

Human Activities, Pressures and Impacts Steering Group EGs Resolutions

Human Activities, Pressures and Impacts Steering Group EGs Resolutions	i
Resolutions approved in 2022	1
Working Group on Bycatch of Protected Species (WGBYC)	1
ICES/NAFO Joint Working Group on Deep-water Ecology (WGDEC)	2
Working Group on the Ecosystem Effects of Fishing Activities (WGECO)	4
Working Group on Introduction and Transfers of Marine Organisms (WGITMO)	5
Working Group on Marine Planning and Coastal Zone Management (WGMP CZM)	10
Working Group on Offshore Wind Development and Fisheries (WGOWDF)	15
Stock Identification Methods Working Group (SIMWG)	18
Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT)	19
Workshop on the revision of the DOME litter data format (WKLIDA)	21
Workshop on Small Scale Fisheries and Geo-Spatial Data 2 (WKSSFGE02)	23
Workshop on a Research Roadmap for Offshore and Marine Renewable Energy (WKOMRE)	25
Workshop on sea Bird Bycatch monitoring in the NEAFC Regulatory Area (WKBB)	26
Workshop on Implementing Stakeholder Engagement Strategy (WKSTIMP)	28
Workshop to Evaluate Long-term Biodiversity/ Ecosystem Benefits of NEAFC closed and restricted areas (WKECOVME)	30

Workshop on Trade-offs between the Impact of Fisheries on Seafloor Habitats and their Landings and Economic Performance (WKTRADE4)	31
Workshop on Stakeholder Input to Refine the Basis of Trade-off Assessments between the Impact of Fisheries on Sea-floor Habitats and their Landings and Economic Performance (WKD6STAKE)	34
Joint ICES/ NMTT Nordic Climate Change Forum for Fisheries and Aquaculture workshop 2 (WKNCCFFA2)	36
Resolutions approved in 2021	38
Working Group on Marine Litter (WGML)	38
Working Group on Marine Benthal and Renewable Energy Developments (WGMBRED)	41
ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV)	45
Working Group on Biological Effect of Contaminants (WGBEC)	47
Marine Chemistry Working Group (MCWG)	51
Working Group on the Value of coastal Habitat for Exploited Species (WGVHES)	55
Methods Working Group (MGWG)	57
Working Group on Multispecies Assessment Methods (WGSAM)	60
Working Group on Shipping Impacts in the Marine Environment (WGSHP)	63
Working Group on Spatial Fisheries Data (WGSFD)	65
Working Group on Cumulative Effects Assessment Approaches in Management (WGCEAM)	71
Working Group on Marine Protected Areas and other Spatial Conservation Measures (WGMPAS)	72
Workshop on Climate Change Considerations in Marine Spatial Planning (WKCCCMSP)	75
Resolutions approved in 2020	77

Working Group on Economics (WGECON)	77
Working Group on the History of Fish and Fisheries (WGHIST)	80
Working Group on Marine Habitat Mapping (WGMHM)	83
Working Group on Fisheries Benthic Impact and Trade- offs (WGFBIT)	86
Working Group on Offshore Renewable Energy (WGORE)	91
EGs DISSOLVED in 2022	93

Resolutions approved in 2022

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.

2022/OT/HAPISG01 The **Working Group on Bycatch of protected species (WGBYC)**, chaired by Allen Kingston, UK, and Guðjón Már Sigurðsson, Iceland, will meet at AZTI, Sukarrieta, Spain, on 18-22 September 2023 to:

- a) Review and summarize information submitted through the annual bycatch data call and other means for assessment of protected/sensitive species bycatch;
- b) Collate and review information from WGFTB national reports, other ICES WGs and recent published documents relating to implementation of protected/sensitive species bycatch mitigation measures and summarize recent and ongoing bycatch mitigation trials;
- c) Consider the quality of data available for use in the estimation of bycatch rates of protected species through a Bycatch Evaluation and Assessment Matrix, BEAM, to underpin assessments on the bycatch range (minimum/maximum) as appropriate, and where possible, to identify likely conservation level threats;
- d) For high priority species, for which the bycatch rates and associated markers of sustainability are unavailable, highlight the types of fishing gears and fishing activities which pose the greatest risk to these species;
- e) Review ongoing monitoring of different taxonomic groups in relation to spatial bycatch risk and fishing effort to inform coordinated sampling plans;
- f) 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 as outlined in the ICES Roadmap for bycatch advice on protected, endangered and threatened species ¹ (Intersessional);
- g) Continue, in cooperation with the ICES Data Centre to develop, improve, populate and maintain the WGBYC and RDBES databases on bycatch monitoring and fishing effort in ICES and Mediterranean waters through formal data calls (Intersessional).
- h) Produce first drafts of the advice for the i) recurrent advice request from the European Commission, and ii) relevant ICES Fisheries Overviews (Intersessional).

WGBYC will report by 25 October 2023 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.
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¹https://ices-library.figshare.com/articles/report/ICES_Roadmap_for_bycatch_advice_on_protected_endangered_and_threatened_species/19657167

	The activities of the WG are essential to use in answering part of the European Commission annual request for advice on estimates of the annual total numbers of specimens of sensitive species taken as bycatch.
Scientific justification	ToRs a-f) Bycatch monitoring and assessment is fundamental to the work of the expert group and forms the basis to answer the recurrent advice request from the European Commission. Recent changes in legislation have resulted in prioritization of sensitive species and also impacted monitoring programs for PETS bycatch, which both require the regular evaluation of input data and resulting bycatch assessments; ToR g) Operational databases allow for more efficient response to future advice requests and an audit trail for information used in the Group's reports. By remaining intersessional, it will increase efficiency for WGBYC; ToR h) Operational input is required to consolidate the existing advice templates as new information and methodologies become available.
Resource requirements	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, WGHARP, WGCEAM, WGFTFB, HAPISG, WKPETSAMP2, WKPETSAMP3, WKBB, SCICOM
Linkages to other organizations	NAMMCO, ASCOBANS, ACCOBAMS, GFCM, OSPAR, HELCOM, RCGs, IWC

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.

2022/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 online, 24– 26 May 2023 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) Provide and apply a mechanism to identifying a level of change/new VME submissions that should trigger an update of the EU VME advice to ensure the VMEs conservation objective is consistently achieved.

WGDEC will report by 24 June 2023 for the attention of the ACOM and SCICOM Committee.

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	<p>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 2023, facilitated by the ICES Data Centre. Data will be quality checked/prepared at least one month in advance of WGDEC 2023 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.</p> <p>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.</p> <p>ToR [c] This information will be used by ACOM to judge if and when the re-current EU VME advice “Advice on areas where Vulnerable Marine Ecosystems (VMEs) are known to occur or are likely to occur in EU waters” as described in the MoU with DGMARE should be re-issued.</p>
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. Specific ToRs from WGDEC provide information for the Advice Committee to respond to specific requests from clients.
Linkages to other committees or groups	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, 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.

2022/OT/HAPISG03 The **Working Group of the Ecosystem Effects of Fishing Activities (WGECO)**, chaired by Tobias van Kooten, NL; and Brian Smith, USA; will meet in Galway, Ireland, 11–18 April 2023 to:

- a) Investigate the ecological consequences of stock rebuilding, with particular emphasis on benthivorous fish and invertebrates.
 - i. Make first-order estimates of predation pressure on benthos;
 - i. Examine evidence of food limitation and density-dependent growth;
 - ii. Compare the footprints of trawling to the footprints of predation pressure on benthos. ([Science Plan codes](#): 1.4, 2.1, 2.2)
- b) As potential input for the Ecosystem overviews, WGECO will develop and test spatial distribution indicators for survey data (fish and benthos) across ICES ecoregions and analyse trends in these indicators in relation to climate change, abundance change and large-scale fisheries closures. WGECO will focus on high-priority but under-developed indicators, as found from ToR c). ([Science Plan codes](#): 1.5, 2.2, 6.5)
- c) Prioritize indicators (one or more than one) from a set of indicators from current and earlier work by WGECO or its participants (including particularly those from ToR d of WGECO 2018), which meet existing quality criteria, can be estimated on a routine basis and are applicable across several ecoregions. For each prioritized indicator, supply a short explanatory text for justification of the prioritization, identify the required steps to operationalize their use in the ICES fisheries and/or ecosystem overviews, and outline how WGECO or ICES can support their implementation over the next three years. ([Science Plan codes](#): 4.1, 6.5, 6.6)

WGECO will report by 5 May 2023 (via HAPISG) for the attention of ACOM and SCICOM.

Supporting information

Priority	<p>The current activities of this Group will enable ICES to respond to advice requests from member countries. Consequently these activities are considered to have a very high priority.</p> <p>It will also lead ICES into issues related to the ecosystem affects of fisheries, especially with regard to the application of the Precautionary Approach. Consequently, these activities are considered to have a very high priority.</p>
Scientific justification	<p>Term of Reference a)</p> <p>Many stocks are rebuilding and will likely have higher abundance and biomass than we have seen in recent times. This in turn will likely have effects through trophic interactions both up and down the foodweb. At ICES, WGECO and WGSAM have been tasked previously with similar ToRs. WGECO will investigate the potential consequences of stock recovery of benthivorous fish and invertebrates, their ensuing risks for fish stock management and the use of MSFD indicators. It is hypothesized that a large increase in benthivorous fish will have an impact on benthic productivity and biodiversity. This ToR requires data on the spatial distribution of benthivorous predators, their prey consumption rates and diet composition. It also requires data on the abundance and production of benthic faunal.</p>

	<p>Term of Reference b)</p> <p>WGECO has traditionally had a leading role in developing and testing indicators, and their use for provision of advice. The work of this ToR facilitates operationalization of these indicators, by identifying data sources, refining, evaluating their strengths and weaknesses and gaps in indicator availability. Indicators that are evaluated to be promising will be applied to fish and benthic invertebrates species in the ICES region.</p> <p>Term of Reference c)</p> <p>WGECO has over consecutive years (e.g. 2016, 2017 and 2018) proposed and reviewed indicators. For ICES producing a set of quantitative indicators linked to existing data, that can be estimated on a routine basis and are applicable across several ecoregions is of high priority. Given the overarching role of the group, WGECO is in a good position to provide steer in term of a priority set of indicators using criteria (see e.g. Rice and Rochet 2005 or WGBIODIV 2015 on OSPAR indicators). This ToR also offers WGECO or ICES the opportunity to work in a structured fashion over a 3 year period towards operationalizing a set of prioritized indicators for use in ICES advice products, namely for the ICES fisheries and/or ecosystem overviews.</p>
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 20–25 members and guests.
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to advisory committees	There are no current direct linkages with the advisory committees.
Linkages to other committees or groups	There is a very close working relationship with the groups of the Fisheries Technology Committee, JWGBIRD, BEWG, WGBIODIV, WGBYC, WGFBIT, WGDEC and WGSAM.
Linkages to other organizations	OSPAR, HELCOM

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

2022/FT/HAPISG04 The Working Group on Introductions and Transfers of Marine Organisms (WGITMO), chaired by João Canning-Clode*, Portugal, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2023	6–8 March	Athens, Greece		Meeting in association with WGBOSV
Year 2024				
Year 2025			Final report by 15 June to SCICOM	

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, CIESM, HELCOM).	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.	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 nonindigenous 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 comparison of prevention or selective mitigation methodologies.	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 concern for aquaculture, energy installations, and coastal development as stressors on coastal environments. Issues include (1) the regular cleaning process and how to avoid unintentional dropping scraped off material during in-water	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 journal also addressing the issues described under "Background". In preparation of this paper input from Australia and New Zealand is sought as key players in this field with long-lasting experience.

