

## **Human Activities, Pressures and Impacts Steering Group EGs Resolutions**

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## Working Groups transferred from HAPISG to HUDISG

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The following groups have been transferred to the resolutions file for **Human Dimension Steering Group (HUDISG)** Expert Groups; although they formally belong to HAPISG until 1 January 2024:

- **Working Group on Economics (WGECON)**
- **Working Group on the History of Fish and Fisheries (WGHIST)**
- **Working Group on Marine Planning and Coastal Zone Management (WGMPCZM)**

## Resolutions approved in 2023

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### 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.*

**2023/AT/HAPISG01**      The **Working Group on Bycatch of protected species (WGBYC)**, chaired by Lotte Kindt-Larsen\*, Denmark; Ailbhe Kavanagh\*, Ireland; and Guðjón Már Sigurðsson, Iceland; will meet in Bayeux, France, 16–20 September 2024 to:

- a) Review and summarize information submitted through the annual bycatch data call and other means for assessment of endangered, threatened and protected (ETP) species bycatch;
- b) Collate and review information from WGFTFB national reports and recent published documents relating to implementation and tests of ETP 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 ETP species through a Bycatch Evaluation and Assessment Matrix, BEAM, to:
  - a. underpin assessments on the bycatch range (minimum/maximum) as appropriate,
  - b. highlight data deficient situations,
  - c. where possible, assess population impacts;
- d) Continue to develop and refine the methodology to assess data poor species, for which bycatch rates and associated markers of sustainability are unavailable;
- e) Review ongoing monitoring of different taxonomic groups in relation to spatial bycatch risk and fishing effort to inform coordinated sampling plans;
- f) For data deficient situations as highlighted in ToR c, propose measures necessary to obtain the required information;
- g) Continue, in cooperation with the ICES Data Centre to develop, improve, populate, and maintain the WGBYC and RDBES databases on ETP species bycatch monitoring and fishing effort in ICES and Mediterranean waters through formal data calls (Intersessional).

WGBYC will report by 25 October 2024 for the attention of ACOM.

### Supporting information

Priority	<p>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.</p> <p>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.</p>
Scientific justification	<p>ToRs a-e) 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 ETP species bycatch, which both require the regular evaluation of input data and resulting bycatch assessments.</p> <p>ToR f) will contribute to practical recommendations on how to improve data collection and data quality.</p> <p>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.</p>
Resource requirements	None beyond usual Secretariat facilities
Participants	25–30 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, WGTIFD, WGSFD, WGRFS, WGJCDP WKSUP, WGRDBESGOV, HAPISG, 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.*

**2023/AT/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 at the ICES HQ, Copenhagen, Denmark, 25–29 March 2024 to:

- 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, and in EU waters in relation to the EU deep-sea access regulation. In addition, evaluate whether the EU VME advice needs to be updated, based on the criteria suggested by WGDEC in 2023 (ToR c) and agreed in dialogue with ACOM leadership.
- c) Conduct a review of historical records included in ICES VME Database.
- d) Begin a preparatory scope and draft resolution for a workshop to improve the VME index, taking into consideration the known limitations of the VME Index and the weighting algorithm method for identifying areas where VME are likely to occur in the Northeast Atlantic region.
- e) Review and update advances in knowledge of the life history, connectivity and ecology of VME indicator taxa, with an emphasis on the Northeast Atlantic, and identify research priorities.
- f) Conduct a literature review of the impact of different bottom-contact static gears on VMEs and understand the ecosystem effects of different static gears and begin a preparatory scope for a future workshop in consultation with WGSFD aiming to review and assess the impact of different gear types on VMEs across the ICES area.
- g) Recommend next steps for a future incorporation of species distribution models in consultation with WGMHM into the ICES VME advice framework.

WGDEC will report by 3 May 2024 for the attention of the ACOM and SCICOM.

### Supporting information

Priority	The current activities of this Group will enable ICES to respond to advice requests from a number of clients (NEAFC/EC). Consequently, these activities are considered to have a high priority.
Scientific justification	<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 2024 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] New information on the occurrence and distribution of VMEs, VME indicator taxa and VME elements 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. WGDEC is also requested to review and report new information on the occurrence and distribution of VMEs within EU waters in line with the EU request in 2023 to “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 achieve” (ICES WGDEC, 2023).</p>

ToR [c] The VME database forms the evidence base upon which ICES basis its VME advice. Performing standard database consistency checks on the historical holdings in conjunction with the data owners will help ensure the quality of this advice.

ToR [d] As part of the European Commission MoU request to “As per article 9(4) Regulation (EU) 2016/2336, establishing specific conditions for fishing for deep-sea stocks (commonly referred as “Deep-sea access regulation”), WGDEC together with WGSFD is requested to contribute towards carrying out an annual assessment of areas where VMEs are known to occur or are likely to occur in EU waters. This recurring advice that WGDEC together with WGSFD contribute towards, should be based on the ICES advice provided on 5 January 2021, which established a list of VMEs occurrences and likely occurrences for regulatory purposes. The ICES Benchmark Workshop WKVMEBM on the occurrence and protection of VMEs reviewed existing methods used by ICES for the provision of VME advice. WGDEC is requested to make recommendations and draft a request for an ICES Workshop aiming to address known limitations and validation of the VME Index using existing data sets of known distribution of VME, and to identify and trial approaches to improve the multicriteria weighting algorithm method (VME index).

ToR [e] Understanding the life history of VME species and ecological issues associated with natural and anthropogenic pressures is essential to support conservation and management strategies. WGDEC is requested to collate recent/new information on the ecology of VMEs within ICES ecoregions, identifying research priorities with the focus on VME assessment methods and relevant information that underpins the assessment and the provision of management advice.

ToR [f] In light of recent literature, the footprint and effects of bottom contacting gears differ between mobile and static. In order to use the best available knowledge, a literature review of the effects of static bottom-contact gears on VME (including differences inherent to regions) will be conducted to inform ICES advisory process. WGDEC will formulate recommendations for a future workshop aiming to review and assess the impact of different gear types on VMEs and to understand the ecosystem effects of different fishing gears.

ToR [g] In line with the outcome of WKVMEBM 2022, in collaboration with WGMHM, the implementation of predictive habitat modelling (PHM) to determine likely VME occurrence, standards for data and modelling approaches for PHMs need to be developed for use in supporting ICES advice, together with a set of criteria for model outputs that would be most useful in communicating ICES advice. WGDEC will formulate recommendations for a workshop aiming the incorporation of species distribution models into the ICES VME advice framework.

Resource requirements	Some support will be required from the ICES Secretariat.
Participants	The Group is normally attended by some 15–20 members and guests.
Secretariat facilities	None, apart from WebEx and SharePoint site provision
Financial	No financial implications.
Linkages to advisory committees	ACOM is the parent committee and specific ToRs from WGDEC provide information for the Advice Committee to respond to specific requests from clients.
Linkages to other 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.*

**2023/AT/HAPISG03**      **The Working Group of the Ecosystem Effects of Fishing Activities (WGECO)**, chaired by Tobias van Kooten, NL; and Brian Smith, USA; will meet at ICES HQ, Copenhagen, Denmark , 8–12 April 2024 to:

