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Draft resolutions for approval

Scallop Assessment Working Group (WGScallop)

To be submitted after the autumn meeting.

Working Group on Biodiversity Science (WGBIODIV)

Working Group entitled "Towards a EUROpean OBservatory of the non-indigenous calanoid copepod Pseudodiaptomus marinUS" (WGEUROBUS)

To be submitted after the autumn meeting.

Working Group on Phytoplankton and Microbial Ecology (WGPME)

Working Group on Operational Oceanographic Products for Fisheries and the Environment (WGOOFE)

To be submitted

Working Group on Fisheries-Induced Evolution (WGEVO)

To be submitted

Resolutions approved in 2024

Working Group on Crangon fisheries and life history (WGCRAN)

2024/MT/EPDSG01 The **Working Group on Crangon fisheries and life history (WGCRAN)**, chaired by Ulrika Beier*, the Netherlands, and Bart Vanelslander*, 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 2025	June	Oostende, Belgium	Interim report	Outgoing: Kim Hünerlage and Eva Maria Pederson Incoming: Ulrika Beier and Bart Vanelslander
Year 2026	Tbd		Interim report	
Year 2027	Tbd		Final report	

TO R	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES		EXPECTED DELIVERABLES
			DURATION		
a	Report and evaluate population status indicators for brown shrimp stock.	Data collection of the status of the brown shrimp (Crangon crangon) stock like recent landings and effort trends in the brown shrimp fisheries. Generate a standardized LPUE time-series and provide a detailed description of the process of collecting the data series effort, landings & LPUE for WGCRAN.	1.1; 2.1	year 1,2,3	Standardized stock indicators will be delivered by all WGCRAN members within the annual report(s).
b	Develop a spatial indicator of brown shrimp distribution	Compilation and analysis of combined Logbook information, VMS, landings and effort data to develop a spatial indicator of brown shrimp distribution based on LPUE to monitor regional distribution as well as regional shifts in fishing effort.	2.1; 2.4; 3.5; 5.4	year 1,2,3	Results will be presented in the annual report(s).
c	Development of decision-support tools for brown shrimp harvesting	Develop and evaluate brown shrimp-specific management decision-support tools to evaluate strategies on how to sustainably and efficiently harvest the brown shrimp stock.	2.1; 2.2; 5.1; 5.4; 6.1	year 1,2,3	Results will be presented in technical reports, summarized in a peer-reviewed paper and included in the annual report(s).
d	Assessment of bycatch in the brown shrimp fisheries	Review the status and results of research on bycatch time series and consider the implications for management. Evaluate methods and procedures used on board for collecting data on bycatch. Gather, compile and evaluate information on the onboard and ashore sieving fractions and processes and new national bycatch/discards data from e.g. DCF.	3.1; 3.2	year 1,2,3	Results as well as updates on the development of selfsampling will be presented in the annual report(s).

e	Analysis of trends of brown shrimp stock indicators	Analyse german, belgian and dutch scientific survey data to assess trends of survey-based stock indicators (e.g. biomass, fraction of large shrimps, mortality). Development of a surplus production model using brown shrimp catch data and biomass indices.	3.1;3.2	Year 1-3	Time series will be presented and commented in the annual reports.
f	Synthesis of policy and management regarding North Sea brown shrimp fisheries.	Synthesize information on national legislation, laws and management concerning the North Sea brown shrimp fisheries (e.g. Natura 2000, MSC process, landing obligation, area closures).	7.1	year 1,2,3	An overview and update of relevant information on legislation, law and management will be included in the annual report(s).
g	Overview of ongoing research	Present and review ongoing brown shrimp research in the ICES area (e.g. impact studies, development of fishing gears, life cycle studies) aiming at supporting international collaboration as well as evaluating management implications.	6.1	year 1,2,3	The summaries of updates on ongoing research will be included in the annual report(s).