		cleaning activities, (2) can uncontrolled robots conduct regular cleaning or is always a remote controller needed?			
d	Expand knowledge base and develop further the use of decision-support tools to communicate to decision-makers and stakeholders, non-indigenous species risks and impacts in marine and transitional waters.	The aim is to develop further and apply more widely risk-screening tools (i.e. AS-ISK and CMIST) to permit their comparison and cross-calibration of screening outcomes in order to enhance their accuracy for identifying aquatic invaders and knowledge gaps, under both current and future climate conditions, so to inform legislation-related policy and management decisions in Europe (Regulations on the use of aliens in aquaculture, 2007, and managing IAS, 2014; also EU Directives, MSFD, WFD) and North America (e.g. watch-lists in Canada). This may be particularly useful for risk assessments and early warning systems.	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	Molecular (DNA -based and RNA -based) approaches have been increasingly used in the past decade 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	2.5, 1.6, 4.4	3 years	Input on the effective utilization of these methods for international and national policies and regulations. Specifically: 1) Development of guidance on future implementation of molecular tools, based on outcome of workshop to be held jointly with the International Conference on Marine Bioinvasions in 2023. 2) Peer-reviewed manuscript providing update on the state of the science and the integration of molecular methods in management contexts. 3) Summary from

	impact risk, and application for invasive species control)	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, including for early warning systems. This is a shared ToR with WGBOSV.			WGITMO/WBOSV members of existing projects employing molecular tools, specific needs of member states that might be addressed with these tools, and status of incorporation into formal decision-making and management.
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-NIS interactions	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 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)	2.5, 2.6, 2.1	3 years	At least one peer-review article on NIS introduced on marine debris with an emphasis on European waters; Draft protocol on opportunistic sampling NIS on marine debris; Develop an online database of NIS present in marine debris
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	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	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 review paper. A joint submission of manuscripts to a peer-reviewed scientific journal.

non-indigenous species on aquaculture and on ecosystems will be addressed	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.
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Summary of the Work Plan

Year 1	Work on all ToRs with special focus on e, f, g
Year 2	Work on all ToRs with special focus on b, c, f, g
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	Standard EG support.
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 nonindigenous 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 (WGABD), Biodiversity Science (WGBIODIV), and aquaculture focused working groups. WGITMO also contributes to EO concerning NIS issues and impacts. Anticipate building linkages with the Working Group on Integrated Morphological and Molecular Techniques (WGIMT) and Working Group on Marine Litter (WGML) during the next three years under these ToRs. Potential linkages with WGECON, WGPDMO.
Linkages to other organizations	ICES, CIESM, IMO, HELCOM, OSPAR

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

2022/FT/HAPISG05 The Working Group on Marine Planning and Coastal Zone Management (WGMPCZM), chaired by Andrea Morf, Sweden; and Caitriona Nic Aonghusa, Ireland; and Talya ten Brink*, USA; will work on the following ToRs and generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2023	27–31 March	Blanes, Spain		
Year 2024				Change in Chair: Outgoing: Andrea Morf, Sweden
Year 2025			Final report by September 2025 to SCICOM	

ToR descriptors

ToR	Description	Background	Science Plan Codes	Duration	Expected Deliverables
a	Review and report on progress of marine spatial planning (MSP) and coastal zone management (CZM) in ICES member states. This ToR will inform activities in other ToRs and following relevant developments in other ICES expert groups with special attention to recognised key themes.	Marine and coastal plans are being implemented and revised in many countries. This presents opportunities to learn from planning processes, as well as new trends and policy objectives in coastal and marine use. This ToR facilitates systematic reflection to develop understanding and institutional learning. It explores how different nations have progressed and managed their marine planning. The WG will share challenges and best practices. This ToR provides basic information and overviews supporting in-depth analysis in other ToRs. Current key themes include: 1. Use trends and key spatial demands, conflicts, coexistence and synergies; 2. Process management, implementation, monitoring & evaluation; 3. Stake-/rightsholder involvement; 4. Use of various types of information, under-represented types of data (e.g. social), decision support tools; 5. Transboundary issues including	2.7, 6.2, 6.3, 6.6, 7.3, 7.4,	3 years	Y 1: Country update template for an annually updated baseline to inform other ToRs. Y 2: Streamlined template to follow identified key developments. Y 3: Policy brief describing key developments and trends in MSP.

		the application of the ecosystem approach.		
b	Incorporating marine conservation and restoration needs into MSP by exploring if and how MSP can be used to deliver better protection and coexistence of protection and restoration areas with other activities.	On-going biodiversity loss and ecosystem degradation are key challenges, both globally and at regional/local levels. There are various approaches to develop marine conservation and restoring and enhancing ecosystem functions. Principal among these is the aspiration to increase MPA coverage to 30% by 2030. However, institutional and management gaps in many countries make it difficult to efficiently address this. Not least marine planning law is only loosely connected to conservation planning and management. There is a need to identify institutional and structural issues associated with conservation and planning nationally and internationally, including gaps and linkages to EU, regional and global policies.	6.1, 6.2, 6.3, 6.4 3 years	Y1: Document analysis (and if necessary expert workshop) to review a) current conservation/restoration planning requirements, b) the needs to scale up pilot efforts, and a stocktake of c) the current state of play and how MSP and conservation/restoration are addressed. Y2: Expert workshop to identify legislative and implementation barriers preventing the optimal use of MSP to support conservation and restoration goals. Y3: Report or scientific discussion paper with recommendations as to how MSP can better support conservation and restoration goals.
c	Supporting the development of climate-smart MSP by: a) improving the understanding of the impacts of climate change on the development and implementation of MSP and of the alignment between climate- and MSP-policies. b) exploring how MSP can be used as a mechanism to implement climate action, supporting climate change adaptation and mitigation.	Climate Change (CC) pressures cause changes to the spatial distribution of marine biodiversity which, in turn, impacts on coastal and marine human activities. Marine spatial plans now generally acknowledge this though dedicated policies. There is a need to analyse how CC impacts MSP and how well relevant policies are aligned and to explore concretely how MSP can promote CC adaptation and mitigation. Some of the known issues relate to (i) the land-sea boundary; (ii) how to address differing time scales between policy and user needs; (iii) how to support truly adaptive, flexible MSP and management that can incorporate change; (iv) the need to provide solutions, from plan to implementation; and (v) coexistence and offshore wind as a mitigating solution.	1.1, 1.3, 1.9 3 years	Y1: ICES/PICES Symposium session on MSP addressing CC (Bergen, April 2023); expert workshop (WKCCCMSP) to assess the current status and inform the next steps; scientific paper based on the results. Y1/Y2: Improved understanding of how CC is addressed in the implementation of marine plans globally. Y:3 Framework to inform the implementation of climate smart plans.
d	Identifying spatial planning requirements	In light of energy security, offshore wind is causing major	2.7, 6.2, 6.3, 7.3, 7.4, 7.6 3 years	Y1-2: Collect and analyse current status of offshore wind and

	<p>changes in how many ICES Member States are using their seas. Areas such as the North Sea are turning rapidly into energy powerhouses to meet renewable energy targets. Besides electricity, the production of hydrogen for industrial use is evolving as a complementary policy target. This puts marine planning under stress to deploy ever larger areas for renewables. However, these spatial needs and policy targets have to be balanced with other interests, such as fisheries and conservation.</p>	<p>offshore hydrogen in MSP plans in selected ICES Member States, specifically how they cope with spatial requirements of renewables policies and trade-offs with other marine policies. Y2: Analysing transboundary planning challenges for large scale offshore wind scenarios including issues of co-existence and co-use, specifically cross-boundary trade-offs and conflicts from cumulative impacts at a Regional Seas scale. Y3: Synthesis report on institutional requirements, transboundary planning needs and potential transnational trade-offs for large scale offshore wind scenarios.</p>
<p>e Addressing education and training needs in marine spatial planning (MSP) and coastal zone management (CZM) by following the development of practice and profession and by developing relevant educational and training materials in collaboration with the ICES secretariat and with other interested actors.</p>	<p>As marine and coastal planning are evolving rapidly, there is a need to promote the understanding of marine and coastal planning and management and help training relevant practical skills. This includes appropriate and up-to-date education and training materials – both for planning experts, decision makers and wider society. The group will:</p> <ol style="list-style-type: none"> 1. Follow the education and training needs for marine and coastal planners and policy makers. 2. Work with the ICES secretariat to develop and deliver training materials / courses as required. 3. Act as scientific advisory board to the MSP Challenge serious game - sensitive to developments and capacity needs. 4. Advise on how MSP and CZM can make platforms to enhance Ocean Literacy within society. 	<p>6.3, 6.4, 7.4 3 years</p> <p>Y1-3: Follow the developments and report on education and training needs. Advice on request to the ICES Secretariat and other interested parts. Y2: A workshop or a conference session on MSP/ICZM as platforms for OL to share experiences, in collaboration with other interested organisations (e.g. IOC UNESCO, VASAB). Y3: Policy brief or training module (as appropriate) covering identified current needs.</p>

f	<p>Develop a better understanding of how social considerations are addressed in MSP by mapping current planning practices and assessing which practices are suitable for various MSP purposes and situations.</p>	<p>Given the ongoing roll-out of MSP, the relationship between MSP/ CZM and the social dimensions of sustainable development is of high interest to planners and academics; this dimension remains an important gap in both planning evidence and practice. Over the past period the WG has collected data on how marine spatial plans are referring to social aspects and whether/ how the participation of vulnerable groups, e.g. small-scale fishers, is actively encouraged. The aim is to provide documentable and comparable knowledge on relevant MSP practices and on their suitability for different purposes and contexts, on the basis of systematic data collection and analyses.</p>	<p>6.3, 7.1, 7.5, 3 years 7.6</p>	<p>Y1: Scientific paper on how current marine plans refer to social dimensions. Y2: Synthesis workshop on how social considerations can be enhanced in MSP. Y3: Scientific paper on enhancing social considerations in MSP.</p>
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Summary of the Work Plan

Year 1	<p>ToR A: Country update form and presentation template for an annually updated baseline, also informing other ToRs. ToR B: Document analysis and (as necessary) expert workshop to review current conservation and restoration practice and needs in relation to MSP. ToR C: Workshop product from 2022 (Nov) to inform next steps and conference session on MSP addressing CC and a scientific paper based on the results of workshop. ToR D: Current of status of offshore wind and hydrogen in marine plans. ToR F: Scientific paper on how current marine plans refer to social dimensions.</p>
Year 2	<p>ToR A: Streamlined template to follow identified key developments. ToR B: Expert workshop to identify legislative and implementation barriers preventing the optimal use of MSP to support conservation and restoration goals. ToR D: Analysing transboundary planning challenges for large scale offshore wind scenarios. ToR E: Workshop or a conference session on MSP/ICZM as platforms for OL to share experiences, in collaboration with other interested organisations (e.g. IOC UNESCO, VASAB) ToR F: Synthesis workshop on how social considerations can be enhanced in MSP.</p>
Year 3	<p>ToR A: Policy brief on the main insights regarding the key themes. ToR B: Report or scientific discussion paper with recommendations as to how MSP can better support conservation and restoration goals. ToR C: Framework to inform the implementation of climate smart marine plans. ToR D: Synthesis report. ToR E: Policy brief or training module covering current training and education needs. ToR F: Scientific paper on enhancing social considerations in MSP.</p>