- a) Examine the role of fishing displacement in ecosystem-based management. Consider the ecological consequences of displacement by emergent human activities and more generally spatial planning and their effect on policy objectives. Consider whether displacement of fishing from Offshore Renewable Energy development areas could also be synergistic with the need for increases in offshore MPAs, and the extent to which these spatial uses are mutually compatible.
- b) In discussion with ICES leadership (secretariat, ACOM, SCICOM), identify emerging issues in relation to fisheries and ecosystems. Determine, based on policy priorities, which issues are most important for the future provisioning of ecosystem advice by ICES. Establish science priorities for these issues in consultation with relevant ICES EGs, and provide an overview of strengths, weaknesses, and potential missing elements in ongoing research through ICES, international (HEU) and national projects known to the WGECO members.
- c) Develop a framework to specify thresholds for indicators of the state of, or pressure on, ecosystem components and functions. Existing management frameworks require threshold reference points for ecosystem indicators to assess status (e.g., in or out of GES). In some cases, quantitative data are available to define these thresholds (e.g., Fmsy) but this will often not be possible. WGECO will work towards a framework for approaches to define thresholds depending on the knowledge available at the time. WGECO will apply this framework to one or more examples and will advise on potential thresholds or proxies in the case of “cumulative impacts”.
- d) Evaluate the application of spatial distribution indicators based on survey data and fill in the main gaps for its proper use in monitoring. This will be done by (i) developing procedures to estimate error measures for spatial indicators (so that groups of samples can be compared), (ii) suggesting methods to identify the appropriate scale of applying indicators for monitoring (i.e., where do we split or merge areas to estimate the spatial indicators) and (iii) commencing work on spatial overlap indicators. Trends in these indicators will be analyzed in relation to climate change, abundance change, and large-scale fisheries closures.

WGECO will report by 6 May 2024 (via HAPISG) for the attention of ACOM and SCICOM.

## Supporting information

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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>
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Scientific justification	Term of Reference a) Previous work has shown that emergent human activities such as offshore renewable energy (ORE) development will impact fisheries with the potential for displacement of fishing effort. The extent of this displacement may be akin to MPA implementation. The work for this TOR will identify and examine how this displacement may affect ecosystems in terms of overlap with ecological processes (e.g. fish and benthos distributions, predation, habitat preference). Additionally, with continued interest in offshore MPAs, this TOR will also consider how ORE areas and MPAs may function synergistically with variable effects for fish and benthos.
	Term of Reference b) The membership of WGECO collectively has a uniquely complete overview of ongoing research in the field. Explicitly putting this overview together and cross-checking it with policy priorities is expected to yield a tangible and actionable review of the science community's capacity to provide advice on future policy and management issues.
	Term of Reference c) A successful framework for setting thresholds will require consistency across taxa and ecological groups. The risk of threshold framework development in taxon-specific expert groups is that such consistency does not emerge. Another risk is that this leads to frameworks which may be ecologically strong, but inefficient for policy and management. WGECO members collectively have the overview and policy sensitivity to develop a balanced, high quality and applicable framework for setting thresholds.
	Term of Reference d) 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 continued operationalization of these indicators by developing methods to quantify error for spatial indicators and recommending methods for choosing an appropriate spatial scale for monitoring species distributions. Indicators that are evaluated to be promising will be applied to fish and benthic invertebrate species in the ICES region. The outcome of this TOR will provide potential input for the ICES Ecosystem Overviews.
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 Offshore Renewable Energy (WGORE)

2023/MT/HAPISG04 The **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 2024	9 September (ASC 2024)	Gateshead, UK		
Year 2025				
Year 2026			Final report by DATE to SCICOM	

## ToR descriptors

TOR DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	DURATION	EXPECTED DELIVERABLES
a Cumulative Effects Assessment of offshore wind, wave, and tidal farms in the ICES area.	a) Assess cumulative environmental effects of ORE at ecosystem and regional scales applying state of the art assessment methodologies. b) Individual countries are largely focused on their ORE developments with regulatory systems only set up to deal with internal assessment but not cross border. The work would provide an ecosystem approach for dealing with cross border discussions between member states. c) Link up with WGCEAM	2.1, 2.2, 2.4,	3 years	Peer-reviewed journal paper(s)
b Review of the use and environmental effects of chemicals in offshore wind, wave, and tidal farms.	a) There is growing evidence that large quantities of chemicals and metals are being used in offshore renewables. The goal is to identify the chemical groups being used, quantify the usage and the environmental risk. b) Chemical contaminants can impact all levels of receptor in the ecosystem. The widespread distribution of ORE means contaminants can have an impact across a very wide area. Understanding a new source of contaminants is key to effective management. c) Continued collaboration with the Marine Chemistry Working Group (MCWG) and the Working Group on Marine Benthic and Renewable Energy Developments (WGMRED).	2.1, 2.4, 2.6	3 years	Peer-reviewed journal paper

c	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 WKTBIMP, WGOWDF and associated groups.</p>	2.1, 2.7, 4.5	3 years	Short report with WG final report. (Possible journal paper if sufficient content)
d	Review on effectiveness and transferability of management measures to reduce, mitigate or compensate damage of the natural environment.	<p>a) In the ICES area various measures are applied to reduce the environmental impact of ORE development. Robust validation of their effectiveness is rare and may not be transferable to other project locations. Here we leverage the existing community of practice to evaluate which measures were shown to be effective and how broadly they can be applied.</p> <p>b) Following the mitigation hierarchy, management measures here include Reduction, Mitigation and Compensatory measures of damage to the natural environment (avoidance will not be considered as this falls under planning).</p> <p>c) Link with WKOMRE. Consult with relevant WG's on knowledge of effectiveness.</p>	2.7, 6.1, 6.2	3 years	Peer-reviewed journal paper
e	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 WGMBRED.</p>	2.1, 2.7	3 years	Peer reviewed journal paper.

## Summary of the Work Plan

Year 1	ToR A. Finalize paper identifying the steps needed to move towards a cumulative environmental effects of ORE at ecosystem and regional scales. Select methodology for assessment.
	ToR B. Refine scope of work, define data sources and chapter structure for reporting. Contact ICES WG Marine Chemistry to confirm workload split. Analyse the data and begin draft report.
	ToR C. Review status on known and newly emerging environmental issues. Define chapter structure for reporting.
	ToR D. Identify management measures to be included in the review. Organize technical workshop on how to assess effectiveness. Define chapter structure for reporting.
	ToR E. Address reviewer comments and finalise paper.
Year 2	ToR A. Apply identified methodology. Link up with WGCEAM to help define the parameters.
	ToR B. Finalise analysis and complete reporting. Identify remaining knowledge gaps and concerns.
	ToR C. Finalise analysis and complete reporting.
	ToR D. Analyse and draft paper. Disseminate first results.
	ToR E. Annual update of developments
Year 3	ToR A. Finalise analysis and complete reporting.
	ToR B. Report on remaining knowledge gaps
	ToR C. Update report on (re)emerging environmental issues for offshore wind, wave, and tidal renewable energy technologies with input from group members and input from WKTBIMP, WGOWDF and associated groups.
	ToR D. Update and finalise paper
	ToR E. Annual update of developments

## 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 and the implementation of the ICES Roadmap on offshore renewable energy. Consequently, these activities are considered to have a very high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 20–25 members and guests.
Secretariat facilities	None. Possible support with workshop under ToR D.
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 is a very close working relationship with MCWG, WGMRED, WGCEAM and WGOWDF.
Linkages to other organizations	None currently

Working Group on Marine Habitat Mapping (WGMHM)

2023/MT/HAPISG05      The **Working Group on Marine Habitat Mapping (WGMHM)**, chaired by Julian Burgos, Iceland; and Jose Manuel González Irusta, Spain; will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2024	4–8 November	ICES HQ, Copenhagen, Denmark		
Year 2025				
Year 2026			Final report by DATE to SCICOM	

