthos data sampled with different gears, ii) development of methods to predict benthos longevity biomass in data poor areas, iii) integration of environmental drivers in the predictions, iv) improve the resolution of gear-specific depletion rates, v) estimation of parameter uncertainty.	2.3; 2.4	3 years	Year 1- 3: Stepwise progress for the different aspects that can be tackled. Updates or adaptations need to feed in Tor A, to improve the regional assessments. If appropriate progress or results, research paper(s) will be conducted.

c	**WGFBIT AND THE WIDER WORLD** Alignment of the WGFBIT seafloor assessment framework with other assessment methods for benthic habitats under relevant EU directives.	The WGFBIT seafloor assessment framework (based on assessing the relative benthic state) is not the only way to assess benthic impacts from physical disturbance. Therefore, alignment with other methods needs to be explored.	2.3; 2.4	3 years	Year 1-3: Research paper(s)
d	**ECOSYSTEM FUNCTIONING** Explore if ecosystem functioning can be incorporated more explicitly into the WGFBIT seafloor assessment methodology.	This can be done through examining the direct influence of bottom fishing on sediment parameters related to ecosystem functioning (e.g. apparent redox discontinuity potential layer). The link between total benthic community biomass and/or particular traits (e.g. longevity or sediment position) with biogeochemical parameters that are related to particular benthic ecosystem functions will also be explored – for this part links to work by BEWG and WGECO will be sought.	1.3; 1.9; 2.3	3 years	Year 1-3: Research paper(s)

Summary of the Work Plan

ToR a) **REGIONAL ASSESSMENTS**. Apply and improve the EU MSFD D6/D1 assessment framework related to bottom abrasion of fishing activity at the regional / subregional scale, which was developed by ICES WGFBIT (2018–2020). Priortity will be given to improve the parameterisation of framework components at regional and sub-regional scale and with that also improve the overall assessment of benthic status and of alternative management options to achieve good environmental status (GES). The framework should remain generic enough that it allows cross regional comparison and specific enough that it addresses regional-specific trade-offs (i.e. incorporating other pressures than fisheries).

ToR b) **UPDATES FOR THE ASSESSMENT FRAMEWORK.** Explore and potentially implement options to improve the parameterisation of framework components. This can be done through the below action points.

i) The default WGFBIT seafloor assessment framework uses data collected by grab or box corer and therefore targeting the infauna. For some regions, such infauna data is not always available , and assessments are therefore based on epi-benthic data from trawl samples. The use of different sampling methodologies, with subsequent assessment focus on different parts of the ecosystem, has influence on the outcome. Therefore, these differences or commonalities in a regional context, need to be investigated,

ii) The determination of grid cell recovery values are based on longevity compositions sampled from unfished areas. In some regions this type of data is sparse, so alternative approaches/data are needed. A thorough investigation of this aspect will enlarge the WGFBIT assessment framework applicability and increase the confidence of the assessments,

iii) Application of the WGFBIT assessment framework for regional areas requires the development of statistically robust relationships between the benthic biomass longevity distribution and environmental drivers, such as depth, sediment, bottom shear stress, salinity, temperature, primary production, etc. For some regions it has been difficult to obtain meaningful relationships that distinguish sensitive and less sensitive areas spatially, and improved modelling (inclusion of more and better enviromental data across larger cross-regional scales) could potentially solve this,

iv) The gear-specific depletion rate of the assessment method is currently based on only 3 different metiers; beam trawl, otter trawl and dredges. Recent approaches have provided the basis for having a finer gear resolution of the depletion rates (cf Rijnsdorp et al., 2020) and this should be pursued. Methodology to estimate the seabed disturbance area of passive fishing gears is on its way and inclusion of these gears in the assessment framework can be explored in alignment with ICES WGSFD, where these aspects are already being investigated,

v) It is necessary to quantify the uncertainty in the risk assessment methodology developed by WGFBIT. This is required to a) identify which input parameters and modelling steps account for the majority of the uncertainty, and therefore will benefit from efforts to reduce it (e.g. by carrying out further studies), and b) to map the distribution of the overall uncertainty in the assessment area in order to consider it when evaluating management scenarios. The utility of a bootstrapping approach will be explored.

ToR c) WG**FBIT AND THE WIDER WORLD**

i) Alternative EU MSFD D6/D1 assessment frameworks are under development. Comparing different methods has several advantages; 1) Multiple assessments with similar outcomes will increase the confidence of the assessment within a region, as locations with a low or high state/impact should be clearly distinguishable across assessment methods. Areas that differ between assessments, need more investigation, 2) Multiple assessments will help to improve approaches and the guiding of decision making. A more profound decision can be made, when it is based on several outputs.

ii) Threshold Values for determining adverse effects (and loss) and GES is highly requested for policy purpose in relation to: 1) impacts of physical pressures (and bio-geo-chemical pressures); 2) specific indicators (and response value levels) and 3) areal protection – what, where, how much and how strict? (securing ecosystem functioning). The lack of

empirically based threshold values is an upcoming and increasingly urgent concern internationally (TG Seabed, HELCOM, OSPAR) and at the national level concerning the implementation of the EU MSFD D6C3 and D6C5, as well as for the D1 and D5. The options to integrate GES threshold values in WGFBIT will be explored by looking to current practices under the WFD and NATURA 2000 management at the national level.