Supporting information

Priority	<p>WGMPCZM activities cover many priority areas across the ICES science plan and should therefore be of high to very high priority. The activities of WGMPCZM are urgent in terms of the current marine and coastal problems to address requiring an integrative perspective and a rapidly developing practice of MSP/ICZM in need of relevant knowledge and training: climate change and biodiversity and habitat loss and how to address these (restoration, carbon sequestration), pressure on deep sea areas, fast evolving blue economy activities, current rapid development of marine and coastal management institutions and related need for capacity development and institutional learning. Most ToR topics are somehow included in the ICES science plan, but often lack links to relevant R&D, training, education and capacity development in marine and coastal planning and management (both students, practitioners and decision makers). There are important links to other ICES initiatives and working groups working with CC, integrated ecosystem assessments, social dimensions, marine uses and pressures and would like to develop these. This group is still relatively unique within ICES as one with a highly interactive science policy interface – ascertained through the composition of the group, encompassing researchers, planners and policy experts from various disciplines and fields of practice.</p>
Resource requirements	<p>The research programmes which provide the main input to this group are already under way, and resources are committed. Group members will also continue to apply for resources as the issues develop.</p>
Participants	<p>The Group is normally attended by some 20–25 members and guests.</p>
Secretariat facilities	<p>Standard EG support.</p>
Financial	<p>No financial implications.</p>
Linkages to ACOM and groups under ACOM	<p>There are no obvious direct linkages. But the WG can support advice requested based on its ToRs and capacity.</p>
Linkages to other committees or groups	<p>There is a working relationship amongst all the groups within HAPISG (in particular, WGOWDF, WGOORE) and contacts to expert groups under other steering groups (e.g. Integrated Ecosystem Assessments, WGIPEM and other WGs addressing offshore wind farm issues). ToR A expressly wants to follow relevant developments and invite sharing across EGs.</p>
Linkages to other organisations	<p>National organisations responsible for the implementation of marine and coastal planning and related knowledge, EU DGMARE, EU MSP Expert Group, the HELCOM-VASAB MSP working group, the OSPAR MSP initiative, the IOC UNESCO MSP Global initiative, the United Nations (e.g. treaty negotiations for BBNJ, Ocean Literacy, Ocean Sciences Decade).</p>

Working Group on Offshore Wind Development and Fisheries (WGOWDF)

2022/FT/HAPISG06 The Working Group on Offshore Wind Development and Fisheries (WGOWDF), chaired by Andrew Lipsky, USA; Andrew Gill, UK; and Antje Gimpel, 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 2023	10-13 July	Bridlington, UK		
Year 2024				
Year 2025			Final report by Date Month May to SCICOM	

ToR descriptors

TOR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATIO N	EXPECTED DELIVERABLES
a	Review and report on fishing industry interactions with offshore wind developments, define and determine effects on fishing operations and communities.	<i>ToR A continued and developed further from 2020-2022.</i> We will identify case studies to demonstrate effects on fishing communities; assess the potential of fishing community compensation and mitigation as well as adaptation and co-existence in practice. We further want to review and develop methods to assess fishery changes due to offshore wind.	2.2, 2.7, 6.6, 7.3	3 years	Review paper: Case Studies
b	Develop and report on methodologies to assess and mitigate impacts of offshore wind energy on fishery data collections, including fisheries independent surveys and fisheries dependent data.	<i>ToR B - continued from 2020-2022.</i> We will review tools and report out on solutions to measure and address effects and impacts of fisheries, conservation, and wind energy interactions on fisheries independent and dependent data collections. With this ToR we aim to advance sampling methods such as the use of wind infrastructure as observation platforms or nodes for observation platforms (power supply for automated survey vehicles, use of fiber cables to send data to land). Develop and report on methods to measure fisheries changes due to offshore wind (link to ToR C).	2.2, 2.3, 2.7, 3.2, 3.3	3 years	Method development papers; Case Studies
c	Assess the effects of habitat alteration by offshore wind developments on fisheries resources.	<i>ToR C continued and adapted</i> This ToR will focus on the effects of fixed and floating devices. Here we will examine population level effects and impacts as well as ecosystem effects and impacts. We further	2.2, 2.4, 2.7, 6.6	3 years	Review paper

		focus on oceanographic wind and ocean wake effects on fish habitats. In addition, we will consider trophic effects including lower trophic level production in OWF areas (and methods to determine) and multi-stressor effects on fish populations as well as climate change considerations.			
d	Review gaps and identify opportunities for cross-cutting links and communication between ICES groups in relation to renewable energy and marine ecosystems and sustainability.	<p>The focus is on cross-cutting links and communication. We will focus on communication database on fisheries and OWF interactions and the tracking /capturing where changes are happening as a result of OWF-fisheries. This includes transboundary issues, OWF with restoration and social issues (link to WGMPCZM; Scallops – WGScallop) and survey interactions with WKUSER2 outputs. We will coordinate with WGSOCIAL and WGECON to support their OWF research survey to identify existing and ongoing OWF-fisheries research (link to ToR a). Another focus is liaison with Spatial Fisheries Data WG using OWF as case study (WGSF) and the continuation of working together with WGs MBRED and ORE. Other topics include assisting in future ICES ORE strategies/workshops and to determine if any WGs are active in relation to:</p> <ul style="list-style-type: none"> • Shifting fisheries species distributions relating to climate change? • Fisheries tools adaptation - WGFTFB - Fish Technology and Fish behaviour 	6.6	Year 3	Report to ICES Recommendations of additional studies linked to other WGs
e	Evaluating and addressing the impact of strategic plan-level development of OWFs within a region on fishery operations and communities.	The ToR looks at the bigger picture of evaluating and addressing cumulative impacts of OWF activities on fishery operations and communities at the scale of regional or national management and policy (i.e. the lessons learned). The topic sits alongside the more detailed consideration of interactions at OWF level (which is more a focus of ToR a, b and c). As part of the ToR we would evaluate look at what OWF expansion plans mean at a regional/national level for fisheries, including the socioeconomic consequences of privatization of marine space. This will assist in the determination of why the more specific outputs of ToR a, b and c impacts on the policy and planning objectives that decision makers are working towards. It would increase the potential impact of WGOWDF work, as it will be placed in context of the wider policy picture and showing why the WG research matters at scale and will draw	2.7, 6.4, 7.6	3 years	Systems framework paper/report

on the wide range of membership in the WG. The ToR would use a systems thinking approach to assist with strategic level thinking within WGOWDF such as strategic compensation.

Summary of the Work Plan

Year 1	The WG will meet and exchange ideas on the ToRs. The WG will then develop a plan as to how to address each ToR in the 3-year time frame. The content of papers will be planned and worked on during Year 1, at the workshop and intersessionally. The WG Chairs will continue to regularly interact with the Chairs of WGMBRED and WGOORE to ensure activities are complementary.
Year 2	The WG will make progress on all deliverables and will plan the WG workshops to achieve this. The WG Chairs will interact with the Chairs of WGMBRED and WGOORE to ensure activities are complementary.
Year 3	The WG will complete the ToR papers and submit them for publication. The WG will also discuss next steps for the WG. The WG will complete a review of ICES expertise related to renewable energy and marine ecosystems and sustainability working with WGMBRED and WGOORE. 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 is normally attended by around 30–40 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 very close working relationship with all the groups HAPISG, in particular WGMPCZM, WGMBRED, WGOORE and WGSFD. It is also very relevant to the EOSG.
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.

Stock Identification Methods Working Group (SIMWG)

2022/FT/HAPISG07 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 2023	By correspondence		Interim report by August 2023	
Year 2024	June	Faro, Portugal	Interim report by August 2024	
Year 2025	By correspondence		Final report by August to ACOM & 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, 1.8, 5.2	3 years (and continued)	EG report, revised stock ID book chapters
b	Provide technical reviews and expert opinions on matters of stock identification, as requested by specific Working Groups and ACOM.	Ad hoc advice requests to be addressed at short notice	1.4, 1.8, 5.2	3 years (and continued)	EG report, contribution to ASC
c	Review and report on advances in mixed stock analysis, and assess their potential role in improving precision of stock assessment.		1.4, 1.8, 5.2, 5.4	3 years (and continued)	EG report
d	Review of the suggested splitting of the West Greenland inshore stock (cod) into two separate stock units, based on available biological (tagging), catch trends and survey trends.	Advisory requirement	1.4, 1.8, 5.2	1 year	Bief review report provided to NWWG and ACOM (clear response required) Chapter in EG report

Summary of the Work Plan

Year 1	Address terms of reference through work by correspondence in 2023
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Year 2	Organise a physical meeting for SIMWG for summer 2024
Year 3	Address terms of reference through work by correspondence in 2025

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 15–20 members and guests.
Secretariat facilities	Standard EG 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 HAWG, WGBIE and WGHANSA; benchmark workshops including WKELASMO, workshops on cod stock structure (WKNSCodID, WK6aCodID). 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. Depending on the request, SIMWG's scope might expand beyond the ICES area to address straddling stocks e.g. in the NAFO, NEAFC, CECAF and other RFMO areas.

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

2022/FT/HAPISG08 The **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 2023	18–20 April	ICES HQ, Copenhagen, Denmark		
Year 2024				
Year 2025			Final report by DATE to SCICOM	

ToR descriptors

ToR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES		EXPECTED DELIVERABLES
			DURATION		
A	Review data on marine extraction activities and provide a summary on	a) OSPAR requirements b) Advisory requirements	2.1, 6.1, 6.4	Year 1, 2, 3	Annual extracted amounts and areas (including spatial data) added to the Dashboard (see

	marine extraction for the OSPAR region to OSPAR				ToR C) and included in e-evaluation and Final Reports.
B	Review of developments in marine sediment resource mapping, legal regime and policy, environmental impact assessment, research and monitoring.	Developments allow countries to optimize their policy and management approach relating to marine aggregate extraction. A review of recent developments (2003 to present) will be used to update the ICES Guidelines for the management of marine sediment extraction (see https://doi.org/10.17895/ices.pub.5398)	2.1, 6.1, 6.4	Year 3	Chapter in Final Report and/or inclusion in the Dashboard (see ToR C)
C	Further development of the WGEXT Dashboard (https://rconnect.cefas.co.uk/connect/#/apps/26/access) and underlying database to improve transparency and access to aggregates data.	This ToR is designed to improve accessibility to data concerning marine aggregate extraction (e.g. area and quantities involved, research findings, management approaches). This will be achieved through: <ul style="list-style-type: none"> i) Identify and acquire missing data (spatial, quantities and qualifiers) ii) Analyse data to identify trends (e.g. proportion of material used for beach replenishment through time) iii) Investigate potential for AIS (Automatic Identification Systems) to provide a consistent approach to showing location and intensity of aggregate dredging across all ICES member countries. Work will include consideration of how Electronic Monitoring System (EMS) data can be used to help train a machine learning algorithm to differentiate between vessel transit and dredging. iv) Compile bibliography of marine aggregates related research and guidance. v) Compare approaches taken by different countries to the management of marine aggregate dredging (informed by ToR A2). vi) Explore with the ICES secretariat and data centre how to make the dashboard available (i.e. ensuring compliance with developing ICES guidelines). 	2.1, 2.4, 3.5, 3.6, 4.1, 4.2, 4.3, 6.1, 6.2, 6.3, 6.4, 6.5	Year 1, 2, 3	<ul style="list-style-type: none"> i) Fill in data gaps ii) New 'Analysis' tab including results narrative iii) Chapter in Final WG Report. Potentially integrate AIS data within the tool, either as a feed from other initiatives (e.g. UNEP/GRID-Geneva), or as a result of direct development by WGEXT. iv) Add new 'Bibliography' tab to the dashboard. Include search function by topic/country/ location. v) Add new 'Approaches to Management' tab to allow for comparison between countries (results presented as a matrix). vi) Dashboard hosted by ICES Data Center?

D	Consider implications of the expansion of offshore marine renewables (e.g. wind farms and cables) for aggregate dredging.	The expansion of offshore renewables has the potential to steralise sand and gravel resources, through placement of infrastructure (e.g. monopiles, cables) that prevent access to sand and gravel resources. Under this ToR we will examine the issues involved and make reccomendations for addressing them.	2.1, 6.1 6.4	Year 1, 2, 3	Chapter in Final Report
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Summary of the Work Plan

Year 1: A, B, C, D

Year 2: A, B, C, D

Year 3: A, B, C, D

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. The dashboard provides much greater visibility of marine aggregates sector, and provides easy access to data for use in other wider ecosystem assessments. 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	Standard EG support.
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 working relationship with WGs in SCICOM (e.g. for ToR C: WGMPCZM, WGOWDF, WGSFD, WGCEAM and WGOORE) and OSPAR who are involved in use of AIS, cumulative effects and spatial planning.
Linkages to other organizations	Data on marine extraction are delivered to OSPAR.