ToR descriptors

TOR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	DURATION	EXPECTED DELIVERABLES
a	Review recent advances in marine habitat mapping and modelling, including field work methodology, data analysis, interpretation and dissemination, mapping in new areas, and where possible new theoretical approaches and social science techniques.	This ToR provides the main avenue for mappers to communicate new or improved techniques to the other scientists present. As such, this ToR is essential for spreading best practice and developing new methods.	1.5, 4.1	Years 1–3	Meeting reports
b	Discuss current and potential application of habitat maps for the monitoring and management of marine ecosystems.	Members of the group are often the creators of these maps and have important insights into how the maps can be used for scientific and management purposes.	3.4, 6.1, 6.2	Years 1–3	Meeting reports. Scientific publication.
c	Identify caveats and limitations of Predictive Habitat Models that limit their use in direct management.	Predictive Habitat Models can provide useful outputs, but their use in management is limited. This ToR aims to identify factors that limit the adoption of model output into management, potentially supported by suggestions from external marine managers.	1.5, 6.1, 6.2	Years 1–3	Meeting reports
d	Propose methodologies and solutions to address the limitations identified in ToR c (e.g. improving	To stimulate the use of outputs from Predictive Habitat Models for management purposes, this ToR will identify and develop	1.5, 6.1, 6.2	Years 1–3	Meeting reports

	communication to managers and other stakeholders, better representation of uncertainty).	solutions to address limitations to their use. This could involve, for example, integrating fishers knowledge (using social science methods) to help develop more effective spatial fishery management measures in the future.			
e	Develop guidelines to integrate multiple sources of spatial information on the distribution of habitats to produce maps representing the best available evidence.	Habitat maps are produced at different spatial resolutions, based on different types of data, and producing output of varying uncertainty. More than one map may be available for a particular site. Methods need to be developed to combine multiple sources of spatial information, reflecting the weight of evidence for the presence of habitats in a particular area.	1.5, 3.2, 4.3	Years 1–3	Meeting reports. Scientific publication.

### Summary of the Work Plan

Year 1	Cover ToRs A-E.
Year 2	Cover ToRs A-E. Support a second 'Workshop on the Use of Predictive Habitat Models' (WKPHM2) to be held jointly with the Working Group on Deep-Water Ecology (WGDEC).
Year 3	Cover ToRs A-E.

### Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries, especially with regard to the application of the Precautionary Approach. Consequently, these activities are considered to have a very high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 10–15 members and guests.
Secretariat facilities	Standard support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	Linkage to WGDEC (advice legacy group).
Linkages to other committees or groups	There is a very close working relationship with WGDEC. It is also very relevant to BEWG, WGECON and WGSOCIAL.
Linkages to other organizations	

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

2023/MT/HAPISG06

The Working Group on Fisheries Benthic Impact and Trade-offs

(WGFBIT), chaired by Jan-Geert Hiddink, UK; Marija Sciberras, UK; and Tommaso Russo, 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 2024	18–22 November	Nantes, France		
Year 2025				
Year 2026			Final report by DATE to SCICOM	

### ToR descriptors

ToR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	DURATION	EXPECTED DELIVERABLES
a	<b>Regional assessments.</b> Apply and improve the seafloor assessment framework developed by WGFBIT to produce standardized sub-regional assessments of seabed state for the North, Celtic, Baltic, Arctic (Icelandic, Norwegian Barents sea), Mediterranean Seas and the Bay of Biscay and the Iberian Coast, in shallow waters (<200) and deep-sea areas (200-800m), and explore methods to set thresholds between good and degraded seabed state.	EU MSFD D6/D1 requires the assessment of the impact of physical disturbance on seabed habitats. Such methods are also needed by non-EU ICES countries. Seabed state assessments will be able to inform management decisions on how to achieve good environmental state at regional scales.	1.9, 2.1, 2.4, 6.3	3 years	Year 1: A draft Europe-wide set of regional assessments of the impact of towed bottom fisheries using standardized methodologies.  Year 2 & Year 3: Further extension of the assessments into deeper waters for the regions where this is missing, and into regions where assessments have not been completed before.
b	<b>Trade-offs between benthic impacts and fisheries values and landings</b> Evaluate impacts of different management scenarios, including MPAs	DGENV activity and especially the implementation of the MSFD require the preliminary evaluation of different spatial scenarios which, in turn, should be based on the spatial assessment of both impacts and economic indicators (landing value, costs, gross value added). The combined analysis of potential environmental benefits and related economic impacts on the fleets will allow to identify the best scenarios to achieve sustainability.	2.7, 5.4, 6.2, 6.4	3 years	Year 1: A series (not necessarily complete for all European seas) of state-of-the-art regional spatial assessments of the impact of towed bottom fisheries and of the related economic indicators (landing values, Gross Value Added, Costs).  Year 2 & Year 3: Further extension of the assessments to all the European Seas. Consolidation and standardisation of

					methodologies for: 1) trade-off analysis; 2) estimation of possible consequences of spatial closures (displacement and its consequences on impacts and economic indicators)
					Research paper(s)
c	<b>Knowledge exchange with other regional assessment methods.</b> Keep informed about development of other methods for the regional assessment of bottom trawling impacts in a two-way knowledge exchange of the WGFBIT seafloor assessment framework with other assessment methods for benthic habitats under relevant EU directives (e.g. TGSeabed, NAFO).	The WGFBIT seafloor assessment framework (based on assessing the relative benthic state) is not the only way to assess benthic impacts from physical disturbance. Other methods are being developed in parallel. Therefore, alignment with other methods needs to be explored and compare the consistency of outputs.		3 years	
d	<b>Ecosystem functioning.</b> Examine the effect of trawling using functional traits as proxies for predicting ecosystem functioning responses to fishing pressure.  Develop methodology to predict changes in species composition following trawling to estimate changes in community known to affect ecosystem functioning.	EU MSFD D6 on seafloor integrity requires the assessment of the impact of physical disturbance on seabed habitats state and function.	1.3, 1.9, 2.3	3 years	Research paper(s)

## Summary of the Work Plan

### ToR a) REGIONAL ASSESSMENTS

EU MSFD D6/D1 requires the assessment of the impact of physical disturbance on seabed habitats. Such methods are also needed by non-EU ICES countries. Seabed state assessments will be able to inform management decisions on how to achieve good environmental state at regional scales.

We will apply and improve the seafloor assessment framework developed by WGFBIT to produce standardized (sub-) regional assessments of seabed state for the North, Celtic, Baltic, Arctic (Icelandic, Norwegian Barents sea), Mediterranean Seas and the Bay of Biscay and the Iberian Coast, in shallow waters (<200) and deep-sea areas (200-800m), and explore methods to set thresholds between good and degraded seabed state

## **ToR b) TRADE-OFFS BETWEEN BENTHIC IMPACTS AND FISHERIES VALUES AND LANDINGS**

DGENV-MSFD set a series of targets in terms of seafloor protection. The achievement of these objectives must, however, in a *sensu*-FAO vision of sustainability, harmonise the reduction of environmental impacts with the safeguarding (as far as possible) of economic performance and the consequent social impacts.

To complete this route, therefore, it is essential to have high-resolution spatial assessments of both impacts and economic indicators (landing value, costs, gross value added). These assessments can then be used to identify the best scenarios as combination of spatial closures and other ancillary measures (e.g. effort reduction, improved selectivity, temporal ban, etc.).

At present, the Fishery-Dependent Information Data call represents the most comprehensive source of information for this kind of assessment, but its spatial resolution is too coarse and, consequently, there remains a need for linking of available VMS, STECF FDI and AER economic data to estimate landings and economic performance indicators of each fishery.

We will apply and improve the approaches developed by WKTRADE to consolidate the methodologies and information bases needed for a more homogeneous and complete coverage of European seas.

At the same time, we will explore different approaches to integrate the consequences of different protection scenarios in terms of effort re-distribution (displacement).