Summary of the Work Plan

Year 1	<p>Stock status indicators will be updated and harmonized between countries (ToR a). German and Dutch survey data will be analysed and reported, Belgian data will be included in the analyses (ToR e). Data used for the compilation of manuscripts in support of ToR b and c will be made available. Information and updates on national legislation, laws and management concerning the brown shrimp fisheries will be summarized (ToR d and f). New information generated from ToR g will be reported.</p>
Year 2	<p>Stock status indicators will be updated and harmonized between countries (ToR a). German, Belgian and Dutch survey data will be analysed and reported (ToR e). Data used for the compilation of manuscripts in support of ToR b and c will be made available. Information and updates on national legislation, laws and management concerning the brown shrimp fisheries will be summarized (ToR d and f). New information generated from ToR g will be reported.</p>
Year 3	<p>Stock status indicators will be updated and harmonized between countries (ToR a) as well as German, Belgian and Dutch survey data will be analysed and reported (ToR e). Data used for the compilation of manuscripts in support of ToR b and c will be made available. Information and updates on national legislation, laws and management concerning the brown shrimp fisheries will be summarized (ToR d and f). New information generated from ToR g will be reported.</p>

Supporting information

Priority	Brown shrimp (<i>Crangon crangon</i>) fisheries are economically important with landings value ranking this species among the top three species caught from the North Sea. The priority of WGCNAN is to understand the interactions between the brown shrimp population (structure and abundance) and human behaviour (mainly fishing effort), the environment, and the ecosystem. One important aspect is and will be the monitoring, investigation and development of population status indices. WGCNAN is the only expert group to evaluate the Brown Shrimp Fisheries Management Plan which was developed by the industry in the course of the MSC certification.
Resource requirements	The research programmes that 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 members and guests.
Secretariat facilities	Standard EG support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	WGCNAN aims at a permanent linkage with ACOM after year 2 when sound and proven stock indicators and tools to evaluate management strategies have been developed (ToR a, b, c).
Linkages to other committees or groups	There is a linkage to WGBEAM through the international scientific surveys (DFS & DYFS) and to WGSFD through the VMS data. Members of WGCNAN are also members in these groups.
Linkages to other organizations	None

Working Group on Marine Mammal Ecology (WGMME)

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

2024/AT/EPDSG04 The Working Group on Marine Mammal Ecology (WGMME), chaired by Sophie Brasseur, The Netherlands, and Peter Evans, UK, will meet online on 12-13 March 2025 at 09:30-12:30 CET each day to prepare the different ToRs, define and allocate tasks, with a follow-up face-to-face meeting in early September 2025 to discuss the ToR results, and finalise the report.

ToRs:

- a) Review and report on any new information on seal and cetacean population abundance, distribution, population/stock structure in the NE Atlantic (including North Sea and Baltic Sea), including information on rare or vagrant species of marine mammals in the area of interest and updating the seal database with abundance estimates and new data points.
- b) Review and report on i) any new information on seal and cetacean management frameworks in the NE Atlantic (as defined above), continuing the review of management frameworks relating to by-catch and underwater noise that was started in WGMME 2024; and ii) consider indicators and targets for MSFD assessments and possible implications of the Restoration Law – List, Discuss and Evaluate methodologies used to define Favourable Reference Values or other parameters used to define relative status of marine mammal populations.
- c) Review and report on information on i) seal and cetacean and anthropogenic threats (including cumulative effects) to individual health and population status in the NE Atlantic (as defined above); review and update threat matrices (from WGMME 2019) for marine mammals in each ecoregion; and ii) identify gaps in our knowledge with regards to anthropogenic threats to marine mammals in the NE Atlantic. Where appropriate, take account of the DGMARE priority ETP species list. In coordination with developments of the Offshore Renewable Energy (ORE) ICES Roadmap, provide input and background information as needed on impacts of ORE in marine mammals.
- d) In dialogue with WGBYC, contribute to the [Roadmap for ICES ETP species bycatch advice](#)¹ by preparing a table of marine mammal species abundance, demographic trends and life history parameters for use by WGBYC in qualitative bycatch risk assessment.
- e) Continue the country-by-country review of stranding records (number/species/age, other details if available) frequencies and trends in causes of death for each cetacean and seal species as determined from post-mortem examinations; consider metrics used to determine these frequencies.

WGMME will report by 31 October 2025 for the attention of ACOM.