Workshop on the revision of the DOME litter data format (WKLIDA)

2022/WK/HAPISG09

A Workshop on the revision of the DOME litter data format

(WKLIDA), set up in collaboration between the ICES Data Centre and the Working Group on Marine Litter (WGML), and chaired by Hong Minh Le*, Belgium; Bavo De Witte*,

Belgium; and Anna Osypchuk*, ICES Secretariat; will be established and will meet in Copenhagen, Denmark, 18–20 January 2023 to:

- d) Revise the DOME litter format structure, including its records and fields, and develop a new and optimised format version (ERF3.2.6) ([Science Plan codes: 3.1, 3.2, 3.5](#));
- e) Review reference standards in the litter format and harmonise them with the EMODnet Chemistry standards ([Science Plan codes: 3.1, 3.2, 3.5](#));
- f) Review the compatibility of DOME Litter format structure with high variability of sampling and analytical methods ([Science Plan codes: 3.1, 3.2, 3.5](#));
- g) Assess the requirements and the completeness of the quality assurance information in the ICES DOME litter data format ([Science Plan codes: 3.1, 3.2, 3.5](#)).

WKLIDA will report by 30 September 2023 (after WGML 2023 meeting) for the attention of WGML and SCICOM.

Supporting information

Priority	The activities of this group will improve litter dataflow to DOME, supporting the work of our partners (AMAP, HELCOM, OSPAR), with focus on litter in biota, sediment, and water, as well as data standards harmonisation, which is necessary to assist litter monitoring and to support litter data assessments. Consequently, these activities are considered to have a very high priority.
Scientific justification	<p>Term of Reference a)</p> <p>Current DOME litter format reveals issues for submitting litter data to ICES DOME. e.g., the current format does not allow reporting of litter in biota or subsamples, and has limitations in reporting litter parameters, while sediment sample weight cannot be reported in the current form, and litter properties are aggregated in the same field instead of separated. To facilitate qualitative data submission for litter data, there is a need for a thorough revision of the current DOME litter format structure, including its records and fields and the development of an optimised format version.</p> <p>Term of Reference b)</p> <p>Litter data alignment between databases is of uttermost importance to allow sound integrated litter assessments and to decrease the data reporting burden on the national data submitters. Within Europe, litter data are provided to ICES DOME and EMODnet Chemistry databases. Harmonisation of litter data format between both is essential to allow combining their data and providing a comparable view of data to users. Such harmonisation will also support interoperability and direct data flows between the databases, which will facilitate data submissions as well as access to a maximum amount of litter data. In practice, the harmonisation will consist in the mapping of both formats and in the alignment of their common vocabularies and definitions.</p> <p>Term of Reference c)</p> <p>A high variety of methods is in use to sample and analyse litter. The method choice strongly links to the matrix and plastic characteristics such as size, shape or polymer. The ICES DOME litter data format should accommodate litter data submissions, independent of the method used and incorporating essential method information.</p>

	<p>Term of Reference d)</p> <p>The degree of quality assessment applied within plastic sampling and analysis methods is a strong indicator of data quality and is important to take into account in data assessments. While, the current format does not foresee reporting of uncertainty-related information, reference material information, or intercomparison reference, a revised DOME litter data format should allow for the submission of essential QA/QC information.</p>
Resource requirements	No specific resources are required.
Participants	The Group is expected to be attended by some 15-20 members and guests.
Secretariat facilities	Standard EG support (meeting facilities for 20 pax at ICES HQ).
Financial	No financial implications.
Linkages to advisory committees	There are no obvious direct linkages with the advisory committees.
Linkages to other committees or groups	The workshop is arranged by and will report to the ICES Working Group on Marine Litter (WGML) operating under the HAPISG.
Linkages to other organizations	The work of this group will be developed in collaboration with EMODnet Chemistry partners to achieve suitable alignment between both formats, and potentially support our further cooperation with AMAP, HELCOM and OSPAR.

Workshop on Small Scale Fisheries and Geo-Spatial Data 2 (WKSSFGE02)

2022/WK/HAPISG10 A Workshop on Small Scale Fisheries and Geo-Spatial Data 2

(WKSSFGE02), chaired by Tania Mendo, UK; and Marta Rufino, Portugal; will be established and will meet in Faro, Portugal, 13–16 March 2023 to:

a) Build up from [WKSSFGE0](#) to progress on the development of methods to classify positions into fishing events in small-scale fisheries, including passive gears, using high resolution geo-spatial data and specifically:

- i) Create an open data set of case studies (anonimized) to test the methods, with different gear types and locations.
- ii) Test and compare methods to classify positions into fishing activities (i.e. random forest, machine learning, geocomputing) on different types of vessel tracking data and gear types to infer relevant effort parameters.
- iii) Recommend the optimal/maximum frequency of acquisition of geopositional data (time between pings) by gear types to infer relevant fishing activities

Data from case-studies shared at WKSSFGE0 will be available but participants are encouraged to bring their own data as well to test the different methods.

b) Using data already available:

- i) Analyse the availability of VMS and logbook data submitted to ICES that corresponds to small-scale fisheries in EU waters.
- ii) Provide an overview of the extent of small scale fisheries in EU waters using the FDI database, the corresponding extent of bottom contacting fishing gear and provide recommendations for data collection and determination of fishing effort for the most impacting gear(s) to the seafloor.
- iii) Combine the previous datasets (ii) and iii) to quantify coverage of small scale fishing fleet in EU waters

c) Develop a guidance document collecting a group discussion on opportunities, challenges and benefits for tracking of small vessels.

WKSSFGE02 will report by 31 March 2023 for the attention of the ACOM and SCICOM.

Supporting information

Priority	<p>The activities of this Workshop will feed into ICES advice to EC/DGENV on the spatial extent of fisheries that are not carrying VMS and represent a high percentage of the total fleet . Consequently, these activities are considered to have a very high priority.</p>
Scientific justification	<p>Term of Reference a)</p> <p>In the EU, VMS data are available for vessels larger than or equal to 12 m since 2012, with a maximum ping rate of 2 hours, and with a possibility for an exemption for 12-15 m vessels if they operate within the territorial waters of the MS or never spend more than 24 hours at sea per trip. However, information of fisheries from vessels that are not carrying VMS is missing resulting in an underestimation of the fishing pressure, especially in coastal areas.</p> <p>WKSSFGE02 discussed and developed standard procedures for identifying trips/hauls in SSF using geo-spatial data (e.g. AIS, GPRS trackers) that can be compatible with VMS derived outputs. WKSSFGE02 will build up from WKSSFGE01 and follow-up on the building blocks required to estimate effort indicators for SSF and harmonize with the EU-MAP variables.</p> <p>The classification of the position of the vessel is key to obtain information on effort indicators and infer fishing activity. Using the methods that provided best results at WKSSFGE01, WKSSFGE02 will test and compare the different approaches, e.g. Random Forest, Machine learning and speed-filter methods, on different types of data and gear types (on open anonymized data set).</p> <p>The optimal frequency between pings depends very much on the gear and type of fishery. WKSSFGE02 will recommend the best frequency by gear to classify the positions into fishing activities and provide relevant effort indicators.</p> <p>For passive gears, WKSSFGE02 will improve the workflow at ICES to map fishing activity, work on effort estimates from EU MAP, discuss the potential for estimation of soaking time, the best temporal resolution and alternative data sources to estimate number of hooks, pots or traps.</p> <p>Term of Reference b)</p> <p>In response to a special request from DGENV to advise on the impact of small scale fisheries in the seabed, WKSSFGE02 will:</p> <ul style="list-style-type: none"> i) Use existing VMS and logbook data submitted to ICES to inform about the current coverage of VMS-tracked small scale fleet, the proportion of 12-15m vessels without VMS from table 2 of the VMS/logbook data call and discuss suitability to be used in ICES advice, ii) Describe the extent of small-scale fisheries by MSFD (sub)region in all EU-waters using STECF FDI database, report on the most predominant gears and focus on the development of metrics and methods to determine fishing activity of the most predominant gears. <p>Term of Reference c)</p> <p>Several ICES members, such as the UK, have started a mandatory tracking system for England and Wales with iVMS, and for some countries AIS data or other tracking systems are available. Additionally, at the EU level current negotiations between the EU Commission, Parliament and Council are underway for the tracking on small scale fishing vessels by all Member States (P9_TA(2021)0076) but there is not a general framework to support this decision.</p> <p>WKSSFGE02 will draft a guidance document exploring the challenges and opportunities of introducing a vessel tracking system for all vessels, the benefits for a common tracking system, provide advice on the temporal resolution needed for different gears, importance of including the small-scale fleet for marine spatial planning considerations and the implications for estimation of by-catch events by small-scale fleet.</p>

Resource requirements	Secretariat support and advice process.
Participants	The group will be attended by members of WGSFD, WGCATCH and other invited experts.
Secretariat facilities	Standard EG support.
Financial	Covered by DGENV special request to ICES.
Linkages to advisory committees	The report from WKSSFGE02 will be peer-reviewed and enter into the ICES Advisory process to be approved by ACOM.
Linkages to other committees or groups	WGSFD, WGCATCH, WGBYC, WGTIFD, SCICOM, HAPISG
Linkages to other organizations	EU Regional Coordination Groups Intersessional Subgroups on Small-scale fisheries and Metier and transversal variable issues.

Workshop on a Research Roadmap for Offshore and Marine Renewable Energy (WKOMRE)

2022/WK/HAPISG11 **A Workshop on a Research Roadmap for Offshore and Marine Renewable Energy (WKOMRE)**, chaired by Jon Hare, USA; and Andrew Gill, UK; will be established and will meet at ICES HQ, Copenhagen, Denmark, 7–9 March 2023 to:

- a) Identify the main challenges and opportunities regarding ecosystems associated with offshore and marine renewable energy developments and scope their characteristics, policy drivers and evidence requirements across ICES member states ([Science Plan codes](#): 2.2, 2.7);
- b) Review ongoing work on offshore and marine renewable energy development in ICES to identify synergies and knowledge gaps ([Science Plan codes](#): 6.1);
- c) Develop a roadmap for the integration, coordination and delivery of science on offshore renewable energy developments ([Science Plan codes](#): 4.5).

WKOMRE will report by 30 April 2023 for the attention of ACOM and SCICOM.

Supporting information

Priority	Offshore renewable energy developments, and in particular offshore wind, are priority policy objectives in most ICES member countries and beyond. Advisory needs will develop quickly. The activities of this workshop will lead ICES into better coordination of science on offshore renewable energy development, identify scientific capabilities and services and role that ICES can provide to meet transboundary science needs. and prepare for advisory requests. Consequently, these activities are considered to have a very high priority.
Scientific justification	Term of Reference a) Several expert groups in ICES are focussed on work in relation to offshore renewable energy development and its interactions with other human activities, scientific operations, as well as its impact on marine habitats. An increasing number of other expert groups have recently started working on specific aspects related to offshore renewable energy development. It is therefore important, through a review process, to identify potential synergies and knowledge gaps to guide ICES work so that effective integration and scientific advice can provided.