## **ToR c) KNOWLEDGE EXCHANGE WITH OTHER REGIONAL ASSESSMENT METHODS**

The WGFBIT seafloor assessment framework (based on assessing the relative benthic state) is not the only way to assess benthic impacts from physical disturbance. Other methods are being developed in parallel. Therefore, alignment with other methods needs to be explored and compare the consistency of outputs. We will keep informed about development of other methods for the regional assessment of bottom trawling impacts in a two-way knowledge exchange of the WGFBIT seafloor assessment framework with other assessment methods for benthic habitats under relevant EU directives (e.g. TGSeabed, NAFO).

## **ToR d) ECOSYSTEM FUNCTIONING**

By depleting fauna and changing the species composition, bottom fishing can result in alterations in the functional effect traits (sediment mixing, bioirrigation, and habitat creation and maintenance) of a community, which in turn may have broad implications for the overall ecosystem performance. The goal of ToR d is to explore whether ecosystem functioning can be incorporated more explicitly in to the WGFBIT seafloor assessment methodology.

The current PD method utilized in the WGFBIT assessment method combines information on total benthic biomass with the relative abundance of different longevity classes to estimate the relative impact of different types of fishing on the seabed. The working assumption of this method is that high community biomass will coincide with communities where the body size distribution, age structure as well as numbers of the benthic fauna are close to natural, and thus a community where its ecosystem functioning is less likely to be impaired by trawling. A caveat of this, however, is that total community biomass does not necessarily reflect changes in species and functional trait composition which play a key role in regulating ecosystem functions. Hence, when exploring bottom trawling impact on the benthos, changes in species functional composition may prevail on changes in total biomass. Functional traits have often been advocated as proxies for predicting ecosystem functioning responses to anthropogenic perturbations.

In ToR d we aim to:

[1] determine the relationship between macrofauna and ecosystem functioning (ecosystem engineering, sediment biogeochemistry) and examine how this is influenced by trawling. Macrofaunal parameters such as total biomass, sediment mixing potential, bioirrigation potential, and species functional traits are considered. A combination of multivariate and univariate analyses is undertaken (a) to examine influence of trawling on effect trait composition, (b) to relate traits to biogeochemical state (e.g. organic matter and chlorophyll-a concentrations) and flux (e.g. oxygen flux) variables, and (c) to examine trawling influence on this relationship,

[2] develop a method to predict changes in species composition due to trawling (following principles of PD model used in FBIT) to estimate changes in bioturbation potential of a community known to affect ecosystem functioning. A modelling approach (logistic-growth model) is undertaken. Results from this model can be linked to a biogeochemical



model such as OMEXDIA to estimate changes in the biogeochemical nature of the sediment due to sediment erosion, mixing or deposition as a result of trawling.

Year 1	a, b, c, d
Year 2	a, b, c, d
Year 3	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 some 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 Workings Groups WGECO, WGDEC, WGSFD, BEWG, WGMHM, WGIMM, WGMBRED, WGMPCZM.
Linkages to other organizations	EU (DG-ENV, DG-MARE), RSCs (Baltic's HELCOM, North Atlantic's OSPAR, Mediterranean's Barcelona Convention and Black Sea's Bucharest Convention), JRC, STCEF.

### Workshop to Update and Assess Trade-offs between the Impact of Fisheries on Seafloor Habitats and their Landings and Economic Performance (WKD6ASSESS)

**2023/WK/HAPISG07**      **Workshop to Update and Assess Trade-offs between the Impact of Fisheries on Seafloor Habitats and their Landings and Economic Performance (WKD6ASSESS)**, chaired by Karin van der Reijden, Denmark; and Lorenzo D'Andrea, Italy, will meet at the ICES HQ, Copenhagen, Denmark & online, 6-7 and 13 December 2023 to:

- a) Update the 2021 ICES advice ([eu.2021.08](#)) outputs using available scripts with new data, and ensure the routine for assessing trade-offs is repeatable, by development and documentation of the code by applying the ICES TAF principles. The scripts should be aligned as far as possible with that of the [WGFBIT](#) procedure.
- b) Build on the most recent available data and evolving science (WKSSFGE02, WKTRADE4, WKD6STAKE) to improve the routine by:
  - i. reviewing and incorporating proposed (WKTRADE4) approaches to better estimate spatial fisheries performance indicators (including revenue, costs, landings, value added, etc.) at local, habitat and regional scales and for

- different fishing gear/metiers given the available data and cross regional applicability. The purpose being to demonstrate which indicators can be used in the [WCFBIT](#) procedure to describe trade- offs.
- ii. evaluating stakeholder input received during WKD6STAKE to make concrete recommendation for updates to the 2021 ICES advice ([eu.2021.08](#)) and outputs.
- c) Engage with [WGMPAS](#) to explore methods to
  - i. perform a broad-scale assessment of the various fishing activities as well as the associated trade-offs that occur in and around MPAs.
  - ii. evaluate the impacts of scenarios related to policies such as protecting 30% by 2030, and banning all bottom fishing in NATURA 2000 areas.
- d) Address ToRs a-c in all European marine regions, including the Mediterranean and Black Seas, to the extent possible.

The WKD6ASSESS will report by 5 January 2024 for the attention of ACOM and SCICOM.

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	<p>ToR [a] and ToR [b]</p> <p>In 2021, ICES <a href="#">advised</a> the EU on management scenarios to reduce mobile bottom-fishing disturbance to seabed habitats and how these could affect fisheries landings and their value. The advice was presented together with a series of <a href="#">interactive maps and tables</a> that illustrated these scenarios. In 2023, ICES is in the process of updating this advice with new economic performance indicators and more recent VMS records. To this end, a small-scale fisheries workshop <a href="#">WKSSFGE02</a> and a stakeholder workshop <a href="#">WKD6STAKE</a> were held, and a further workshop <a href="#">WKTRADE4</a> is scheduled for 7-9 November. The WKSSFGE02 workshop has continued on improving the availability and understanding of fisheries data from small-scale and or passive fisheries, that are currently less well covered in the ‘standard’ VMS-based fisheries data. Workshop WKD6STAKE sought feedback from fisheries and environment stakeholders at national, regional and European level on how to improve the <a href="#">2021 Advice</a>, in particular, its series of <a href="#">interactive maps and tables</a>. Participants proposed possible improvements in various aspects of the advice, such as fisheries data, trends and timeframes, monitoring effects of management decisions, regional versus national use of the advice, and scales for outputs. The WKTRADE4 workshop will explore available VMS, STECF FDI and AER economic data to operationalize estimates of landings and economic performance indicators of each bottom- disturbing fishery. As such WKD6ASSESS will focus on improvements to the 2021 EU <a href="#">advice</a>, taking on board the workshop findings and running the assessment procedure with the latest data to ensure its relevance and use for/by experts who have a policy role or interest in balancing spatial management of fisheries and conservation/sustainable use.</p> <p>ToR [c]</p> <p>This pilot MPA assessment will make use of EU-funded projects (e.g. SEAwisE, MAPAFISH/ MAPAFISH MED) that recently reviewed fisheries restriction measures that are currently in place for MPAs in EU (and UK) waters. Similarly, the work will reach out to experts such as ICES WGMPAS to review and contribute. The work will incorporate ICES advice (<a href="#">2021</a> and 2024) to the EU on management scenarios to reduce mobile bottom-fishing disturbance to seabed habitats and how these could affect fisheries landings and</p>