ToR d) **ECOSYSTEM FUNCTIONING**

The WGFBIT seafloor assessment framework uses total benthic community biomass as key metric to assess seabed impacts under the assumption of a strong correlation with ecosystem functions such as carbon mineralization and nutrient cycling. We propose to test this assumption and investigate how ecosystem functioning can be incorporated into the PD methodology. This will not only ascertain that RBS is a good way forward, but also help us in setting thresholds for acceptable ecosystem impacts. This can be done through examining the direct influence of bottom fishing on sediment parameters related to ecosystem functioning (e.g. apparent redox discontinuity potential layer). The link between total benthic community biomass and/or particular traits (e.g. longevity or sediment position) with biogeochemical parameters that are related to particular benthic ecosystem functions will also be explored – for this part links to work by BEWG and WGECO will be sought.

Year 1	ToR a, b, c, d
Year 2	ToR a, b, c, d
Year 3	ToR a, b, c, d

Supporting information

Priority	The 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	Experts that provide the main input to this group have been involved in successful EU funded projects (BENTHIS). It is envisoned that future funding will be availble and that this ICES working group experts can also provide an international platform to establish a consortium. This would allow to commit future resources to the group's work.
Participants	The Group is normally attended by around 30 members and guests.
Secretariat facilities	Standard support
Financial	No financial implications
Linkages to ACOM and groups under ACOM	Advice products and working groups (e.g. WGECO and WGDEC)
Linkages to other committees or groups	There is a very close working relationship with all the groups under the Ecosystem Pressures and Impacts Steering Group. It is also very relevant to the Workings Groups WGECO, WGDEC, WGSFD, BEWG, WGMHM, WGIMM, WGMBRED, WGMPCZM.

Linkages to other organizations	EU (DG-ENV, DG-MARE), RSCs (Baltic's HELCOM, North Atlantic's OSPAR, Mediterranean's Barcelona Convention and Black Sea's Bucharest Convention), JRC, STCEF.

Working Group on Offshore Renewable Energy (WGORE)

2020/FT/HAPISG15 The **Working Group on Marine Renewable Energy (WGMRE)** will be renamed **Working Group on Offshore Renewable Energy (WGORE)**, chaired by Daniel Wood, UK, and Bob Rumes, Belgium; 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	27 September	Online meeting		
Year 2022	15-18 February	Online meeting		
Year 2023			Final report by Date to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Cumulative Effects Assessment of offshore wind, wave, and tidal farms in the ICES area.	a) Renewable energy devices are currently licenced on a farm by farm basis in most countries. There has been little work carried out to assess environmental effects at ecosystem and regional scales. The aim is to provide a detailed assessment of ORE at these scales. b) Individual countries are largely focused on their ORE developments with regulatory systems only set up to deal with internal assessment but not cross border. The work would provide an ecosystem approach for dealing with cross border discussions between member states. c) Link up with WGCEAM	2.1, 2.2, 2.4	3 years	Peer-reviewed journal paper
b	Review of the use and environmental effects of chemicals in offshore wind, wave, and tidal farms	a) There is growing evidence that large quantities of chemicals and metals are being used in offshore renewables. The goal is to identify the chemical groups being used, quantify the usage and the environmental risk. b) Chemical contaminants can impact all levels of receptor in the ecosystem. The widespread	2.1, 2.4, 2.6	3 years	Peer-reviewed journal paper

			distribution of ORE means contaminants can have an impact across a very wide area. Understanding a new source of contaminants is key to effective management.			
		c)	collaboration with the ICES WG Marine Chemistry and WGMBRED			
c	Evaluate and report on the environmental effects of emerging marine renewable energy technologies and devices.	a)	There is a growing number of new technologies being trialled to extract energy from the marine environment. These include floating solar farms, Ocean Thermal Energy Conversion (OTEC) and Pressure Retarded Osmosis (PRO). There is a need to understand what the environmental effects/impacts of these devices could be, and to identify research gaps.	2.1, 2.7	3 years	Peer reviewed journal paper. Most likely a review paper.
		b)	Regulators and advisors require prior information on new devices so that they can firstly prepare for licensing deployment and secondly to prepare research funding for emerging issues.			
		c)	Ad-hoc requests if required to other WG. Particularly WGMBRED.			
d	Review and report on (re)emerging environmental issues for offshore wind, wave, and tidal renewable energy technologies	a)	Offshore wind farms are now a well-established feature. Wave and tidal devices are being deployed in an increasing number of areas. New issues such as bat collision risk and the use of chemicals are emerging. Other pressures such as Electro Magnetic Fields (EMF) are re-emerging with the development of floating offshore wind.	2.1, 2.7	3 years	Short report with WG final report. (Possible journal paper if sufficient content)
		b)	Issues often emerge because of individual interest within a member state. This work will allow transfer of knowledge across and beyond ICES member states.			
		c)	Link up with work from WKTBIMP, WGOWDF and associated groups			

Summary of the Work Plan

Year 1	ToR A: Identify pressures to be included, data sets to be used and define methodology(ies) to be used. Link up with WGCEAM to help define the parameters. It is anticipated that the methodology will build on spatial approaches developed by Halpern et al., 2012 and used by HELCOM. ToR B: Refine scope of work, define data sources and chapter structure for reporting. Make contact with ICES WG Marine Chemistry to agree workload. ToR C: Define chapter structure, identify emerging technologies. ToR D: Review status on known and newly emerging environmental issues. Define chapter structure for reporting.
Year 2	ToR A: Compile datasets, carry out main analysis. Drafting of report e.g. methods, introduction etc. ToR B: Analyse the data and begin draft report. ToR C: Review emerging technologies in a workshop. Draft report. ToR D: Link up with WKTBIMP and associated groups via online workshop on cross border. Draft report.