	<p>Term of Reference b)</p> <p>To develop a roadmap for the integration and coordination of ICES Activities with respect to understanding the effects of marine renewable energy developments on the marine environment and society.</p>
Resource requirements	Many research programmes are underway or have been carried out. The breadth of the work in ICES and the need for coordination might require additional resources in the ICES Secretariat.
Participants	The workshop is targeted towards the chairs and members of existing relevant groups and additional experts. In person/hybrid participation to be encouraged to effectively brainstorm, scope and plan the work required to address the issues.
Secretariat facilities	Meeting room and technical support for hybrid meeting.
Financial	No direct financial implications for the workshop, however, see above “resource requirements”
Linkages to advisory committees	ACOM
Linkages to other committees or groups	There is a very close working relationship with all the groups working on offshore renewable energy development, ecosystem observations/monitoring, and marine spatial planning, WGOWDF, WGOORE, WGMBRED, WGMPCZM, WGSOCIAL, WGECON, WGCEAM, EOSG
Linkages to other organisations	OSPAR, HELCOM, EU-MSFD, renewable energy industry

Workshop on sea Bird Bycatch monitoring in the NEAFC Regulatory Area (WKBB)

2022/WK/HAPISG12 A Workshop on sea Bird Bycatch monitoring in the NEAFC Regulatory Area (WKBB), chaired by Gildas Glemarec, Denmark; and Kim Magnus Bærum, Norway; will meet:

intersessionally in April 2023 to:

- a) Review the results from WKPETSAMP2² to evaluate and select input data to be used by WKBB (Science Plan Codes: 3.2 and 3.3)

in Copenhagen on 1-4 May 2023 to:

- b) Identify the areas of spatio-temporal overlap of different seabird species and fishing activities in the NEAFC RA, and estimate the level of the area/season interaction for relevant combinations of seabird species and fisheries (Science Plan Codes: 4.2, 6.1);

² Workshop on appropriate sampling schemes for Protected Endangered and Threatened Species bycatch (WKPETSAMP2)

- c) Document gaps and deficiencies related to the quantity and quality of total fishing effort data affecting statistically robust bycatch mortality estimates at the fleet level in the NEAFC RA, and identify actions required to enable such estimations (Science Plan Codes: 3.5);
- d) Recommend pilot study(ies) to monitor and assess the scale and magnitude of seabird-fisheries interactions in the NEAFC RA for high-risk seabird bycatch métiers (as identified under ToR b); (Science Plan Codes: 3.2, 3.3, 6.1)

WKBB will report by 30 June 2023 for the attention of ACOM and SCICOM.

Supporting information

Priority	The workshop is directly linked to a special request for advice from NEAFC on 'seabird bycatch in the NEAFC Regulatory Area.'
Scientific justification	<p>This workshop is directly linked to the ongoing workshop on "improving protected species bycatch monitoring", namely WKPETSAMP2 and WKPETSAMP3; both processes being related to a special request for advice from DGEEnvironment. WKBB will also support the objective 4.2. of The Roadmap for ICES bycatch advice on protected, endangered, and threatened species and propose options to improve data availability and quality.</p> <p>Relevant outcomes from the Workshop on Estimation of Rare Events (WKRARE, 2021) will be considered. In addition, conclusions from the recent report on "monitoring seabird bycatch in the NEFAC regulatory area³" will also be considered.</p> <p>Data collection methods to be considered for ToR d) include sampling programmes using at-sea observers, electronic monitoring with video, and fisher-reported data. When proposing monitoring pilot studies, experts will consider i) which gears/métiers pose the greatest risk in terms of seabird-fisheries interactions, ii) the fisheries hotspots in the area(s) of interest, and iii) the spatiotemporal distribution of the seabird species at risk of interacting with fishing gears in the area(s) of interest.</p> <p>To estimate the level of interaction by area/season for relevant combinations of species and fisheries, tools like e.g., Productivity-Susceptibility Analyses (PSA) may be considered.</p>
Resource requirements	None, beyond the funding for the workshops to be provided by NEAFC.
Participants	The workshop will be attended by up to 15 experts. The workshop requires the participation of experts with knowledge on and access to national and regional fisheries data collection schemes to estimate fishing effort distribution and quantification in the area(s) of concern, experts on seabird distribution and ecology in North-East Atlantic offshore waters, and experts on seabird-fisheries interactions
Secretariat facilities	SharePoint access and Secretariat support.
Financial	Financed through specific budget linked to a special request for ICES advice.

³ ICES. 2023. Monitoring seabird bycatch in the North East Atlantic Fisheries Commission Regulatory Area. ICES Business Reports, 03: 02. 11 pp. <http://doi.org/10.17895/ices.pub.21908577>

Linkages to advisory committees	ACOM
Linkages to other committees or groups	DSTSG, HAPISG, WGCATCH, WGBYC, JWGBIRD
Linkages to other organizations	NEAFC, OSPAR

Workshop on Implementing Stakeholder Engagement Strategy (WKSTIMP)

2022/WK/HAPISG13 **Workshop on Implementing Stakeholder Engagement Strategy** (WKSTIMP), chaired by Marta Ballesteros, Spain; Ashley Wilson, UK; and Alexandre Rodriguez, Spain; will be established and will meet online (16 May), in Copenhagen, Denmark (17 May) and partially hybrid (onsite and specific hybrid session on 18 May) 2023 to:

- a) Lay out the actions necessary to achieve the goals and actions in the stakeholder engagement strategy
- b) Identify options and related costs for the implementation of the actions and propose different scenarios based on these options
- c) Considering these scenarios, and using the proposed structure shown below, draft elements of the implementation plan.
- d) Describe how the outputs of monitoring and evaluation can inform ACOM and SCICOM

WKSTIMP will report by 30 June 2023 for the attention of ACOM and SCICOM.

Supporting information

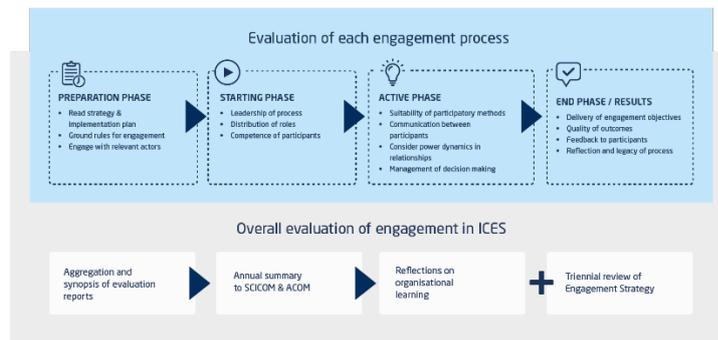
Priority	High. This WK is essential for the implementation of the ICES stakeholder engagement strategy. The WK will produce protocols and guidelines to coordinate a transparent engagement effectively and to ensure the credibility of the science and advice being produced by ICES. It will also reinforce organizational learning and the Strategy review and update.
Resource requirements	The assistance of the Secretariat in maintaining and exchanging information, requirements and data with potential participants. Technical assistance scheduling and running the online day (16 May) and the two days of onsite meeting at ICES HQ (17-18 May) and the hybrid section (onsite+ online on the 18 May)
Participants	<p>Various experts across ICES groups with knowledge and expertise of stakeholder participation in ICES and beyond. Advisory Councils and ICES observers, other stakeholders, regional fisheries and environmental commissions and competent authorities of ICES member countries.</p> <p>On-line day and hybrid session: up to 40 participants. Working languages: possibility to provide translation for EN ES FR to partially overcome language barriers.</p> <p>On-site days: up to 25 participants. Working language: EN</p>

Secretariat facilities	SharePoint site, secretariat support for reporting. Assistance with online workshop functioning and online meetings prior to the workshop and operation of the online 1.5 day. HQ meeting rooms and assistance with running the onsite 2 days workshop.
Financial	No financial implications.
Linkages to advisory committees	All ACOM/SCICOM groups will be impacted by this workshop.
Linkages to other committees or groups	ACOM, SCICOM, WGSOCIAL, WGMARS, WGECON, WGBESEO, IEA Groups, SIHD, ICES Communications Team
Linkages to other organizations	All current and potential future stakeholders.

Proposed structure of the implementation plan

- **Introduction**
- **The Practicalities of Engagement**
 - Specific meeting formats in ICES (in science & advice) and their objectives
 - Avenues of participation in each format
 - The participation process (from access to system to final product)
 - Research ethics, data protection, informed consent
 - Managing potential and perceived Conflicts of Interest
 - Transparency and how it is ensured
 - Resolving unforeseen issues of concern
- **Mechanisms for monitoring and evaluation of engagement**
 - Procedures for feedback loops to stakeholders
 - Monitoring processes
 - Evaluation of engagement against the objectives
 - Cost effectiveness of engagement
 - Annual reporting to SCICOM / ACOM on Stakeholder Engagement implementation
- **Link to communication strategy about stakeholder engagement**
 - New communication needs and documents (internal and external)
 - Specific actions for target audiences linked to engagement objectives
 - Training needs for ICES related to Stakeholder Engagement
- **Review and revision of the strategy**
 - Revisit the ICES Stakeholder Engagement Strategy 3 years after implementation

EVALUATING ENGAGEMENT - Step by Step



Workshop to Evaluate Long-term Biodiversity/ Ecosystem Benefits of NEAFC closed and restricted areas (WKECOVME)

2022/WK/HAPISG14

A Workshop to Evaluate Long-term Biodiversity/ Ecosystem

Benefits of NEAFC closed and restricted areas (WKECOVME), chaired by Eskild

Kirkegaard, Denmark; will be established and will meet at ICES HQ, Copenhagen,

Denmark, and online, 7–11 August 2023 to:

- a) Review and consolidate information on effectiveness of NEAFC's 1) areas restricted to bottom fishing, and 2) closed areas according to the VME Recommendation (19:2014) in relation to long-term biodiversity/ecosystem benefits. Collated information should include:
 - i. evaluation of the biodiversity attributes of the areas concerned
 - ii. list potential threats resulting from pressures, and specifically evaluate the pressures and likely threats from fishing activities affecting or expected to affect the areas and the biodiversity attributes
 - iii. evaluation of the NEAFC management measures as to whether they achieve, or are expected to achieve, positive and sustained outcomes for the *in situ* conservation of biodiversity. This should also include the likely or potential effectiveness in mitigating the threats to the biodiversity attributes.
- b) Based on expert judgement (WGFTFB and WGSFD experts) as well as NEAFC VMS and catch report data analysis by WGSFD, provide a commentary on current and potential maximum depth on the use of mobile bottom contacting gear (trawls) and bottom contacting static gear in the NEAFC regulatory area.

A core group of experts (Daniela Diz, Ellen L. Kenchington, Laura Grady, and Eskild Kirkegaard) will prepare material and help run the workshop.

WKECOVME will report by 22 August 2023 for the attention of the ACOM.

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	<p>ToR [a] this work should be done to be able to demonstrate how relevant NEAFC measures (in particular the concepts of “closed areas” and “restricted bottom fishing areas” under the NEAFC VME Recommendation) correlated to the concepts “Marine Protected Area”, MPA, and “Other Effective Area Based Conservation Measure”, OECM. The work should provide evidence base on current or potential evidence sources to provide further support to the OECM biodiversity benefits narrative. With regard to the VME closed areas and restricted bottom fishing areas is, if there is sufficient evidence that the pressure of bottom fisheries has largely been removed in these areas, what are the monitored biodiversity benefits? In the absence of sufficient monitoring is the workshop able to extrapolate from other evidence that the removal of bottom fishing pressure will have long term biodiversity benefits and describe these? What is the likely (minimal) biodiversity monitoring required or already available to optionally substantiate compliance evidence in terms of ongoing assessment of benefits in the future.</p> <p>ToR [b] In advance of the workshop, ICES working groups WGFTFB/WGSFD will provide a commentary based on expert judgement as well as NEAFC VMS and catch report data analysis on maximum depth on the use of mobile bottom contacting gear (trawls) and bottom contacting static gear in the NEAFC regulatory area. In the context of setting up OECMs, NEAFC will require information on areas that may be fished in the future. As such, an analysis of current NEAFC fishing practices in terms of maximum depth and in terms of general bathymetric features is required to inform the likely future extent by depth of fishing. VME/OECM closed area coordinates should be provided according to its advised depth limit as an option for consideration.</p>
Resource requirements	Some support will be required from the ICES Secretariat.
Participants	The workshop will likely be attended by some 15–20 experts online and physically.
Secretariat facilities	None, apart from WebEx and SharePoint site provision.
Financial	No financial implications.
Linkages to advisory committees	Specific ToRs from WKECOVME provide information for ACOM to respond to specific requests from clients.
Linkages to other committees or groups	While there are currently no direct linkages to other groups, WKECOVME should develop stronger links WGFTFB, WHMHM, WGSFD, WGDEC, and WGDEEP.
Linkages to other organizations	WKECOVME will provide the evidence base for ICES to base its advice to NEAFC. As such, the working groups and experts under OSPAR and NAFO will be relevant.