	<p>their value. The work will use similar indicators for evaluating spatial overlap of bottom fishing activities with MPAs. The work will make use of ICES VMS/logbook, STECF FDI and AER information at a 0.05 x 0.05 degree grid to evaluate overlap with EEA MPA shape files (<a href="#">link</a>). ICES does not have access to information on vessel position at a finer scale and this creates uncertainty in the presented scenario outcomes. ICES is not an enforcement agency (for which fine-scale data is required), but focuses on developing science-based (sub)regional and cross-regional information to aid managers.</p> <p>ToR [d]</p> <p>All European marine regions, including the Mediterranean and Black Sea</p>
Resource requirements	ICES secretariat and advice process.
Participants	<p>Technical Workshop with researchers and RSCs investigators.</p> <p>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.</p>
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 the Occurrence of VMEs (Vulnerable Marine Ecosystems) and Fishing Activities in EU waters of the Outermost Regions (WKOUTVME)

**2023/WK/HAPISG08**      **Workshop on the Occurrence of VMEs (Vulnerable Marine Ecosystems) and Fishing Activities in EU waters of the Outermost Regions (WKOUTVME)**, chaired by Ellen Kenchington, Canada, will meet in person with hybrid afternoon (CET) options, at the ICES Headquarters, Copenhagen, Denmark, 15–19 April 2024 to:

- Review and report on the knowledge base in each region. Use a participatory approach to review survey and metadata call responses for completeness in mapping/identifying nursery areas, fishing practices, fishing grounds, and locations of VMEs, indicators of VMEs and further VME elements where VMEs are known or likely to occur. Identify further data sources that could be used to complete the knowledge base.
- Review and report on available methods used in a range of situations and locations to apply FAO guidance for the identification of VMEs. Consider and report on the complementarity of these methods with the current benchmarked approach used by ICES to identify VMEs in the northeast Atlantic.
- Define and report on analytical frameworks to generate the requested outputs, scenarios and options at a second workshop, and the extent to which these frameworks are applicable in each region given the knowledge base described in response to ToR 'a' and 'b'.

WKOUTVME will report by 15 May 2024 for the attention of ACOM and SCICOM.

## Supporting information

Priority	<p>ICES has received a special request for Advice on the list of areas where VMEs are known to occur or are likely to occur and on the existing deep-sea fishing areas (ref. (EU)2016/2336) in EU waters of the Outermost Regions subject to the deep-sea access regulation (Regulation (EU) 2016/2336). The 9 Outermost Regions of the EU (French Guiana, Guadeloupe, Martinique, Mayotte, Reunion Island and Saint-Martin (France), Azores and Madeira (Portugal), and the Canary Islands (Spain)) have not yet been part of ICES deliveries. ICES has responded to this request by offering step-wise deliverables, with the first phase a scoping technical service (review), in the form of a workshop (WKOUTVME). This workshop will lay out the foundations for a subsequent workshop which will apply the methodology and deliver the coordinates of the list of VME locations, and of the fishing footprint for static gears, mobile-contacting gears and a combined footprint in the EEZs of the Outermost Regions.</p> <p>The workshop fits within the ICES Science Plan – Conservation and Management Science, the goal of which is to develop tools, knowledge, and evidence for conservation and management — to provide more and better options to help managers set and meet objectives.</p>
Scientific justification	<p>The workshop will conduct a technical scoping exercise and review of available knowledge and data for all 9 of the EU Outermost Regions (Azores, Madeira, Canary Islands, Reunion, Mayotte, French Guiana, Martinique, Guadalupe and Saint Martin). Most of these regions are remote/inaccessible with some of the main fisheries dependent on the seamounts. Therefore, the benchmarked approach used by ICES in the Northeast Atlantic to identify vulnerable marine ecosystems (VME) may have to be adapted to the data sources available while still providing scenarios and options. The workshop will propose a framework for that analysis, and identify any knowledge gaps that could compromise that work.</p> <p><b>Preparation for the workshop</b></p> <p>A core planning group has been established to prepare of the workshop. They will meet by correspondence and once in person (January 2024) to:</p> <ol style="list-style-type: none"> <li>1. Establish a network of experts that are engaged and have access to data/information/knowledge in all 9 EU Outermost Regions (Azores, Madeira, Canary Islands, Reunion, Mayotte, French Guiana, Martinique, Guadalupe and Saint Martin);</li> <li>2. Develop a questionnaire for circulating to the list of experts prior to the workshop;</li> <li>3. Draft a formal data request from ICES;</li> <li>4. Engage local experts, knowledge holders and other stakeholders from the Caribbean, Oceanic Atlantic and the Indian Ocean to attend the workshop through targeted invitations.</li> </ol> <p><b>Expected outputs from the workshop</b></p> <p>The outcome of this workshop will be an ICES Scientific Report which will address ToR a-c and elaborate on, for each region: (i) the location and nature of the VMEs; (ii) the location and nature of the fish and fisheries (iii) details for the recommended application of the benchmark approach for delineation of VMEs, (iv) knowledge gaps in (i) and (ii) that could influence (iii).</p>
Resource requirements	<p>Most the preparatory work will be developed by web conferences. The core planning group would like to meet in Copenhagen at the ICES HQ in January and space has been provisionally booked. WKOUTVME may also take place at ICES HQ and if so will require use of facilities and support staff for one week: 15-19 April 2024.</p>
Participants	<p>Up to 30 participants</p>

Secretariat facilities	ICES Professional Officers assigned to this workshop.
Financial	No financial implications.
Linkages to advisory committees	ACOM
Linkages to other committees or groups	SCICOM, HAPISG, we anticipate strong interest from WGDEC, WGMHM, and WGSFD.
Linkages to other organizations	DGMARE, NEAFC, NAFO, GFCM, FAO

**Workshop to develop guidelines on how to approach the ecological, economic and social trade-offs between offshore renewable energy developments (wind farms) and fisheries (WKWIND)**

**2023/WK/HAPISG09      Workshop to develop guidelines on how to approach the ecological, economic and social trade-offs between offshore renewable energy developments (wind farms) and fisheries (WKWIND)**

The workshop aims to review approaches to assess the trade-offs between offshore renewable energy developments (initial focus on offshore wind farms) and the provisions of wild harvest fish by assessing the economic, social and ecological consequences. WKWIND will provide the first steps for developing ICES best practice guidelines on how to assess trade-offs to enable sustainable marine management.

WKWIND will be chaired by Andrew Gill, UK; Angela Muench, UK; and Sean Hayes, USA; and will meet at ICES HQ, Copenhagen, Denmark, 29 April – 2 May 2024 to:

- a) Develop guidelines to assess the trade-offs between offshore wind farm developments and fisheries activity and associated social, economic and ecological consequences, taking into consideration:
  - i. Defining the spatial and temporal boundaries of the trade-offs to be assessed between fisheries and offshore wind farms.
  - ii. Review the existing data and tools relevant to trade-off assessment using information provided by previous ICES workshops (e.g. WKSSFGE02, WKD6STAKE, WKTRDAE4, WKD6ASSESS).
  - iii. Developing an approach that allows managers and stakeholders to explore the trade-offs between the extension of energy provision and the provision of wild harvest fish and the respective ecological, economic and social consequences.

(Science Plan codes: 6.6, 6.4, 3.5)

- b) Propose activities to advance the four priorities identified in the [ICES ORE Roadmap](#) for the Provision of Advice on Offshore Renewable Energy  
(Science Plan codes: 1.1, 1.9, 2.1, 2.5, 2.7, 3.1, 3.2, 4.1, 5.3, 6.1, 6.2, 6.3, 7.1).

Prior to the workshop, the Chairs will prepare material to address the ToRs. This group will also ensure the completion of the workshop report, and operational TAF (Transparent Assessment Framework) products for further consideration by ICES EGs. WKWIND will report by 1 June 2024 for the attention of ACOM and SCICOM.