Supporting information

Priority	The activities of this Group contribute to the understanding of the ecological role of marine mammals.
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¹ ICES. 2024. ICES Roadmap for Bycatch on Endangered, Threatened, and Protected (ETP) Species. ICES Convention, policies, and strategy. 48 pp. <https://doi.org/10.17895/ices.pub.26003467>

Scientific justification	<p>ToRs a) and b) are standing terms of reference. Their scope was expanded by ToR c) since it was deemed useful to include information on threats to population status, including cumulative effects of multiple stressors. ToR d) reflects common interests between WGMME and WGBYC, and WGMME contribution to the roadmap for ICES bycatch advice.</p> <p>ToR e) reflects a core interest of the WG since samples collected from strandings can provide relevant information in relation to cause of death (e.g. population health, bycatch), life history, or diet.</p>
Resource requirements	None.
Participants	The Group is expected to be attended by 15–20 members.
Secretariat facilities	None beyond sharepoint facilities and editorial support for the report.
Financial	None.
Linkages to advisory committees	ACOM
Linkages to other committee: or groups	WGBYC, WGHARP, WGBIODIV, WGMPAS, WGSAM, WGJCDP, EPDSG, SCICOM
Linkages to other organizations	OSPAR, HELCOM, ASCOBANS, IWC, NAMMCO

Resolutions approved in 2023

Working Group on Oceanic Hydrography (WGOH)

2023/MT/EPDSG01 The **Working Group on Oceanic Hydrography (WGOH)**, chaired by Frederic Cyr, Canada and Ricardo Sánchez Leal, 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	8-12 April	Hybrid meeting Tenerife, Spain	Interim e-evaluation	Outgoing chairs: Caroline Cusack, Ireland; and Tycjan Wodzinowski, Poland Incoming chairs: Frederic Cyr, Canada and Ricardo Sanchez Leal, Spain.
Year 2025	25-28 March	Gdynia Poland	Interim e-evaluation	
Year 2026	TBD	TBD	Final e-evaluation report by Date (TBD) May to SCICOM	

ToR descriptors

TO R	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	Through a growing network of oceanographers, examine the hydrographic variability of the North Atlantic and adjacent seas. Identify events, trends and drivers in the region.	The experts of the WGOH will compile a wide range of observations taken by various national programmes. This exercise helps to monitor developments of the environmental conditions that they sample.	Code 1.1; 1.2; 1.9	3 years	Annual WGOH meeting featuring a series of regional presentations, covering the evolution of hydrographic conditions and development of monitoring programmes. The synthesis of these changes are summarised in the IROC products.
b	Standard Sections and Stations summarised into the production of the IROC-online products (web: https://ocean.ices.dk/core/iroc)	The Working Group recognises the need to disseminate climate information in a timely and appropriate manner. IROC products (content and structure) are revised every year. Improvements are proposed and implemented when possible.	Code 1.1; 1.2; 1.9	3 years	i) A summary of data series is uploaded to the IROC website, annually. ii) IROC Highlights available ~2 - 3 weeks after the WGOH annual meeting, summarising conditions in the previous year. iii) IROC report published as an ICES CRR document once every three years. Target: Release in summer, before the ASC.

c	Explore and continue to increase the international profile and exposure of this EG across national and international events and engagement with the broader ocean observing system community (e.g. GOOS; GO-SHIP, EOOS).	Participate in and/or organise national and international events. Enhanced information exchange benefits both ICES and international monitoring programmes. There is an increasing need to establish stronger connections between hydrographic monitoring programmes involved with WGOH and the broader GOOS community. The contact established with OceanOPS (formerly JCOMMPS) and GO-SHIP should be maintained.	Code 1.2; 1.9; 3.4	3 years	EG members will publish in the proceedings of suitable events. Outcomes of engagement activities with the broader ocean observing system community are documented as part of the 3 rd year progress report. The WGOH will connect with and provide requirements to GO-SHIP (e.g. through the Horizon Europe funded project EuroGO-SHIP) and will continue to work toward providing GO-SHIP information about WGOH metadata and data links with OceanOPS.
d	Support for ICES processes on hydrographic data and ocean scale marine climate variability. Including Data Centre, other EGs, requests by the parent steering group EPDSG (Ecosystem Processes and Dynamics Steering Group) and advice programme as required.	Oceanic hydrography remains a fundamental component of assessing the state of marine ecosystems. WGOH documents interannual to multidecadal variability and trends in the oceanic hydrography for most ecoregions. WGOH can provide expert advice to ICES in relation to observing systems (GOOS), CMEMS (Copernicus Marine Environment Monitoring Service) recently referred to as Copernicus Marine Services or policy (MSFD, Marine Strategy Framework Directive).	Code 1.2; 1.9; 6.3	3 years	Delivery of timely data and advice, upon ICES request or by WGOH initiatives in development that depend on ocean hydrography (Ecosystem Overviews, ICES Oceanography Review, Integrated Ecosystem Assessments, etc.). Assessment of ocean hydrography issued upon request.