Workshop on Trade-offs between the Impact of Fisheries on Seafloor Habitats and their Landings and Economic Performance (WKTRADE4)

2022/WK/HAPISG15 **A Workshop on Trade-offs between the Impact of Fisheries on Seafloor Habitats and their Landings and Economic Performance (WKTRADE4)**, chaired by Tommaso Russo, Italy, and Arina Motova-Surmava, UK; will be held online on 20–21 September 2023; and at ICES HQ, Copenhagen, Denmark (hybrid) on 7–9 November 2023 to:

- a) Operationalize linking of available VMS, STECF FDI and AER economic data to estimate landings and economic performance indicators of each fishery. This work should the most emphasis on the gears that have direct impact on the seafloor and, among them, the highest penetration depth into the seafloor.
- b) Describe the practical steps, beyond those implemented in [eu.2021.08](#), to determine the economic costs and benefits associated with bottom fishing at a fine spatial scale (for example at the resolution: 0.05° x 0.05° coded as c-square);
- c) Demonstrate the applicability of proposed approaches for estimating spatial fisheries performance indicators (including revenue, costs, landings, value added, etc.) at local, habitat and regional scales and for different gear/metiers given the present data availability and cross regional applicability). The purpose is to demonstrate what measures of these economic performance indicators can be used in [WGFBIT](#) to describe trade-offs;
- d) Address ToR a to c in all European marine regions, including the Mediterranean and Black Seas, to the extent possible;
- e) for the regions represented document opportunity and limitations of spatial fisheries performance indicators (including revenue, costs, landings, value added, etc.) and/or of the input data needed and the capacity to link to benthic impact.

WKTRADE4 will report by 20 October 2023 for the attention of ACOM and SCICOM.

Supporting information

Priority	High, in response to a special request from DGENV on a set of management options to reduce the impact of mobile bottom contacting fishing gears on seafloor habitats, and to provide a trade-off analysis between the impact of fisheries on seafloor habitats and provisions of landings weight and value. The advice will feed into ongoing efforts to provide guidance on the operational implementation of the MSFD.
Scientific justification	ToR [a] linking of VMS/logbook data where available to both STECF FDI and AER economic data. Since the establishment of the so called ‘new’ FDI data call in 2017, STECF and in particular Fisheries Dependent Information (FDI) Expert Working Group (EWG) had been working on enabling the link between STECF Annual Economic Report (AER) data call and FDI. The link was created through the DCF fishing fleet segments definitions, that include supra-region, fishing technique, vessel length and geographical indicators. All these identifiers are used in spatial FDI data sets with effort and landings at ci-square and should allow linking both data sets if data reporting is consistent. STECF FDI assessed consistency between FDI and AER in 2017 ⁴ , 2021 ⁵ and should access during the FDI EWG 23-10 in September 11-14 meeting. In addition, as a way to harmonise FDI data submission STECF FDI held two methodology meetings that provided a review of the methodologies used to report FDI spatial data. The results of this work will be used to establish a baseline understanding of consistency of the data reported by different countries across

⁴ Holmes, S. J., Zanzi, A., Scientific, Technical and Economic Committee for Fisheries (STECF). *Report on the STECF Expert Working Group 17-12 Fisheries Dependent Information: ‘New-FDI’*, EUR 29204 EN, European Union, Luxembourg, 2018, ISBN 978-92-79-85241-1, doi:10.2760/094412, PUBSY No. JRC111443

⁵ Vanhee, W., Motova, A., Zanzi A., Hekim Z., Scientific, Technical and Economic Committee for Fisheries (STECF)– Fisheries Dependent -Information – FDI (STECF-21-12). EUR 28359 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-45887-6, doi:10.2760/3742, JRC127727.

regions and within separate data sets.

See also spatial STECF FDI data published here: <https://data.jrc.ec.europa.eu/dataset/00ae6659-ddde-4314-a9da-717bb2e82582> and AER economic data published here: [Fleet Economic Performance - European Commission \(europa.eu\)](https://ec.europa.eu/economic-affairs/sectors/industry/aer/)

According to the previous editions of the WKTRADE, there is a need to move forward with the spatial estimations of costs and, ultimately, profits to obtain more realistic assessment of trade-off between substrate protection and sustainability of fishing activities.

These analyses, however, are presently limited to the fleet segments equipped with VMS (i.e. vessels with LOA over 12 m) or other tracking devices (e.g. AIS), while logbooks allow to expand the analyses to the vessels with LOA over 10 m.

ToR [b] determining economic costs and benefits, scripts and analysis.

The main focus of the work will be to access benefits provided by fishing activity to the society through Gross Value Added, revenues and profits obtained by the businesses as well as to access employment indicators (e.g. FTE jobs reliant on certain fisheries). Therefore, the main focus will be to calculate economic indicators at a resolution of spatial management.

There are several methods used to partition economic data to lower aggregation level:

1. The method used by STECF AER to partition fleet costs between different regions for regional analysis⁶ - this method uses only AER data provided during the data call
2. Method developed by SECFISH project in 2019 and published on Cran R repository⁷ - this method requires individual vessel level information to access correlation of different economic variables.
3. Method used by Seafish to report main economic performance indicators by species, métiers, regions and FMPs⁸ - this method require access to more disaggregated than DCF fleet segmentation and individual vessel level economic estimates.
4. Method used by ABIOMMED project to estimate spatial LPUE, spatial landings, spatial costs (those related to the distance from harbours of the fishing grounds) and, ultimately, spatial profits - this method require access to more disaggregated than DCF fleet segmentation and individual vessel VMS and logbook data.

ToR [c] applicability of proposed approaches – operational use.

The data sets and methods outlined in ToR [a] and [b] will be accessed for applicability considering the timing and resources available and operationalised through R scripts that could be applied to all EU Marine Regions.

ToR [d] all European marine regions, including the Mediterranean and Black Seas.

As there has been a lot of work done for North Atlantic region (WKTRADE 1-3), WKTRADE4 will prioritise development of the analysis for Mediterranean and Black

⁶ [Economic and Social Analyses - European Commission \(europa.eu\)](https://ec.europa.eu/economic-affairs/sectors/industry/aer/)

⁷ <https://cran.r-project.org/web/packages/SECFISH/index.html>

⁸ An example of the final output could be found here: [All data related to UK natural capital accounts: 2022 - Office for National Statistics \(ons.gov.uk\)](https://ons.gov.uk/economy/natural-resources/land-and-marine-resources/articles/all-data-related-to-uk-natural-capital-accounts-2022)

Seas Region.

ToR [e] for the regions represented document opportunity and limitations of spatial fisheries performance indicators (including revenue, costs, landings, value added, etc.) and/or of the input data needed and the capacity to link to benthic impact.

With insight from ToR a-d, the workshop will provide an overview for each EU (sub)region on the status of spatial fisheries performance indicators (including revenue, costs, landings, value added, etc.) and/or of the input data needed and the capacity to link to benthic impact. Both the opportunity and limitations should provide an overview of indicators used, or under development, by Regional Sea Conventions (RSC), EU STECF, Member States and ICES, for assessing impact of fisheries on seafloor habitats and their landings and economic performance. This review should specify the input data, how it is processed, the parameters of economic performance used, how quality is quantified, how the output is presented, and how confidence and uncertainty are handled.

Resource requirements	ICES secretariat support and advice process.
Participants	Technical 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 WGFBIT, WGSFD, WGECON and SCICOM.
Linkages to other organizations	Links to OSPAR and HELCOM.

Workshop on Stakeholder Input to Refine the Basis of Trade-off Assessments between the Impact of Fisheries on Sea-floor Habitats and their Landings and Economic Performance (WKD6STAKE)

2022/WK/HAPISG16 A Workshop on Stakeholder Input to Refine the Basis of Trade-off

Assessments between the Impact of Fisheries on Sea-floor Habitats and their Landings and Economic Performance (WKD6STAKE), chaired by Philip Boulcott, Scotland, UK, and David Connor, Ireland; will meet online on 9–10 October 2023 to:

- a) In the context of relevant and overlapping policy priorities (EU Green Deal, 30% marine protected areas by 2030, MSFD D6/D1, proposal for a Nature Restoration Law, etc.), prioritize five higher level analysis (graphs, plots, tables, maps, etc.) and associated management measures that can be used to easily communicate options (and trade-offs) to improve the health of the sea-floor;
- b) Provide a commentary on what is required to operationalize trade-offs analysis and policy implementation within the context of environmental policies (global, EU, regional and national) and fisheries management (RFMOs).

- c) Building on “trade-off” analysis used in 2021 ICES advice ([eu.2021.08](#)), the workshop participants will be asked to review and report on:
- i. how the trade-off analysis is linked to MSFD D6 assessment requirements at a (sub) regional (e.g. RSC) and consistency between (sub)regions of European marine waters, ,
 - ii. the operational challenges (short-, medium- and long-term) and solutions to implementing trade-off assessment results in the policy context,
 - iii. additional information to support decision-making to improve sea-floor habitats based on bottom-fishing activity.

WKD6STAKE will report by 1 November 2023 for the attention of ACOM and SCICOM.

Supporting information

Priority	High, in response to a special request from DGENV on a set of management options to reduce the impact of mobile bottom-contacting fishing gears on sea-floor habitats, and to provide a trade-off analysis between fisheries and sea-floor protection. The advice will feed into ongoing efforts to provide guidance on the operational implementation of the MSFD and related policies such as the EU Action Plan and the Nature Restoration Law.
Scientific justification	<p>ToR [a-c] ICES has launched its stakeholder engagement strategy as well as run a recent workshop on the implementation tools to make the strategy operational (report out in August 2023). ICES has a broad network of observers and stakeholders that can inform operational implementation aspects of “trade-offs”. Additionally, ICES so far has only received indirect knowledge from engagement in local/indigenous communities but moving towards more inclusive advice that incorporates local/indigenous communities is one of the drivers of ICES’s new strategy. More specifically the goal of ICES stakeholder engagement such as WKD6STAKE can be summarized as:</p> <ul style="list-style-type: none"> ● ensure input from various communities of knowledge so that essential knowledge from relevant disciplines and actor groups is incorporated into ICES science and advice; ● engage stakeholders and advice requesters to develop and deliver current and future advice products for the changing priorities of managing marine activities; ● increase legitimacy, ownership, and accountability for the creation of knowledge; and ● facilitate knowledge exchange and collaboration when addressing operational, tactical, and strategic challenges, thus enhancing innovation and social learning.
Resource requirements	Data Centre, Secretariat support and meeting room.
Participants	Stakeholder Meeting with relevant stakeholders from DG-Environment, DG-Mare, RSCs, NGO’s, National Fisher Organizations, and representatives from national agencies. Technical 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	None, apart from WebEx and SharePoint site provision
Financial	Covered by DGENV special request.
Linkages to advisory committees	Direct link to ACOM.

Linkages to other committees or groups	Links to WGFBIT, WGSFD, WGECON and SCICOM.
Linkages to other organizations	Links to OSPAR, HELCOM, UNEP/MAP and Black Sea Commission.

Joint ICES/ NMTT Nordic Climate Change Forum for Fisheries and Aquaculture workshop 2 (WKNCCFFA2)

2022/WK/HAPISG17

Joint ICES/ NMTT Nordic Climate Change Forum for

Fisheries and Aquaculture workshop 2 (WKNCCFFA2): Dealing with Maritime Space and User Conflicts in a New Era of Offshore Wind

The Nordic Marine Think Tank (NMTT), chaired by Dorothy Dankel, Norway; in collaboration with the International Council for the Exploration of the Sea (ICES), represented by Lisa Pfeiffer, USA; will meet at the Vestlandshuset/Vestlandssalen, hosted by the Vestlandfylkeskommune in Bergen, Norway, 30 November 2023 for a workshop to:

- a) Improve our knowledge about the broader societal impacts of the offshore energy production complex on the fisheries and aquaculture sectors. [Science Plan codes:](#) 4.5, 5.8, 6.6);
- b) Review and consider the recent Norwegian cross-directorate process, where environmental, fisheries and other data from maritime sectors was integrated to produce maps of marine spatial area conflict to initiate a process to identify suitable areas for offshore wind parks; ([Science Plan codes:](#) 7.3, 7.4, 7.5, 7.6);
- c) Based on Tor (a) and (b), develop an improved understanding of the range of impacts that will help policymakers to make more informed decisions regarding installations of sea-based energy production (principally wind) while informing fisheries managers about possible changes to fisheries management settings. ([Science Plan codes:](#) 7.6);
- d) Demonstrate the usefulness of a Digital Twin (in collaboration with the Norwegian/Swedish data company *Digital Tvilling*) concept for scenario co-development across the energy, fisheries and aquaculture sectors examining trade-offs of co-use and co-existence of offshore space. [Science Plan codes:](#) 3.6, 7.6).