## Supporting information

Priority	High, it is intended to prepare ICES for expected future EU and national advisory requests on ORE and ecosystems interactions, on assessing the trade-offs between existing/ proposed marine wind farm developments, fisheries and biodiversity. The outputs and advice will feed into ongoing efforts to provide strategic guidance that will feed into sustainable management and marine spatial planning with respect to achieving fisheries, marine offshore renewables and biodiversity sustainable development objectives.
Scientific justification	<p>Climate change and energy security have created an urgent global effort to develop renewable energy. Offshore wind energy and other offshore and marine renewable energy technologies provide many countries with the ability to generate renewable electricity within their borders. As a result, rapid and large-scale offshore renewable energy (ORE) development is now underway, at an unprecedented pace and magnitude. To achieve the ICES Vision and Mission in the face of rapid growth in offshore renewable energy, ICES has four goals as set out in the <a href="#">ICES ORE Roadmap</a>, namely:</p> <ol style="list-style-type: none"> <li>i. To advance the ICES scientific capacity to support advice regarding the interactions among offshore and marine renewable energy developments and marine ecosystems.</li> <li>ii. To facilitate an international effort to design data collection networks at the range of spatial and temporal scales needed to monitor, assess, and predict the impacts of offshore and marine renewable energy development on marine ecosystems.</li> <li>iii. To advance development and application of models, coordinated process studies, and long-term observations supporting the analysis of impacts from offshore and marine renewable energy development at regional and ecosystem scales and at subseasonal to decadal scales.</li> <li>iv. To develop frameworks that guide the use of best available information on the interactions of offshore and marine renewable energy, ecosystem functions and structure, and ecosystem services and provisions.</li> </ol> <p>In addition, ICES has received a draft request for advice from the European Commission on the assessment of ecosystem interactions and trade-offs between offshore wind developments and fisheries. This and the need to develop capacity and flexibility within the advisory process to address advice requests at short notice necessitates organising a workshop to explore and prepare data and example advisory products to meet this and future advice needs.</p>
Resource requirements	ICES Data Centre and secretariat support.
Participants	Scientific leadership will be provided by the ORE WGs (WGMBRED, WGOWDF, WGORE), with input from experts representing

	WGFBIT, WGSFD, WGBIODIV, WGMPAS, WGMPCZM, WGECON, WGSOCIAL. Expected attendance by some 20–25 members and guests.
Secretariat facilities	Data Centre, Secretariat support and meeting room
Financial	No financial implications.
Linkages to advisory committees	Direct link to ACOM and SCICOM.
Linkages to other committees or groups	Links to WGSFD, WGFBIT, WGECON, WGSOCIAL, WGOWDF, WGBMBRED, WGOORE, WGMPAS, WGMPCZM, WGBESEO, HAPISG and HUDISG.
Linkages to other organisations	The work of this group is closely aligned with similar work in OSPAR, and HELCOM.

### **Workshop on SUPPORTing the EU Action Plan to restore marine ecosystems; harbour porpoise in the Baltic Proper (WKSUP)**

**2023/WK/HAPISG10 Workshop on SUPPORTing the EU Action Plan to restore marine ecosystems; harbour porpoise in the Baltic Proper (WKSUP)**, chaired by Christian Von Dorrien, Germany; and Caterina Fortuna, Italy; will be established and will meet online through April and May 2024 to:

- Identify the métiers most likely to cause by-catches of harbour porpoise (métiers of concern);
- For métiers of concern, map the fishing effort in the Baltic Sea (subdivisions 24-29, 32) at appropriate spatial and temporal resolution based on data for 2021-2022;
- Based on available data, map porpoise occurrence in the Baltic Proper (subdivisions 24-29, 32 at appropriate spatial and temporal resolution;

WKSUP will meet as hybrid meeting at ICES HQ, Copenhagen, Denmark, 17–20 June 2024 to:

- Develop a bycatch risk assessment for harbour porpoises in the Baltic Proper, with focus on the Baltic Proper porpoise population, at appropriate spatial and temporal resolution based on b) and c);
- Score the different interaction rates and evaluate spatio-temporal units in terms of bycatch risk.

WKSUP will report by 11 October 2024 for the attention of ACOM and SCICOM.

### **Supporting information**

Priority	The workshop is directly linked to a special request for advice from DGMare on 'Support for the implementation of the Action Plan (III) – Harbour porpoise in the Baltic sea (Baltic proper)'
Scientific justification	<p>Bycatch is a major threat to the harbour porpoise in the Baltic Sea.</p> <p>The European Commission has developed an Action Plan<sup>1</sup> under which it recommends Member States to adopt national measures or submit joint recommendations to the Commission to minimise by-catch (or reduce it to the level that enables the full recovery of the populations) of harbour porpoise in the Baltic Sea by end 2023.</p> <p>The work by WKSUP will contribute to completing these tasks.</p>

<sup>1</sup> [EUR-Lex - 52023DC0102 - EN - EUR-Lex \(europa.eu\)](https://eur-lex.europa.eu/lexuris/ui/1/52023DC0102-EN-2023-0102)

Resource requirements	None beyond funding for the workshop to be provided by DGMare.
Participants	The workshop will be attended by approximately 20 experts.
Secretariat facilities	Sharepoint access and Secretariat support including assistance from the ICES data centre.
Financial	Financed through specific budget linked to a special request for ICES advice.
Linkages to advisory committees	ACOM
Linkages to other committees or groups	WGSFD, WGMME, WGBYC
Linkages to other organizations	ASCOBANS, HELCOM

**Workshop on Status of Vulnerable Marine Ecosystems in the NEAFC Regulatory Area for 5-year review (WKVMESTAT)**

**2023/WK/HAPISG11 A Workshop on Status of Vulnerable Marine Ecosystems in the NEAFC Regulatory Area for 5-year review (WKVMESTAT)**, chaired by Eskild Kirkegaard, Denmark, will meet at ICES HQ, Copenhagen, Denmark, 19–23 August 2024 to:

- a) Review and summarise ICES scientific advice to NEAFC on VME;
- b) Review and report on any changes to scientific understanding on evidence for VME from relevant UNGA resolutions/FAO and other intergovernmental guidance;
- c) Review and report on any changes to evidence for Significant Adverse Impacts (SAI) of bottom fishing from relevant UNGA resolutions/FAO and other intergovernmental guidance. This can include any advice on science related to threshold levels under article 9 of the Recommendation;
- d) Provide any insights from recent relevant scientific developments, including in other regions around the globe;
- e) Conclude if the science supports that Recommendation 19:2014 has been effective in protection of VMEs in the NEAFC Regulatory Area.
- f) Review the list of “VME indicators” in Annex 5 to the Recommendation and suggest additions if relevant.

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

WKVMESTAT will report by 26 August 2024 for the attention of ACOM and SCICOM.