Year 3	ToR A: Finalise analysis and complete reporting. ToR B: Finalise analysis and complete reporting. ToR C: Update and finalise report. ToR D: Update and finalise report

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	Standard EG support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages currently.
Linkages to other committees or groups	There is a very close working relationship with MCWG, WGMBRED, WGCEAM and WGOWDF.
Linkages to other organizations	None currently.

Resolutions approved in 2019

Working Group on Introduction and Transfers of Marine Organisms (WGITMO)

2019/FT/HAPISG01 The **Working Group on Introductions and Transfers of Marine Organisms** (WGITMO), chaired by Cynthia McKenzie, 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	4–6 March	Gdynia, Poland		Joint meeting with WGBOSV and WGHABD
Year 2021	1–3 March	Online meeting		
Year 2022	4–6 May	Online meeting	Final report by 15 June to SCICOM	Meeting in association with WGBOSV

ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
a	Advance research, develop collaborations and address surveillance and knowledge gaps in issues related to the introduction and transfer of marine organisms, through annual reviews of national/international activities and responding to advice requests.	Data, information and knowledge collated and synthesised ensures timely update of AquaNIS as well as national and international databases as appropriate. This information will be used as an underlying information source for other ToRs, responding to incoming advice requests as well as organising collaboration with other international science organisations (e.g. PICES and CIESM).	2.1, 2.4, 3.3	3 years	Annual reports to ICES. Further develop and advance AquaNIS database, and populate it with new data. Respond to incoming advice requests as requested.
b	Evaluate the impact climate change may have on the introduction and spread of non-indigenous marine organisms, including Arctic environments.	This work will be carried out jointly with WGBOSV. Contributes to SICCME and ICES high-priority action areas 'Arctic research'.	2.5, 2.2, 3.6	3 years	Primary publication on the Arctic environment and the spread of non-indigenous species.
c	Investigate biofouling as a vector for the introduction and transfer of aquatic organisms on vessels and artificial hard structures, their pressure and impact on the ecosystem with a	Biofouling has been increasing recognized as an important vector in the introduction and transfer of aquatic organisms. Elements of this work will be carried out jointly with WGBOSV as a comparison vector in invasion pathways. Biofouling is an increasing	2.7, 2.1, 6.4	3 years	Input on the general applicability of preventive measures and selective mitigation technologies through a technical paper or manuscript submitted to a peer-reviewed scientific

	comparison of prevention or selective mitigation methodologies.	concern for aquaculture, energy installations, and coastal development as stressors on coastal environments.			journal. Input to IMO Biofouling guidelines.
d	Advance knowledge base to further develop indicators to evaluate the status and impact of non-indigenous species in marine environments	The aim is to develop a wider knowledge-base to more effectively address several legislative acts related to introductions of non-native species, such as EU IAS Regulation and EU MSFD (D2). Specifically, WGITMO aims to improve/develop metrics and critically evaluate the underlying uncertainties, including the on-going global trial of the Aquatic Species Invasiveness Screening Kit (AS-ISK) and a comparison of AS-ISK and the Canadian Marine Invasive Species Tool (CMIST).	2.2, 2.7, 6.1	3 years	At least one manuscript to be submitted to a peer-reviewed scientific journal.
e	Evaluate the development and utilization of DNA- and RNA-based molecular approaches to provide science-based tools for strategic planning, policy development, and operational processes regarding non-native species and biological invasions (including detection and monitoring, reconstruction of patterns and vectors of introduction and spread, assessment of establishment and impact risk, and application for invasive species control)	Molecular (DNA-based and RNA-based) approaches have been increasingly used in the past decades to uncover cryptic introduced species, understand underlying processes of population establishment and spread, and detect novel introductions and monitor existing ones. Recent innovations have increased the power of these approaches to understand invasion risk and offer possibilities for novel biotechnological solutions for control or eradication of invasive populations. With the advent of recent technologies, it is timely to assess and evaluate their potential applications as well as their limitations.	2.5, 1.6, 4.4	3 years	Input on the effective utilization of these methods for international and national policies and regulations through meeting participation, group correspondence, and/or development of technical reports or peer-reviewed papers.
f	Investigate the role of human-produced marine debris as a vector and facilitator for the introduction and spread of non-indigenous species (NIS). Advance research and identify knowledge gaps on marine debris-	The accumulation of debris in the ocean is severely affecting ocean and coastal ecosystems, as its ingestion and entanglement directly impacts marine organisms. Furthermore, recent research indicates that marine debris is both a growing vector for the	2.5, 2.6, 2.1	3 years	Review paper on NIS introduced to European waters via marine debris

	NIS interactions (eg. Marine debris as a facilitator for jellyfish blooms).	introduction of non-indigenous species (NIS), with transoceanic rafting already likely to intensify species invasions worldwide and a potential facilitator of marine diseases. Develop collaborations with other working groups (HELCOM-TGML; OSPAR ICG-ML, ICES-WGML, MSFD-ML; PICES; CIESM)			
g	Investigate best practices to minimize the role of aquaculture as a vector for the introduction and transfer of non-indigenous aquatic organisms. This would include both non-indigenous species targeted for aquaculture and hitchhikers (biofouling and interstitial, parasites and pathogens). Impacts of non-indigenous species on aquaculture and on ecosystems will be addressed.	Aquaculture has been recognized as an important vector in the introduction and transfer of aquatic organisms. ENSARS provided some baseline information on aquaculture risk analysis, including development and global testing of ENSARS' derivative, the AS-ISK. There are important social and economic impacts (positive and negative) of introductions related to aquaculture. Linkages with aquaculture working groups, and WGPDMO will be sought as well as a close collaboration with WGECON.	2.1,2.2, 5.6	3 years	Input on the general applicability of preventive measures (good practice codes) and selective mitigation technologies through technical guidance and/or a peer-reviewed paper.