WKNCCFFA2 will report by 15 December 2023 for the attention of ACOM and SCICOM.

Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries and trade-offs with marine renewables, especially concerning the application of the Precautionary Approach. Consequently, these activities are considered to have a very high priority. These activities can enhance the existing work in the ICES network regarding social trade-offs between different fishery and aquaculture management scenarios concerning marine renewables.
Scientific justification	The Climate Change Forum for Fisheries and Aquaculture was initiated in 2021 and established to discuss and exchange knowledge about climate change and its impacts on the fisheries and aquaculture sectors. Climate change is a long-term issue but with marked impacts already on fisheries and aquaculture. The Forum

	<p>contributes to our knowledge and understanding of how fisheries and aquaculture can address climate change and adapt to changing environmental ocean conditions brought about by climate change. The Forum is designed to focus on the Nordic cases and the emerging and evolving role of ICES as a science provider for more complex Marine Spatial Planning issues in the era of offshore wind. The purpose of this Forum is to frame these current issues of energy and food production into a Nordic cooperation frame: How can Nordic countries learn from experiences to prepare, with ICES, for a sustainable multi-use of Nordic marine areas?</p>
Resource requirements	<p>Resources are already committed from the Nordic Marine Think Tank, the Vestlandfylkeskommune (Western Norway's regional authorities), and student associates in Bergen, Norway. The additional resource required to undertake additional activities in the framework of this group is simply participation in the event by the SCICOM Chair, and, if possible, ACOM Chair.</p>
Participants	<p>The workshop will have a maximum capacity of 50–60 participants and guests primarily from Nordic countries.</p>
Secretariat facilities	<p>None.</p>
Financial	<p>The NMTT has secured 400 000 DKK to fund running costs associated to this event. The event will be free of charge for participants and live-streamed.</p>
Linkages to advisory committees	<p>ACOM - ongoing work on offshore renewable energy, spatial advice, social trade-offs within management scenarios, and development of climate-informed advice. EO, AO</p>
Linkages to other committees or groups	<p>HAPISG, HUDISG, ASG. WGSOCIAL (assessing social trade-offs around ORE), WGMBRED, WGOWDF, WGOORE, WGOOA.</p>
Linkages to other organizations	<p>The work of this group is closely aligned with similar work in NOAA and BOEM in the United States.</p>

Resolutions approved in 2021

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	5–9 June	Azores, Portugal		
Year 2024			Final report by DATE to SCICOM	

ToR descriptors

TO R	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 considered across all related ICES WGs.	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.
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.	3.1; 3.2; 3.5	3 year	ICES ASC session on innovative methods for macro- and microlitter monitoring Macrolitter identification exercise between labs, reported in the EG report. Other reporting platforms will be

		<p>Check possibility to organise a ringtest for seafloor litter monitoring based on the work previously initiated by WGML.</p> <p>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.</p>			<p>discussed.</p> <p>SWOT analysis of current monitoring approaches and perspectives for future monitoring for macro- and microlitter, reported in the EG report.</p>
c	<p>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.</p>	<p>Availability of high quality proficiency testing is vital to produce reliable results.</p> <p>Improve QA/QC of seafloor litter and microplastic data.</p>	4.1; 6.3	3 year	<p>Finalisation of seafloor litter monitoring guide as ICES TIMES publication.</p> <p>Yearly updates on outputs from other groups working on marine litter and from ongoing research projects, reported within the EG report</p>
d	<p>Align WGML with key international expert groups by collaborating with EMODNET regarding marine litter and microplastic data assessment and quality assurance.</p>	<p>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.</p>	3.1; 3.5	3 year	<p>WGML alignment with international partners</p> <p>Evaluation of data formats for microplastic and litter data submission, reported within the EG report.</p>
e	<p>Conduct an assessment of the distribution of abandoned, lost or otherwise discarded fishing gear (ALDFG).</p>	<p>The fisheries sector represent an important source of marine litter, especially through abandoned, lost or otherwise discarded fishing gear (ALDFG). More information is needed on the distribution and sources of ALDFG. WGML aims at assessing the distribution of ALDFG and identify main sources.</p>	2.1; 2.6	3 year	<p>Spatial distribution of ALDFG based on trawl surveys.</p> <p>Improved list of ALDFG for source identification.</p>

Summary of the Work Plan

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

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	6–9 November	Lisbon, Portugal		
Year 2024				

ToR descriptors

TO R	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	Review the methods for non-invasive imagery benthic data collection and interpretation methods.	<p>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.</p> <p>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 analyses and international collaboration.</p>	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.
b	Review the existing methods assessing the effects of energy emissions from benthal marine renewable	The present knowledge base informing the effects of MRED energy emissions on the benthos is either lacking	2.1, 2.2, 2.7	Year 1–3	Manuscript to be submitted to peer-reviewed journal.

	energy devices (MRED) to make recommendations for addressing knowledge gaps.	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.			
c	Develop the scientific basis to support decision making processes with regard to decommissioning of marine benthic 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 colonising organisms, and hence will modify the effect on the environment. As some of these effects are considered as 'positive', understanding the consequences of	2.1, 2.2, 6.1	Year 1-3	Manuscript to be submitted to peer-reviewed journal.

		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-ecosystem services linkage and use the available knowledge base from previous WGMBRED cycles to test selected assessment frameworks.	1.3, 7.2	Year 1-3	Report to ICES on the methodology to assess the effect of marine benthal energy devices on the biodiversity-ecosystem services link.
e	Review available literature on biological traits for application in assesments of the	The functional effects of the introduction of renewable energy devices in the marine	1.3, 2.1	Year 1-3	Report to ICES on the use of functional traits to investigate the

functional effects of renewable energy devices on the marine ecosystem	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.	effect of benthal renewable energy installations on ecosystem functioning
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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	<p>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 decommissioned and will be of direct use in marine spatial planning initiatives. Hence, the activities can be considered to be of very high priority.</p> <p>The WGM BRED work and ToRs are aligned with the ICES Science Programme and are of high priority. The WGM BRED 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.</p>
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	8–10 March	Athens, Greece		Meeting in association with WGITMO
Year 2024				

ToR descriptors

TO R	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 (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),	The BWMC aims to minimize the transfer of harmful aquatic 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	2.7, 4.1	3 years	Input on the general applicability or otherwise of such conditions or methods to IMO or national regulators through meeting participation, correspondence group and/or technical paper or peer-reviewed manuscript.

	or other aspects of the EBP.	need to be addressed.			
c	Investigate and evaluate the potential effects of shipping on biodiversity in a world transformed by climate change, and provide recommendations regarding the dispersal 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-reviewed manuscript.
e	Evaluate the development of DNA- and RNA-based molecular tools for surveillance and monitoring of ship-borne non-native species, including harmful species.	This work will be carried out jointly with WGITMO. Robust monitoring efforts for vessel-borne biodiversity (including non-native species) is critically 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	1.6, 4.4	3 years	Input on the general applicability or otherwise of such methods to IMO or national regulators through meeting participation, correspondence group and/or technical paper, peer-reviewed manuscript, or workshop.

compliance testing methods, and although some challenges remain, these tools warrant close scrutiny.

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	Standard EG support.
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 WGSHP. 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	17–21 April	Helsinki, Finland		
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 synthetic particles on marine biota.	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 providing surfaces for adsorption. The particles themselves will also affect organisms. Anthropogenically derived particles include micro- and nanoplastics, nanoparticles,	3.1; 3.2; 6.1	3 years	Report to ICES, Scientific paper

		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 methods to address the bioavailability and effects of contaminants on sediment-dwelling	The highest concentrations of contaminants 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	2.2	3 years	Report to ICES

	organisms.	<p>because of low bioavailability and because the organisms that are used are robust.</p> <p>Review and update/provide sediment quality guidelines, including assessment of bioavailability, the selection of and sublethal endpoints in organisms.</p> <p>MCWG requested WGBEC to provide a list of simple methods for sediment toxicity testing.</p> <p>WGBEC will investigate different taxonomic groups in order to find more sensitive test species and sublethal endpoints.</p>			
h	Evaluate species differences in biological effects monitoring.	<p>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.</p>	2.3, 2.4	3 years	Report to ICES
i	Effects of mixtures of chemicals on marine organism.	<p>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.</p>	2.1; 2.2; 4.5	3 years	Report to ICES
j	Contribute to ICES Ecosystem Overviews as requested by IEASG Expert Groups.	<p>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.</p>	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
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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 of 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	DURATI ON	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. 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.	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 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 parameter 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	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 constitute direct input into the marine systems and require follow-up and identification of knowledge gaps.	2.1; 2.2; 2.7; 4.5; 6.1	years 2-3	Publications, contributions to joint WG reports, Final report to ICES.

	(such as exhaust gases, spills and scrubbers) on the marine environment.	Specifically for offshore windfarms, continued review of chemicals and different legislation between countries, (in cooperation 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 WGSHP; collecting information on monitoring of munition dumping sites (influence of TNT and other products); and deep-sea mining.			
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); and provide inputs to Ecosystem Overviews (J).	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.
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	Ecosystem Overview input as required. Response to advice requests as required.

Summary of the Work Plan

	Refine ToRs. Respond to requests.
Year 1	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	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	WGBEC, WGML, WGSHP, 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	26–30 June	Rennes, France		
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 management.	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 synthesis of the work realized since 2012 (i.e., everything in one place) would be an effective communication tool.	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 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	13–17 November	East Lansing, USA		
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 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	5.1; 5.4	3 years	Report on steps taken to validate each method examined and any caveats. Write clear conclusions in report (e.g. as: "method X is a valid alternative when ..."). Scientific publications when possible.

		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.			
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
f	Provide a reference document describing the set of stock assessment model diagnostics that should routinely be reported by assessment working groups and benchmarks to evaluate the adequacy of the model fit. The document should include the mathematical description of the indicators, an explanation of what they measure, guidance on evaluation and a practical example.	ACOM requested this ToR as an addition to the ToR e) for this group. There has already been a lot of work done on this topic, but a single reference document for ICES has not been produced. This ToR will create such a reference document.	5.1	2 years	A reference document citing recent work on diagnostics and including a worked example of their application.

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	Reports on keyrun reviews to be provided after each review is complete	
Year 2023	9-13 October	Edinburgh, UK	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	This ToR acts to increase the speed of communication of new	5.1; 5.2; 6.1	3 years	Report on further progress and key updates.

	on multispecies modelling and ecosystem data analysis contributing to modeling throughout the ICES region	results across the ICES area			Review and collaborate 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,	This ToR looks for multispecies and ecosystem approaches to understand the	2.5; 5.2; 6.1	3 years	Review methods to evaluate populations and ecosystem resilience.

including evaluation of management procedures and estimation of biological reference points under the uncertainties of climate change.	resistance and resilience 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
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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	Online meeting		
Year 2023	tbd	tbd		
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	<p>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.</p> <p>The WGSHP 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 WGSHP can be considered to be of high priority.</p>
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.

Working Group on Spatial Fisheries Data (WGSFD)

2021/FT/HAPISG14 The **Working Group on Spatial Fisheries Data (WGSFD)**, chaired by Patrik Jonsson, Sweden; and Jeppe Olsen, Denmark; 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	25-29 September	ICES HQ, Copenhagen, Denmark		Outgoing chair: Neil Campbell, Scotland, UK Incoming chair: Jeppe Olsen, Denmark
Year 2024			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 adequate for the existing data requirements	Members of WGSFD developed a workflow to process the ICES VMS and logbook data call. The workflow needs regular revisions to update with changing datacall requirements.		3 years	Section in WG report (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	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	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).