**Supporting information**

Priority	The current activities of this Group will enable ICES to respond to advice requests from a number of clients (NEAFC/EC). Consequently, these activities are considered to have a high priority.
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Scientific justification	<p>ToR [a-f] NEAFC needs to know if its measures do in fact deliver protection to VME from significant adverse impact of (bottom) fishing. ICES scientific advice can further this understanding. Should the recommendation be found not to be reaching its aims, direction on what further needs to be done can be part of the scientific advice. ICES work should support NEAFC's 5 yearly Review of Recommendation 19:2014 on the protection of VME. The objective of the NEAFC Recommendation 19:2014 (as amended) on the protection of vulnerable marine ecosystems in the NEAFC Regulatory Area is to ensure the implementation by NEAFC of effective measures to prevent significant adverse impacts of bottom fishing on vulnerable marine ecosystems known to occur or likely to occur in the NEAFC Regulatory Area. This is to be based on the best available scientific information provided or endorsed by the International Council for the Exploration of the Sea (ICES). Recommendation 19:2014 includes a provision in Article 10.1 for a general review every 5 years, which would be due in Autumn 2024: "The Commission shall every 5 years from the date of this Recommendation entering into force examine the effectiveness of this Recommendation in protecting VMEs from significant adverse impacts. In addition, this review process shall be supplemented by modifications required as a result of new scientific advice." AM 2023 agreed that the request for ICES to contribute with scientific information regarding the effectiveness of the Recommendation in protecting vulnerable marine ecosystems in the NEAFC Regulatory Area from significant adverse impacts. And that the Terms of Reference for this request would be agreed by correspondence between NEAFC and ICES during 2023.</p>
Resource requirements	Data Centre, Secretariat support and meeting room.
Participants	The workshop will likely be attended by some 15–20 experts online and physically.
Secretariat facilities	WebEx and SharePoint site provision.
Financial	Covered by NEAFC special request.
Linkages to advisory committees	ACOM is the parent committee and specific ToRs from WKVMESTAT 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, WKVMESTAT should develop stronger links WGFTFB, WHMHM, WGSFD, WGDEC, and WGDEEP.
Linkages to other organizations	WKVMESTAT 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.

Resolutions approved in 2022

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	6–8 March	Seville, Spain		Meeting in association with WGBOSV
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 cleaning activities, (2) can uncontrolled robots conduct regular cleaning or is always a remote controller needed?	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 filed with long-lasting experience.
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	2.2, 2.7, 6.1	3 years	At least one manuscript to be submitted to a peer - reviewed scientific journal.

		in Canada). This may be particularly useful for risk assessments and early warning systems.			
e	Evaluate the development and utilization of DNA- and RNA-based molecular approaches to provide science-based tools for strategic planning, policy development, and operational processes regarding non-native species and biological invasions (including detection and monitoring, reconstruction of patterns and vectors of introduction and spread, assessment of establishment and impact risk, and application for invasive species control)	Molecular (DNA -based and RNA -based) approaches have been increasingly used in the past 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 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.	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 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	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

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

### 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 (WG HABD), 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 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 Edward Willstead\*, 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	10-13 July	Bridlington, UK		
Year 2024	3–6 June	New Bedford, Massachusetts, USA		<b>Change in chair:</b> <u>Outgoing:</u> Antje Gimpel, Germany <u>Incoming:</u> Edward Willstead, UK
Year 2025			Final report by Date Month May to SCICOM	

ToR descriptors

TO R	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	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. 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.</i>	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 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.	2.2, 2.4, 2.7, 6.6	3 years	Review paper
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.	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:  <ul style="list-style-type: none"> <li>• Shifting fisheries species distributions relating to climate change?</li> <li>• Fisheries tools adaptation - WGFTFB - Fish Technology and Fish behaviour</li> </ul>	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 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.	2.7, 6.4, 7.6	3 years	Systems framework paper/report
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### 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 WGORE 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 WGORE 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 WGORE. 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.
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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, WGMRED, WGOE 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	By correspondence	Interim report by August 2023	
Year 2024	17–20 June	Online meeting	Interim report by August 2024	
Year 2025			Final report by August to ACOM & SCICOM	

ToR descriptors

TOR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	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	16–18 April	Ostend, Belgium		
Year 2025			Final report by DATE to SCICOM	

### ToR descriptors

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

	provide a summary on marine extraction for the OSPAR region to OSPAR				added to the Dashboard (see 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 <a href="https://doi.org/10.17895/ices.pub.5398">https://doi.org/10.17895/ices.pub.5398</a> )	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 ( <a href="https://rconnect.cefas.co.uk/connect/#/apps/26/access">https://rconnect.cefas.co.uk/connect/#/apps/26/access</a> ) 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:  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	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	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?

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guidelines).

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 recommendations 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

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### 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.

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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	3–7 June	Gdynia, Poland	Final report by 15 August to SCICOM	

ToR descriptors

ToR DESCRIPTION		BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	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	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>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	Align WGML with key international expert groups by collaborating with EMODNET regarding marine litter and microplastic data assessment and quality assurance.	<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	Conduct an assessment of the distribution of abandoned, lost or otherwise discarded fishing gear (ALDFG).	<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 Benthic and Renewable Energy Developments (WGMBRED)

2021/FT/HAPISG05 The Working Group on Marine Benthic 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	4–7 November	Newport, Rhode Island USA	Final report by 15 December to SCICOM	

## ToR descriptors

ToR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	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	The present knowledge base informing the effects of MRED energy	2.1, 2.2, 2.7	Year 1–3	Manuscript to be submitted to peer-

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

		understanding the consequences of different decommissioning scenarios will be important to inform future decision-making processes.			
d	Review the methodology to assess the role of benthos associated with benthal marine energy devices on the provisioning of ecosystem services to society	Marine benthal renewable energy devices serve the desire of society to combat climate change. The presence of the structures themselves, and the numerous marine organisms associated with these devices affect a set of ecosystem functions at various spatial scales, including biogeochemical cycling and food production, cascading into the provisioning of ecosystem services. WGMBRED will review the available methodology to assess the role of organisms in the biodiversity-ecosystem functioning-ecosytem services linkage and use the available knowledge base from previous WGMBRED cycles to test selected assessment frameworks.	1.3, 7.2	Year 1-3	Report to ICES on the methodology to assess the effct of marine benthal energy devices on the biodiveristy-ecosytem services link.
e	Review available	The functional effects of	1.3, 2.1	Year 1-3	Report to ICES on

literature on biological traits for application in assessments of the functional effects of renewable energy devices on the marine ecosystem	the introduction of renewable energy devices in the marine environment are channeled through the activities of the fauna associated with these devices. Assessing the generality of these effects in space and time requires research based on functional biological trait analysis. While structural response traits are available, this is not the case for functional effect traits.	the use of functional traits to investigate the 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 WGMBRED work and ToRs are aligned with the ICES Science Programme and are of high priority. The WGMBRED are active contributors and aim to report their outcomes directly to ICES in their final report, Ecosystem Overviews, ICES ASC, and in parallel as peer reviewed literature.</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 (WGOE), 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	4–6 March	Seville, Spain	Final report by 15 May to SCICOM	Meeting in association with WGITMO

### ToR descriptors

ToR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	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	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	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

	detailed analysis tools (including the quantification of harmful/target species), or other aspects of the EBP.	the implementation, there are science needs related to the validation of methods and tools that need to be addressed.			manuscript.
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	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.

proposed as complementary approaches to traditional monitoring and 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	8–12 April	Aveiro, Portugal	Final report by 30 May to SCICOM	

ToR descriptors

ToR	Description	Background	<a href="#">Science Plan Codes</a>	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	15–19 April	Nantes, France		

Year 2025	Final report by DATE to SCICOM
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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	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.

		understanding trophic magnification in the marine environment.			
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,	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	2.1; 2.2; 2.7; 4.5; 6.1	years 2-3	Publications, contributions to joint WG reports, Final report to ICES.

	buoys, pipelines, cables and shipwrecks) and shipping (such as exhaust gases, spills and scrubbers) on the marine environment.	constitute direct input into the marine systems and require follow-up and identification of knowledge gaps. Specifically for offshore windfarms, continued review of chemicals and different legislation between countries, (in 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 <sub>biota</sub> 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	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.

potential advice requests as passed from ACOM.