Summary of the Work Plan

Year 1	Work on all ToRs with special focus on a, c, e, f, g
Year 2	Work on all ToRs with special focus on a, b, d, e, f
Year 3	Report on All ToRs

Supporting information

Priority	The work of the Group forms the scientific basis for essential advice related to the introduction and transfer of marine organisms, particularly non-indigenous species. 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 resources required to undertake additional activities in the framework of this group are negligible.
Participants	The Group is normally attended by some 40-50 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	The group will serve as primary respondents to incoming advice requests on various issues relating to introduction and transfer of marine organisms, including non-indigenous species.

Linkages to other committees or groups	There is a very close working relationship with the Working Group on Ballast Water and Other Ship Vectors (WGBOSV). In addition to relevance to the Working Group on Harmful Algal Bloom Dynamics (WGHABD), Biodiversity Science (WGBIODIV), and aquaculture focused working groups, WGITMO also contributes to Integrated Ecosystem Assessment EG's. Anticipate building linkages with the Working Group on Integrated Morphological and Molecular Techniques (WGIMT) during the next three years under these ToRs. Potential linkages with WGML, WGECON, WGPDMO.
Linkages to other organizations	PICES, CIESM, IMO, HELCOM, OSPAR

Working Group on Marine Planning and Coastal Zone Management (WGMPCZM)

2019/FT/HAPISG02 Working Group on Marine Planning and Coastal Zone Management (WGMPCZM), co-chaired by Andrea Morf, Sweden; and Catriona Nic Aonghusa, Ireland, 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	by corresp/ webex		physical meeting cancelled - remote work
Year 2021	19-23 April	Online meeting		
Year 2022	4–8 April	Online meeting	Final report by 1 June to SCICOM	

ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
a	Review and report on progress of marine planning (MSP) and coastal zone management (CZM) in ICES member statesand inform activities in other ToRs and working groups, especially in relation to the following key aspects: 1. Addressing conflicts and promoting synergies; 2. Treatment of	Many ICES countries' marine plans soon enter the implementation phase. Based on countries' global and regional commitments (e.g. Sustainable Development Goals, OSPAR, HELCOM, or the EU's Marine Spatial Planning Directive) both environmental, social and economic developments and their implications across the land sea interface in the	2.7, 4.3, **6.2**, **6.3,** 6.4, 6.6, 7.2, 7.3, **7.4**[1]	Years 1,2,3	"ICES WGMPCZM Ambassador" guest lecturing module for WG members (year 1). Report or manuscript on the changes in evidence needed and other R&D requirements arising as planning practice evolves (year 3).

[1] **Comment on science priorities:** WGMPCZM suggests that the **science priorities in bold are included in the database.** WGMPCZM is working in a very cross cutting way across many of the science priorities.

	culturally significant areas; 3. Development and use of decision support tools; 4. Monitoring and evaluation approaches.	seas need attention. Fast development of evidence, methods and practice is under way, but effective learning requires a systematic reflection and sharing across ICES countries and WGs. Science/ICES can facititate systematic reflection and enhance instituitonal learning. Several areas are presently of significance: 1. establishing effective, synergetic use of marine space and minimising conflicts, 2. Basic mapping and including of social and cultural dimensions, 3. Need for and occurring rapid development of decision support tools, 4. Driving ahead monitoring and evaluation of plans and planning.			
b	Define and report on the role of marine spatial planning (MSP) and coastal zone management (CZM) in facilitating marine and coastal ecosystem restoration.	Recognising biodiversity targets (SDG 14, CBD, Aichi agreement, etc.) and related concepts (natural capital, green infrastructure, habitat offsetting and managed realignment), MSP will become more important as a framework to deliver restoration and sustainable use.	6.1, **6.2**	Years 1,2,3	Workshop to review current problems of implementing restoration, relevant approaches & solutions and the (current and potential) roles of MSP/CZM (Y2) based on resolution to be formulated in Y1. Review paper and proposals for concepts and strategies (Y3).
c	Assess and provide	Climate change and	**1.1, 1.3, 1.9**[2]	Years 1,2,3	Workshop to define

[2] Results from many sub codes within **code 1** can relate to CC but code 1 includes little on policy implications and translation into policy. This ToR tries to link results from work (also in other groups, if appropriate) with spatial management.

	guidance on how climate change (CC) is considered and incorporated in marine planning (MSP) and coastal zone management (ICZM).	ocean acidification and their causes and effects include spatial dimensions in marine and coastal socio-ecological systems. Future CC-related impacts will require strategies and actions and related ICZM and MSP practice and method development will need to be pro-active.			best practice (Y2), based on stocktake report of relevant approaches and frameworks for CC in ICZM/MSP and a workshop resolution formulated in Y1. Guidance paper on how to improve current MSP/ICZM practice (Y3).
d	Review and report on transboundary issues and collaboration in planning, i.e the coastal zone, across sea basins and in areas beyond national jurisdiction, including the deep sea.	EEZ based MSP is under rapid development, but human activities, pressures and impacts cross jurisdictional (multi-level governance systems), sea basins and land-sea boundaries and need to be acknowledged and managed accordingly. The present, historically grown institutional systems, data collection and information flows are not necessarily suitable and need to be re-designed. Hence the on-going work to improe ocean governance from local to global level (e.g. UN BBNJ process.	**6.2, 6.3**	Years 1,2,3	Synthesis report with a stocktake of reviews and problem analyses relating to MSP/ICZM addressing land-sea interactions and transboundary issues in marine basins, also taking into account insights from work on other ToRs (e.g. a, c; Y 3).
e	Develop educational/training materials to promote understanding of marine spatial planning (MSP) and coastal zone management (ICZM)	Need for capacity development within ICES, science/practioners. Need to modernise marine graduate and postgraduate education	**6.3, 6.4, 7.4** [3]	Years 1,2,3	Joint work session on board game organised by NL gov/IOC-UNESCO (training for trainers) (Y 1). "WGMPCZM