	<p>are applied when processing mapping.</p> <p>electronic vessel tracking data.</p> <p>- 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.</p>	<p>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 (WKSSFGE0) provides a collection of case studies across the EU and progress on how to infer fishing activity and estimation of fishing effort.</p>			
d	<p>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</p>	<p>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 travel in two hours. In its previous term, WGSFD noted this hindered a move towards higher spatial resolution in the ICES VMS data calls.</p> <p>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.</p>	3.5, 5.4, 6.1	3 years	<p>Section in WG report describing what information will be requested from data submitters. (Year 1).</p> <p>Section in WG report describing median polling frequencies by fleet for respondents to the data call. (Year 2)</p> <p>Recommendations to WGSFDGOV regarding future changes to the spatial resolution of the data call. (Year 3).</p>
e	<p>Improve the utility of WGSFD outputs to the ICES community.</p>	<p>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</p> <p>Specific issues which have been raised include:</p> <p>WGSCALLOP have requested maps of scallop fishing</p>	1.5, 4.4, 5.4	3 years	<p>Section in WGSFD report identifying fisheries where this issue is seen and how it can be resolved (Year 1).</p> <p>Recommendations to WGSFDGOV regarding future changes to data fields required in the data call (Year 1).</p> <p>Updated workflow</p>

		<p>grounds, which cannot currently be provided due to aggregation of king scallops, queen scallops and mussels into DRB_MOL.</p> <p>To support studies of seabird bycatch, WGBYC are seeking maps of distribution of pelagic trawl and longline fishing effort.</p>			<p>script to facilitate the inclusion of this information (Year 1).</p> <p>Section in WGSFD report describing findings (Year 2).</p> <p>Provide section for WGSCALLOP report describing spatial extent of scallop fisheries. (Years 2-3).</p> <p>Provide support to WGBYC describing spatial extent and temporal patterns in pelagic fisheries. (Years 2-3).</p>
f	<p>i) Analyse and produce maps of bottom contacting fishing activity in NEAFC areas using the VMS and logbook information provided by NEAFC.</p> <p>ii) Investigate the use of ICES VMS data to refine the advice provided to NEAFC</p>	<p>WGDEC has used effort data produced by WGSFD using 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.</p> <p>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.</p>	3.5, 4.2, 6.1	3 years	<p>Maps provided annually to WGDEC (Years 1-3).</p> <p>Section in WG report comparing NEAFC VMS data product with ICES data call outputs (Year 1)</p>
g	<p>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</p>	<p>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.</p> <p>Through the ICES data call on VMS and logbook data we now</p>	5.4, 6.1, 6.2	3 years	<p>Peer reviewed paper.</p> <p>Section in the WG report on drivers of fisheries displacement.</p> <p>Section in the WG report on the development of a common ICES spatial data</p>

integration of different marine layers.	<p>have the information available to identify the spatial variability of fisheries over time.</p> <p>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.</p>	<p>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.</p>
h Working with WGFTFB, provide a commentary based on expert judgement as well as NEAFC VMS and catch report data analysis on current and potential maximum depth on the use of mobile bottom contacting gear (trawls) and bottom contacting static gear in the NEAFC regulatory area.	<p>Advisory requirement.</p> <p>In the context of setting up OECMs, NEAFC will require information on areas that may be fished in the future. As such, an analysis of current NEAFC fishing practices in terms of maximum depth and in terms of general bathymetric features is required to inform the likely future extent by depth of fishing. This commentary by WGFTFB/ WGSFD will serve as input to an ICES workshop, 7-11 August, that will also look at the long-term biodiversity/ ecosystem benefits of 1) areas restricted to bottom fishing, and 2) closed areas according to the VME Recommendation (19:2014).</p>	<p>1 year</p> <p>Material provided to ACOM by 28 July 2023.</p>

Summary of the Work Plan

Year 1	<p>Linked to ToRs:</p> <ul style="list-style-type: none"> a) Refine data call, produce fishing activity layers, highlight and address issues. b) Identify suitable habitat layers and incorporation 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
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	g) Establish links with WGSCALLOP, WGBYC and with regular communications.
Year 2	<p>Linked to ToRs:</p> <p>a) Refine data call, produce fishing activity layers, highlight and address issues.</p> <p>b) Review incorporation of identified habitat layer in data call</p> <p>c) Report on spatial distribution of pelagic fisheries</p> <p>d) Provide report on fishing activity around VME areas in the NEAFC RA, with WGDEC</p> <p>e) Document differences in polling frequency and implications for spatial resolution</p> <p>f) Organise a join workshop with WGCATCH and WGBYC.</p>
Year 3	<p>Linked to ToRs:</p> <p>a) Refine data call, produce fishing activity layers, highlight and address issues.</p> <p>b) Review incorporation of identified habitat layer in data call</p> <p>c) Report on spatial distribution of TBB/PUL/PUK fisheries</p> <p>d) Provide report on fishing activity around VME areas in the NEAFC RA, with WGDEC</p> <p>e) Deliver ICES ASC theme session on spatial data in small scale fisheries</p>

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	23-27 October	Online meeting		
Year 2024			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 addressing cumulative effects to identify data and knowledge needs	The ICES framework provides practical guidelines on how to prioritise 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 between CEA framework and other ICES products and liaise with other fora and/ or expert groups both within ICES (i.e. Secretariat, Data Centre	The assessment of cumulative 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	6.2, 6.4, 6.5	Year 1-3	Identification of action points and linkages. Index of cumulative effects.

or expert groups) as well as outside ICES. Investigate the development of a cumulative effects estimate for potential inclusion in the Ecosystem Overviews (EOs).	be identified. Further, the consolidation of a common CEA framework requires a continuous collaboration and exchange of expertise with other groups and fora working on CEAs.
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Summary of the Work Plan

Year 1	Ongoing work will focus on the application of the CEA framework in case study 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 cumulative 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 synthesise the scientific advancements 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, WGOORE, 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	28 November - 2 December	Paris, France		
Year 2023	20-24 November	Plymouth, UK		
Year 2024				

ToR descriptors

TO R	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.,	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).

	offshore wind farms and aquaculture).				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	<p>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.</p> <p>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)</p> <p>An assessment of how projected climate change could impact MPAs and MPA network effectiveness.</p> <p>Recommendations on how to best design and climate proof MPA networks.</p>

Summary of the Work Plan

Year 1	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> • 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).
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Supporting information

Priority	<p>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.</p> <p>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.</p>
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, WGOORE, WGMGBRED. 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 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; Caitriona Nic Aonghusa, Ireland; and Talya ten Brink, USA; will be established and will meet online, 11–12 October 2023 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 1 December 2023 (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 are 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 and 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 committee 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, DC MARE, COPERNICUS Climate Data Store, National Planning Authorities.

Resolutions approved in 2020

Working Group on Economics (WGECON)

2020/FT/HAPISG04 The **Working Group on Economics (WGECON)**, chaired 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	19–23 June	Edinburgh, UK	Final report by 15 August to SCICOM	Potentially introduce additional chair(s) to ensure transition towards future WGECON

ToR descriptors

TO R	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 contribute 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	<p>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:</p> <ul style="list-style-type: none"> - 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 dimensions 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. <p>Produce e-evaluation report.</p>
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	<p>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.</p> <p>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.</p> <p>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.</p>
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).
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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	12–15 June	Falmouth, UK	Final report by 15 August 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 21 st 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	<p>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.</p> <p>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.</p>
Years 2 and 3	<p>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.</p> <p>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.</p>

Supporting information

Priority	<p>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</p>
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	<p>and their current impacts – has great potential for informing decision making and management of ecosystems and marine service industries in the future.</p> <p>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.</p>
Resource requirements	<p>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.</p> <p>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.</p>
Participants	<p>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.</p>
Secretariat facilities	Standard EG support.
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, WGECON, 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	6–10 November	Santander, Spain	Final report by 15 December 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

		<p>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 collaboration.</p>		
c	<p>Review recent advances in marine habitat mapping and modelling techniques, including field work methodology, and data analysis and interpretation</p>	<p>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.</p>	<p>1.3, 1.4, 1.5, 3.2, 3.4</p> <p>Years 1–3</p>	<p>Meeting reports</p>
d	<p>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 indicator 'extent') to use habitat maps for monitoring of the environment.</p>	<p>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.</p>	<p>1.3, 1.4, 1.5, 3.2, 3.4</p> <p>Years 1–3</p>	<p>Meeting reports</p>
e	<p>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.</p>	<p>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 sources that are of value for marine habitat mapping into one database.</p>	<p>1.3, 1.4, 1.5, 3.2, 3.4</p> <p>Years 1–3</p>	<p>Meeting reports</p>
f	<p>Identify and advance theoretical aspects of</p>	<p>This ToR is to provide an opportunity for EG members</p>	<p>1.3, 1.4, 1.5, Years 1–3</p>	<p>Meeting reports and scientific</p>

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
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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 EG 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	20–24 November	Tvarminne, Finland	Final report by 15 January 2024 to SCICOM
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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 WGEKO 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). Priority 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 environmental 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) WGFBIT 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 envisioned that future funding will be available 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 EG 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 Working Groups WGECO, WGDEC, WGSFD, BEWG, WGMHM, WGIMM, WGMRED, 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.
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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		
	6 December	Online meeting		
Year 2023	12 September (ASC 2023)	Bilbao, Spain	Final report by 1 November to SCICOM	

ToR descriptors

TO R DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a Cumulative Effects Assessment of offshore wind, wave, and tidal farms in the ICES area.	<p>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.</p> <p>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.</p> <p>c) Link up with WGCEAM</p>	2.1, 2.2, 2.4	3 years	Peer-reviewed journal paper
b Review of the use and environmental effects of chemicals	a) There is growing evidence that large quantities of chemicals and metals are being used in offshore renewables. The goal is to	2.1, 2.4, 2.6	3 years	Peer-reviewed

	in offshore wind, wave, and tidal farms	<p>identify the chemical groups being used, quantify the usage and the environmental risk.</p> <p>b) Chemical contaminants can impact all levels of receptor in the ecosystem. The widespread 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.</p> <p>c) collaboration with the ICES WG Marine Chemistry and WGM BRED</p>			journal paper
c	Evaluate and report on the environmental effects of emerging marine renewable energy technologies and devices.	<p>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.</p> <p>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.</p> <p>c) Ad-hoc requests if required to other WG. Particularly WGM BRED.</p>	2.1, 2.7	3 years	Peer reviewed journal paper. Most likely a review paper.
d	Review and report on (re)emerging environmental issues for offshore wind, wave, and tidal renewable energy technologies	<p>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.</p> <p>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.</p> <p>c) Link up with work from WKT BIMP, WGOWDF and associated groups</p>	2.1, 2.7	3 years	Short report with WG final report. (Possible journal paper if sufficient content)

Summary of the Work Plan

Year	ToR A: Identify pressures to be included, data sets to be used and define methodology(ies) to be used.
1	<p>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.</p> <p>ToR B: Refine scope of work, define data sources and chapter structure for reporting. Make contact with ICES WG Marine Chemistry to agree workload.</p> <p>ToR C: Define chapter structure, identify emerging technologies.</p> <p>ToR D: Review status on known and newly emerging environmental issues. Define chapter structure for reporting.</p>

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, WGM BRED, WGCEAM and WGOWDF.
Linkages to other organizations	None currently.

EGs DISSOLVED in 2022

WKVMEBM	Benchmark Workshop on the occurrence and protection of VMEs
WKEMBYC2	Workshop on mitigation measures to reduce bycatch of short-beaked common dolphins in the Bay of Biscay
WKBENTH2	Workshop to scope assessment methods to set thresholds and assess adverse effects on seabed habitats
WKBENTH3	Workshop to evaluate proposed assessment methods and how to set thresholds for assessing adverse effects on seabed habitats