Summary of the Work Plan

Year 1 (2024)	<ul style="list-style-type: none"> a) IROC 2023 web products (data and maps) and the early release of highlights of North Atlantic hydrographic conditions with a special focus on any significant events. b) Review the current roadmap for IROC evolution. Implement modifications to IROC format and content as feasible. c) WG Activities progress report (Interim working group e-evaluation) including status of WGOH time series and update on linkages with the broader community (e.g. oceanographic, policy). d) Review climate monitoring, reanalysis and forecasting programmes relative to ICES work.
Year 2 (2025)	<ul style="list-style-type: none"> a) IROC 2022, 2023, 2024 web products (data, maps and report) production including early release of highlights of North Atlantic hydrographic conditions. Implement modifications to IROC format and content as feasible. b) WG Activities progress report (Interim working group e-evaluation).
Year 3 (2026)	<ul style="list-style-type: none"> a) IROC 2025 (data and maps) web products production and review of content and requirement to continue IROC process. b) WG Final report (i.e. End of Term e-evaluation of fixed term working group).

Supporting information

Priority	Oceanic hydrography remains a fundamental component of assessing the state of marine ecosystems. WGOH documents interannual to multidecadal variability and trends in the oceanic hydrography setting the vital context for prevailing conditions & ecosystem change. The IROC has been cited more than 220 times (http://tinyurl.com/ICES-IROC) demonstrating that it is an important resource for the marine science community within and beyond ICES.
Resource requirements	The research and operational monitoring programmes which provide the main input to this group are already underway, with resources committed. Resources required to undertake additional activities in the framework of this group are negligible. The WGOH need ICES support to ensure there is a clear line of communication (contacts) and instruction (list of oceanography and ocean climate change information required) from EGs who need WGOH input when updating their Ecosystem Overviews. ICES secretariat support as listed below under “Secretariat facilities” is also appreciated.
Participants	The Group meetings are normally attended by about 15–20 members and guests (in-person) with other members joining online. The EG composition is constantly changing. Currently, the WGOH group consists of 56 delegates from 16 countries representing 36 institutions. In recent years (2021 and 2022) up to 36 people attended the online meetings with 60 people attending the 2023 hybrid meeting (this includes the 23 external guests who attended the mini-symposium).
Secretariat facilities	Support required: <ul style="list-style-type: none"> - ICES scientific officers for logistical and technical support for meetings and reporting. - ICES editorial staff for the IROC production. - ICES data management team for advice on data governance, management and support to update and improve the on-line IROC interactive website products. ICES communication officers to help raise the profile of WGOH outputs.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	The group is open to requests regarding environmental policy as required. Currently, WGOH outputs feed into the ICES advice products “ecosystem overview reports”. To date, the EG has provided input to the reports of the following ecoregions (a) 2022 Celtic Seas, (b) 2022 Greater North Sea, (c) 2022 Bay of Biscay and the Iberian Coast ecoregion, and (d) 2021 Greenland Sea.
Linkages to other committees or groups	There is a close working relationship with many EPDSG EGs. The most direct link is to WGOOFE (Working Group on Operational oceanographic products for fisheries and environment) where the activities of the 2 groups are complementary. WGOH focuses on the larger Atlantic space and long-term climate scales. In recent years, the WGOH has worked with a number of the Integrated Ecosystem Assessment EGs (e.g. WGEAWESS, WGINOSE, WGIEAGS) providing supporting oceanographic and climate information for consideration in the ecosystem overview reports. Link to ICES editorial team for the annual production of the IROC.
Linkages to other organisations	Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) led programmes, i.e. Global Ocean Observing System (GOOS), The Global Ocean Ship-based Hydrographic Investigations Program (GO-SHIP), The International Center of Excellence for Coordination and Monitoring of Meteo-Oceanographic Observing Systems that are part of the Global Ocean Observing System (WMO-IOC OceanOPS), The Northwest Atlantic Fisheries Organisation (NAFO).