[3] There is less in the science plan on capacity building & training & activities and developing ICES science policy interface, but to us this appears highly important. So, this ToR is less based on the science plan but on the ICES vision and mission:
Vision= Be world-leading marine science organization, meeting societal needs for impartial evidence on the state and sustainable use of our seas and oceans
Mission= Advance & share scientific understanding of marine ES & ESS they provide & use knowledge to generate state-of-the-art advice for meeting conservation, management, and sustainability goals

	processes: 1. Map and if possible address education and training needs for MSP. 2. Work with the ICES secretariate to develop and deliver training materials / courses as required. 3. Act as scientific steering group for the MSP Challenge serious game. 4. Promote MSP and ICZM processes as a platforms for enhancing Ocean Literacy within society.	and train current work force (authorities & consultancy). Low awareness and collaboration of dispersed, transitory initiatives (projects) but emerging courses on different levels. Need to network and create synergies across ICES countries and beyond, remaining country/region relevant. Building on earlier period's experiences with education and training develop relevant input to training (building on e.g. MSP Challenge).			ambassadors" Guest lecturing module for WG members (Y 2). Chapter for MSP Challenge handbook on ICES knowledge and experience (Y 3). Joint WK MSP Challenge simulation platform with NL gov/Buas (Y 3). Continue to provide training based on needs as identified by ICES secretariate as before.
f	Assess and report on the social impacts of marine spatial planning (MSP) and integrated coastal zone management (ICZM) on coastal communities, with a focus on social costs and benefits including effects on well-being and equality.	The relationship between MSP/ICZM and the social dimensions of sustainable development are still comparatively underrepresented in research. At the same time, MSP/ICZM is increasingly recognised as a tool for achieving the SDGs (Agenda 2030), in particular for enhancing the well-being of (coastal) communities. Both the spatial dimensions of C/MSP (e.g. identifying and managing culturally significant areas) and process-related dimensions (e.g. inclusiveness, enhancing social cohesion, gender equality etc.), as well as vulnerabilities and risk-based perspectives (e.g. risks to culturally significant areas) must be considered if MSP/ICZM practice is to maximise its potential as tool for	6.3, **7.1, 7.5, 7.6**	Years 1,2,3	A stocktake report on current marine plans and their links to community well-being and equality (Y 3). A workshop to explore the various dimensions of community well-being, equality, associated vulnerabilities, and the opportunities and constraints for MSP/ICZM in enhancing community well-being (Y 2). A guidance paper on how to improve current MSP/CZM practice (Y 3)

	achieving SD.

Summary of the Work Plan

Year 1	**ToR A: Develop "ICES WGMPCZM Ambassador" lecturing module for WG members and and inform activities in other ToRs and working groups on relevant developments.** **ToR C: Stocktake of frameworks and approaches to deal with CC in C/MSP.** ToR E: Joint work session on board game organised by NL gov/IOC-UNESCO (training for trainers) ToR E: Provide training based on needs as identified by ICES secr. ToR F: Stocktake report on current marine plans and their links to community well-being and equality.
Year 2	ToR B: Review of current problems for implementation of restoration, approaches & solutions and the current/potential role of MSP/CZM through a workshop. ToR C: Workshop to define best practice in relation to how MSP/ICZM deals with CC. ToR E: "WGMPCZM MSP Challenge ambassadors" Guest lecturing module for WG members; ToR E: Chapter for MSP Challenge handbook on ICES knowledge and experience; ToR E: Joint WK MSP Challenge simulation platform with NL gov/Buas. ToR E: Provide training based on needs as identified by ICES secr. ToR F: Workshop to explore the various dimensions of community well-being, equality, associated vulnerabilities, and the opportunities and constraints for MSP/ICZM in enhancing community well-being (year 2).
Year 3	ToR A: Report or manuscript on the changes in evidence needed and other R&D requirements arising as planning practice evolves. ToR b: Review paper and proposals for concepts and strategies for ecosystem restoration through MSP/ICZM. ToR C: A guidance paper on how to improve current MSP/ICZM practice in relation to CC. ToR D: Synthesis report with a stocktake of reviews and problem analyses relating to MSP/ICZM addressing land-sea interactions and transboundary issues in marine basins, also taking into account insights from work from other ToRs (e.g. a, c). ToR E: Provide training based on needs as identified by ICES secrrtariat ToR F: Guidance paper on how to improve current MSP/CZM practice.