### 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, WGOE, 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	17–21 June	Coimbra, Portugal	Final report by 15 August 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), chaired by Anders Nielsen, Denmark; and Andrea Havron\*, USA; will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	14–18 November	Lowestoft, UK		Incoming chair: Anders Nielsen, Denmark
Year 2023	13–17 November	East Lansing, USA		
Year 2024	18–22 November	ICES HQ, Copenhagen, Denmark	Final report by 15 January 2025 to SCICOM	<u>Outgoing chair:</u> Christopher Legault, USA <u>Incoming chair:</u> Andrea Havron, USA

## ToR descriptors

ToR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN</a> <a href="#">CODES</a>	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	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.

		simulation study, empirical application, theoretical basis examination, and by comparing to existing methods. This will both motivate talented developers and promote the take-up of actual improvements by providing a quality assurance check on new methods.			
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.
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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 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	7-11 October	Belfast, Northern Ireland, UK	Final report by 15 November to SCICOM	Change in Chair: <b>Outgoing co-chair:</b> Valerio Bartolino, Sweden

## ToR descriptors

ToR	DESCRIPTION	BACKGROUND	SCIENCE PLAN	DURATION	EXPECTED DELIVERABLES
			CODES		
a	Regional updates: Review further progress and deliver key updates on multispecies modelling and ecosystem data analysis contributing to modeling throughout the ICES region	This ToR acts to increase the speed of communication of new results across the ICES area	5.1; 5.2; 6.1	3 years	Report on further progress and key updates.  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, including evaluation of management procedures and estimation of biological reference points under the uncertainties of climate change.	This ToR looks for multispecies and ecosystem approaches to understand the 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.	2.5; 5.2; 6.1	3 years	Review methods to evaluate populations and ecosystem resilience.  Review of methods for management strategy evaluation which incorporate the effects and uncertainties of climate change

### Summary of the Work Plan

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

### Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries under multiple sources of uncertainties incl. climate change. The activities will provide information (e.g., natural mortality estimates, performance of indicators, multispecies reference points) and tools (e.g., multi-model ensembles, keyrun models) valuable for the implementation of an integrated advice and the application of a precautionary approach in several North Atlantic ecosystems. Consequently, these activities are considered to have a high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 20–25 members and guests. Expertise in ecosystem dynamics, trophic interactions, modelling and fish stock assessment from across the whole ICES region.
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	ACOM, assessment Expert Groups.

Linkages to other committees or groups	WGMIXFISH, WGDIM, WGBIFS, IBTSWG, WGEKO, all IEASG groups, WKCLIMAD.
Linkages to other organizations	None

### Working Group on Shipping Impacts in the Marine Environment (WGSHP)

**2021/FT/HAPISG12** The Working Group on Shipping Impacts in the Marine Environment (WGSHP), 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  14–17 November	Online meeting   Online meeting		
Year 2023	25, 26, 29 September	Gothenburg, Sweden		
Year 2024	12–13 June   4–6 November	Online meeting;   Athens, Greece		

### ToR descriptors

TO R	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	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	2.1; 2.2; 2.7	3 years	Technical paper or peer-reviewed manuscript. Pipeline proposal for inclusion of shipping pressures metric in

		areas of enhanced protection.			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		Change in chair: <b>Outgoing chair:</b> Neil Campbell, Scotland, UK <b>Incoming chair:</b> Jeppe Olsen, Denmark
Year 2024	7–11 October	Sukarrieta, Spain	Final report by 15 November to SCICOM	

## ToR descriptors

TOR DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	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 <a href="#">workflow</a> 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	<p>During this session, WGSFD will:</p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- Examine and apply best practices for handling and analysing spatial data and electronic monitoring systems, quality checking, data pre-processing protocols and statistical analysis, to ensure common and consistent approaches are applied when processing electronic vessel tracking data.</li> <li>- 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.</li> </ul>	<p>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.</p> <p>Small scale fisheries (SSF, boats &lt;12 m) represent about 80% of EU fleet. Most of these fisheries either do not have an AIS/VMS system, or the data collected has insufficient temporal or spatial resolution for accurate mapping.</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 <a href="#">ICES workshop on small scale fisheries and geo-spatial data (WKSSFGE0)</a> provides a collection of case studies across the EU and progress on how to infer fishing activity and estimation of fishing effort.</p>	3.5, 5.4, 6.1	3 years	<p>Section in the WG report.</p> <p>Peer review paper (Year 3)</p> <p>Proposal for workshop with WGCATCH and WGBYC(Year 2).</p> <p>ICES ASC session (Year 3).</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</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</p>

		<p>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>			<p>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 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>	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 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</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>

		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.			
g	Identify drivers of change in fisheries spatial temporal trends and their relation to other uses of the marine space (in accordance with regulations) coupled with the development of a common spatial data framework (to be developed in consultation with the ICES data centre) for the integration of different marine layers.	<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 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>	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 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	<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</p>		1 year	Material provided to ACOM by 28 July 2023.

contacting static gear in the NEAFC regulatory area.	future extent by depth of fishing. This commentary by WGF/TFB/ 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).
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## Summary of the Work Plan

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

## 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	23-25 October	Online meeting		
Year 2024	4-8 November	Online meeting	Final report by 10 December to SCICOM	

### ToR descriptors

TOR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	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	6.1, 6.2	Year 2	Review paper

		stakeholder needs. Link to WGMPCZM.			
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 or expert groups) as well as outside ICES. Investigate the development of a cumulative effects estimate for potential inclusion in the Ecosystem Overviews (EOs).	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 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.	6.2, 6.4, 6.5	Year 1-3	Identification of action points and linkages.  Index of cumulative effects.

### Summary of the Work Plan

<b>Year 1</b>	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.
<b>Year 2</b>	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.
<b>Year 3</b>	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.
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## 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	4–8 November	Faro, Portugal	Final report by 15 December to SCICOM	

## ToR descriptors

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

b	Coordinate and develop assessment methods (including specific tools in line with the ICES EBM framework) to evaluate the potential consequences and trade-offs between various human activities and the biodiversity benefits derived from MPAs.	To understand how MPAs and OECMs integrate within the wider seascape, and on how synergies and/or trade-offs can arise when accounting for (i) multiple and often competing, fishing and other human activities, and (ii) the competition for space between fisheries and other ocean uses (e.g., offshore wind farms and aquaculture).	6.6	1 year	<p>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).</p> <p>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.</p>
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"> <li>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.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Develop a dashboard of indicators that can be used to assess these outcomes for human activities (e.g., fisheries, renewable energy).</li> <li>• Illustrate these pathways and demonstrate the application of the indicators using candidate case studies (with at least one in North America).</li> </ul>
Year 2	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• Based on these assessments, to make recommendations on how best to integrate conservation planning into marine spatial planning.</li> </ul>
Year 3	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Assess how projected climate change effects on ecosystems and fisheries could impact MPAs and MPA network effectiveness.</li> <li>• Make recommendations on how best to design and climate-proof MPA networks that benefit both ecosystems and human use components (e.g., fisheries).</li> </ul>

## 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, WGORE, WGMIBRED. 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
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## EGs DISSOLVED in 2023

WKLIDA	Workshop on the Revision of the DOME Litter Data Format
WKOMRE	Workshop on a Research Roadmap for Offshore and Marine Renewable Energy
WKSSFGE02	Workshop on Small Scale Fisheries and Geo-Spatial Data 2
WKSTIMP	Workshop on Implementing Stakeholder Engagement Strategy
WKBB	Workshop on sea Bird Bycatch monitoring in the NEAFC Regulatory Area
WKECOVME	Workshop to Evaluate Long-term Biodiversity/ Ecosystem Benefits of NEAFC closed and restricted areas
WKCCCMSP	Workshop on Climate Change Considerations in Marine Spatial Planning
WKD6STAKE	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
WKTRADE4	Workshop on Trade-offs between the Impact of Fisheries on Seafloor Habitats and their Landings and Economic Performance
WKNCCFFA2	Joint ICES/ NMTT Nordic Climate Change Forum for Fisheries and Aquaculture workshop 2