Supporting information

Priority	WGMPCZM activities cover many priorty areas within the ICES science plan and should therefore be of high to very high priority. The current activities of WGMPCZM are urgent in terms of a rapidly developing practice of MSP/ICZM and marine and coastal problems to address (Climate change, habitat loss, pressure on deep sea areas, current rapid devleopment of marine and coastal management institutions and related need for capacity development and institutional learning). The first three topics are included in the ICES science plan, but often lacking links to relevant R&D and capacity development in planning and management. We see important links to ICES initiatives and working groups working with CC, integrated ecosystem assessments, social dimensions, marine uses and pressures and would like to develop these. Here, it is also important, that this group is still rather unique within ICES as one one with a highly interactive science policy interface – ascertained through the

	composition of the group, including both researchers, planners and policy experts from various disciplines and fields of practice.
Resource requirement	The research programmes which provide the main input to this group are already underway, and resources are committed, so the additional resource required to undertake additional activities in the framework of this group is negligible. Here, we just list a number of relevant projects and initiatives for different ToRs. For ToR A, relevant projects include the BONUS projects BASMATI, the EU-EASME financed project Pan Baltic Scope and the NorthSEE project, the INTERREG CB project Plan4Blue INTERREG BSR project Baltic Rim, the Estonia-Russia programme 2014-2020 project ADRIENNE; as well as involvement of group members in the EU MSP Platform. There is also ongoing work on country MSP plans, plus increasing attention on evaluating existing plans in the course of their first revision. ToR B can profit from countries' activities related to implementation of SDG 14 and ecosystem based MSP and work with protected area networks in both the HELCOM and the OSPAR areas (including Ireland, Canada) and the Estonia-Russia programme 2014-2020 project ADRIENNE, ToR C can build on activities carried out by the LandtoSea project at HZG, as well as the ongoing relevance of climate-proofing MSP plans and studies carried out in various contexts. ToR D can profit from other ToR work and group members' involvement in the global IOC UNESCO MSP initiative. ToR E is linked to the continued activites around the development and testing of present and new versions of the MSP Challenge Serious Game (by its developers), and a ERASMUS university collaboration on teaching and training in MSP and ICES training. ToR F will mainly draw on the Land-to-Sea, SeaUseTip and CoastWise projects at HZG which collectively are dealing with ecosystem services, culturally significant areas, community benefits and social-cultural tipping points.
Participants	Group activities are normally attended by some 15–25 members and guests (out of ca 60 appointed and chair-invited members).
Secretariat facilities	Depending on ToR and whether meetings occur in Copenhagen we need to rely on the secretariate.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages at present (related to on-going tasks), but there is a potential to develop advice on MSP and ICZM – if requested by someone and fitting the group's ToRs, competence profile and if relevant experts are available.
Linkages to other committees or groups	There is a need for working relationships with other groups, both as needs arise, but also more continuously. This includes not the least SIHD and WG SOCIAL and groups within HAPISG dealing with societal aspects and human activities in the sea, but also groups working on habitats (Tor b), integrated ecosystem assessments and on climate change (ToRc). There is also a proposal for a new spin-off group on cumulative impact assessment, which WGMPCZM wants to keep close contact with.
Linkages to other organisations	The WGMPCZM members have many linkages to relevant institutes, networks and organisations both from research and practice different group members are part of / have close contacts with through collaborations, research and consultancy (here just a few examples): - Research and analysis institutes: Helmholtz Zentrum Geesthacht, Marine Scotland, Marine Institute Galway, Nordregio, Swedish Institute for the Marine Environment, SYKE (Finland) - Research networks: the MSP Research Network, and the Marine Social Sciences Network.

	- Expert groups: the HELCOM VASAB MSP expert group, the EU MSP expert group, the IOC-UNESCO MSP initiative and expert group - National planning authorities from different ICES member countries (see nominated group members) and relevant working groups in the Nordic Council of Ministers.

Working Group on Offshore Wind Development and Fisheries (WGOWDF)

2019/FT/HAPISG06 A **Working Group on Offshore Wind Development and Fisheries** (WGOWDF), co-chaired by Andy Lipsky, USA; Andrew Gill, UK; and Antje Gimpel, Germany, will be established 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 2020	27–29 April	by corresp/ webex		physical meeting cancelled - remote work
Year 2021	9–11 June; 15–16 June	Online meeting		
Year 2022	13–16 June	Online meeting	Final report by 15 August to SCICOM	

ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
a	Review and report on fishing industry interactions with offshore wind development and document lessons learned including effects on the distribution of fishing operations	Europe has been operating offshore wind energy facilities for 20 years. North America is on the verge of large-scale development. The European experience can be used to document the effects of offshore development on fishery operations, fishing communities, and fishery economics. While there are distinct differences in the scale and scope of fisheries between the North American and European wind development areas; there is also the opportunity to identify common issues and promote research to address these issues.	2.2, 2.3, 2.7	2 years	Review paper

b	Develop and report on methodologies to assess impacts on fishery resource data collections.	Offshore wind energy development necessitates changes in fishery-independent survey operations and potentially fishery-dependent data collection. Wind energy development also transforms habitats, thus affecting the distribution and abundance of fish and shellfish populations. Both statistical survey design and survey techniques need to be adapted and/or developed. In addition, modeling approaches need to be developed to understand the impacts of wind development and forecast possible future conditions.	2.2, 2.3, 2.7	3 years	Method development papers
c	Consider and report on effects of habitat alteration by offshore wind development on fisheries. This consideration should include anticipated changes to the benthic habitats, potential for invasive species, vertical and horizontal movement of water, sediment suspension, and water column changes.	Construction, operation, and decommissioning of offshore wind energy developments will affect marine habitats. These activities include seafloor and water column disturbance, ocean noise, electromagnetic signals, and habitat transformation. The various activities will be documented and methodologies for study identified. Potential effects will also be documented on the range of marine organisms with particular emphasis to species that are the target of commercial and / or recreational fisheries.	2.2, 2.3, 2.7	3 years	Review paper Recommendations of additional studies linked to other WGs
d	Review ICES expertise and identify gaps and opportunities relative to renewable energy and marine ecosystems and	The goal of WGOWDEF is to complement the activities of WGMBRED and WGMRE with a focus on fisheries	6.6	Year 3	Report to ICES

sustainability	interactions. The development and activities of the WG will be coordinated with these other two WG. The WG will also evaluate other ICES actvities and coordinate with relevant groups.

Summary of the Work Plan

Year 1	The WG will meet and exchange ideas on ToR a, b, c. The WG will then develop a plan as to how to address ToR a, b, c in the 3 year time frame. The initial review paper will be planned and worked on during Year 1, both at the inaugral workshop and intersessionally. The WG Chairs will interact with the Chairs of WGMBRED and WGMRE to ensure activities are complementary.
Year 2	The WG will make progress on the all review papers and will plan workshops related to each of ToR a, b, and c. The first workshop will present the draft review for ToR a and work up the final paper. The ToR b and c workshops will be structured to gather the information needed for both the other papers, namely the methodologies and the effects. The WG Chairs will interact with the Chairs of WGMBRED and WGMRE to ensure activities are complementary.
Year 3	The WG will complete the ToR b and c review papers and submit for publication. The WG will also discuss next steps for the WG. The WG will complete review of ICES expertise related to renewable energy and marine ecosystems and sustainability working with WGMBRED and WGMRE. A report will be produced for ICES.

Supporting information

Priority	Offshore wind energy development continues in Europe and is beginning in earnest in North America. Sustainable fisheries are critical to global food security and renewable energy is critical to energy security and climate change mitigation. Coexistence requires an understanding of the interactions between offshore wind energy development and fishing. This understanding can be used to foster the exchange of information, collaboration in addressing science questions, and support decision-making. Consequently, these activities are considered to have a very high priority across the ICES area especially as wind energy development continues.
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 will be attended by some 30–40 members and guests..
Secretariat facilities	WebEx support for remote participating
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages but developing the expertise could link to ACOM in the future.
Linkages to other committees or groups	There is potential for a very close working relationship WGMBRED and WGMRE as well as communication with WKUSER. Also the WGSFD (Spatial Fisheries Data)

Linkages to other organizations	There are linkages to fishing organizations and wind developers in the USA and similar linkages in Europe, including wider links to licencing/permitting authorities and other relevant stakeholders.

Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT)

2019/FT/HAPISG09 Working Group on the Effects of Extraction of Marine Sediments on the Ecosystem (WGEXT), chaired by Keith Cooper, UK, 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	27–30 April	by corresp/ webex		physical meeting cancelled - remote work
Year 2021	27 April; 10 May	Online meeting		
Year 2022	26–28 April	Online meeting	Final report by 15 June to SCICOM	

ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
A1	Review data on marine extraction activities and provide a summary on marine extraction for the OSPAR region to OSPAR	a) OSPAR requirements b) Advisory requirements	2.1, 6.4	Year 1, 2, 3	Annual extracted amounts and areas as a chapter in all Interim and Final Reports
A2	Review of developments in marine sediment resource mapping, legal regime and policy, environmental impact assessment, research and monitoring	a) Advisory requirements b) Inform other counties (ICES, EU) to optimize their policy and management	2.1, 6.4	Year 3	Chapter in Final Report
B	Finalize an ICES aggregate database comprising data on marine extraction activities	a) Advisory requirements b) Cooperation with ICES Data Centre	2.1, 6.4	Year 1,2,3	Year 1: finalize template Year 2: incorporate historical data in ICES database Year 3: streamline the dataflow from ICES countries to database

C	Update ICES Guideline for Management of Marine Sediment Extraction	a) Advisory requirements b) Inform other countries (ICES, EU) to optimize their policy and management	2.1, 6.4	Year 1,2,3	Year 1: review the Guidelines Year 2: formulate revised guidelines Year 3: revised guidelines accepted by OSPAR
D	Ensure outputs of the WGEXT are accessible by publishing as a group	a) Inform other countries (ICES, EU) to optimize their policy and management b) Contribute to the visibility and impact of ICES	2.1, 6.4	ongoing	Publish results of the WG on intensity of extraction, on MSFD and on cumulative impacts as journal papers. Distribute Annual Reports to networks outside ICES
E	Include marine sediment extraction in cumulative impact assessment	Contribute and working together with other ICES and OSPAR WGs that are involved in this subject.	2.1, 2.2	Year 1,3	Year 1: intensify the contacts with other WGs in OSPAR and ICES. Year 3: define in cooperation with other WGs a Best Practise to include marine extraction in cumulative inpact assesments.
F	Review developments with implications for the management and the effects of marine sediment extraction.	a) Advisory requirements b) Contribute to the update of the ICES guidelines	2.7, 6.4	Year 3	Chapter in Final Report

Summary of the Work Plan

Year 1	The data on marine extraction are published each year and send to OSPAR (ToR A1). To put the data in the ICES data base a template will be finalized (ToR B). The inventory for revised ICES Guidelines is ready (ToR C). A theme session on extraction will be held at ASC 2020 and the essay on dredging intensity will be submitted to a journal (ToR D). Contacts with other ICES and OSPAR WGs on cumulative effects will be established (ToR E).
Year 2	The data on marine extraction are published each year and send to OSPAR (ToR A1). The historical data (1986-2018) will be put in the ICES data base (ToR B). The text for the actualization of the ICES Guidelines will be ready (ToR C). The review on Extraction and MSFD and the review on Cumulation of Effects will be submitted to a journal (ToR D)

Year 3	The data on marine extraction are published each year and send to OSPAR (ToR A1). A review of developments in marine sediment extraction in the ICES countries will be published in the Final Report (ToR A2).The gathering of extraction data will find its way to the ICES data base (ToR B). The revised ICES Guidelines will be accepted by ICES and OSPAR (ToR C and F). An overview of ToR A1 and A2 will be submitted to a journal (ToR D and F). Together with other ICES an OSPAR WGs a Best Practise to include marine extraction in cumulative impacts assessments will be formulated (ToR E).

Supporting information

Priority	The activities of WGEXT will lead into issues related to the effects on the ecosystem of marine sediment extraction. Sediment extraction is increasing in some countries and rather stable in others. This human activity is connected to several descriptors in the EU MSFD. The report of WGEXT and the ICES Guidelines are used in the management of extraction in the member countries. Consequently, the activities of WGEXT are considered to have a high priority.
Resource requirements	The activities of WGEXT are focussed on the use of existing research programmes (e.g. EIA monitoring) and data on marine extraction and management. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Annual Meeting of WGEXT is normally attended by some 12-20 members and guests. Besides that several members contribute by correspondence.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	ACOM
Linkages to other committees or groups	There is a direct linkage to the ICES Data Centre and a potential working relationship with WGs in SCICOM and OSPAR who are involved in cumulative effects and spatial planning.
Linkages to other organizations	Data on marine extraction are delivered to OSPAR.

Stock Identification Methods Working Group (SIMWG)

2019/FT/HAPISG10 The **Stock Identification Methods Working Group** (SIMWG), chaired by Christoph Stransky, 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 2020	By correspondence			
Year 2021	17 June & by correspondence	Online meeting		
Year 2022	14–16 June	Reykjavik, Iceland	Final report by 1 August to SCICOM	

ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
a	Review recent advances in stock identification methods	a) Tracks best practices in stock ID b) Promotes new technologies Relevant to all ICES species	1.4, 5.1, 5.2	3 years (and continued)	EG report
b	Provide technical reviews and expert opinions on matters of stock identification, as requested by specific Working Groups and SCICOM	a) Contributes to understanding of structure and connectivity of fish populations/stocks b) Highly relevant to assessment and management	1.4, 5.1, 5.2	3 years (and continued)	EG report and updated table of species reviews
c	Review and report on advances in mixed stock analysis, and assess their potential role in improving precision of stock assessment	Relevant to resolving mixed stock composition issues in assessment and management.	1.4, 5.2, 5.4	3 years	EG report and contribution to ICES ASC; methodological paper in international journal
d	Provide a review of recent studies (Aguirre-Saraiba et al., 2021, and Abad et al., 2021 in WGBIE 2021 report) with regards to the stocks' population structure of the northern and southern white anglerfish and hake species in the northern (areas 3a46), north-southern (areas 78abd) and south-southern (areas 8c9a) shelves to validate and improve the current ICES definitions for these stocks and propose revisions, if necessary, based on the new findings.	Request from the Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE).	1.8	1 year	Chapter in EG report

Summary of the Work Plan

Year 1	Address terms of reference through work by correspondence in 2020

Year 2	Organise a physical meeting for SIMWG for summer 2021.
Year 3	Address terms of reference through work by correspondence in 2022

Supporting information

Priority	Understanding stock structure is a fundamental requirement before any assessment or modelling on a stock level can be contemplated. SIMWG liaises with ICES expert groups and working groups on stock identification issues and continues to review new methods as they develop
Resource requirements	SharePoint website and clear feedback from expert groups.
Participants	The Group is normally attended by some 10–15 members and guests.
Secretariat facilities	Standard support
Financial	None
Linkages to ACOM and groups under ACOM	ACOM
Linkages to other committees or groups	SIMWG has recently worked closely with a range of ICES working groups including WGWIDE, WGBIE, WGHANSA, and NWWG; benchmark workshops including WKPLE and WKHAD, and advice drafting groups such as ADGDEEP, and in previous years SIWMG connected with many more ICES groups to fulfill requests.
Linkages to other organizations	There are no obvious direct linkages, beyond the SIMWG members' affiliation and commitment to their own employers.

EGs DISSOLVED in 2021

WKTBIMP	Workshop on Transboundary issues in Marine Spatial Planning
WKTRADE3	A series of two Workshops to develop a suite of management options to reduce the impacts of bottom fishing on seabed habitats and undertake analysis of the trade-offs between overall benefit to seabed habitats and loss of fisheries revenue/contribution margin for these options
WKPHM	Workshop on the Use of Predictive Habitat Models in ICES Advice
WKTOPS	ICES/IUCN-CEM FEG Workshop on Testing OECM Practices and Strategies
WKSEIOWFC	Workshop on the Socio-economic implications of offshore wind on Fishing Communities
WKMOMA	Workshop on estimation of MOrtality of Marine MAmmals due to Bycatch
WKSSFGEO	Workshop on Geo-Spatial Data for Small-Scale Fisheries

WKNCCFFA	Joint ICES/ NMTT Workshop exploring the establishment of a Nordic Climate Change Forum for Fisheries and Aquaculture
WGMS (merged with MCWG)	Working Group on Marine Sediments in Relation to Pollution