Working Group on Zooplankton Ecology (WGZE)

2023/MT/EPDSG02 The **Working Group on Zooplankton Ecology (WGZE)**, chaired by Antonina Dos Santos, Portugal and Todd O'Brien, 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 2024	6–8 February	Plymouth, UK		Outgoing chairs: Sophie Pitois and Lidia Yebra Incoming chairs: Antonina Dos Santos, Portugal and Todd O'Brien, USA
Year 2025	24-27 March	Faro, Portugal		
Year 2026	TBD	TBD		

ToR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
A	Developing size-based indicators of plankton status and energy transfer efficiency	Size is a “master trait” in pelagic ecosystems, dictating the pace of a wide range of processes ranging from individual cell to ecosystem in scale. By considering size as a central theme, zooplankton can be linked to phytoplankton and as a conduit, of highly variable efficiency, to commercially exploited fish. We will continue to compile a database of plankton sizes to be used in conjunction with zooplankton time series to provide a scoping report on suitable data for size spectra analysis. This report will list the availability of suitable time series of data that provide complete abundance and mass indices among taxa that span from nanoplankton up to macroplankton. These suitable datasets will enable the construction of size spectra which provide a simple and robust in-situ index of how efficiently energy is transferred from primary production up to organisms the size of fish. The size-based indicator developed originally for ecosystem status assessment in the Baltic Sea, will be used and expanded across suitable ICES sites across the Atlantic to understand how the changing size structure of the marine ecosystem relates to environmental conditions.	1.3, 2.2, 2.5	Years 1-3	An open access database of species-based zooplankton size data and other traits. A compilation of suitable datasets and time series that provide high quality size spectra from the ICES area. Report on the changes in plankton size and function across the ICES area and its relationship with ecosystem status with the aim of development of size-based indicators.
B	Assessing patterns and trends of zooplankton community properties	Zooplankton community changes have been observed across the North Atlantic in recent decades, associated with changes in ocean circulation and environmental conditions (e.g., water column mixing, water temperature, phytoplankton bloom dynamics). This ToR characterises and compares long-term trends and patterns in community changes across ICES time series. Changes in mesozooplankton, macrozooplankton and gelatinous groups will be considered. Changes in rank-based assessment of community structure at the sites will be assessed in terms of species functional traits and biogeographic associations, and their association with changes in environmental conditions (e.g., depth, distance from shore, region). Tracking and understanding changes in zooplankton community composition	1.1, 1.3, 1.9	Years 1-3	A manuscript on changes in community trends and patterns in the ICES area.

		across time series stations and at the basin scale has applications to understanding pelagic ecosystem dynamics and implications for marine resource management.			
C	Report on the status and trends of plankton in the ICES North Atlantic and inland seas	In collaboration with WGPME, this revival of the legacy ICES Plankton Status Report series will create a hybrid online product of interactive exploration tools and summary text based on satellite and in-situ plankton and environmental data. Splitting the content of the massive Plankton Status Report into smaller geographic regions and shorter summary texts will facilitate easier and more frequent updates (e.g., every 1-2 years online versus every 3-5 years per report), providing more recent and relevant material to the community. This will build upon existing content (e.g. https://wgze.net/metabase , https://wgpme.net/metabase , https://igmets.net/explorer) and further expand it with new capabilities and tools. This work will also enable focused studies on key trends discovered in the general summary results, leading to special reports and/or peer-reviewed papers.	1.3, 1.9	Years 1-3 with continuity	An interactive online web interface and a regularly updated summary text on regional plankton trends and status. Contributions to ecosystem overviews as required.
D	Models and data requirements to understand zooplankton trends	Through its members' zooplankton monitoring sites, WGZE has access to zooplankton time series across the North Atlantic, Mediterranean and Baltic Seas, and it produces the Zooplankton Status Report summarizing trends among regions and over time. Since 2015, joint WGZE-WGIPEM meetings have provided an opportunity to discuss common interests, including gaps in knowledge and data needs for modelling lower trophic levels. In 2023 WGIPEM presented to WGZE a list of zooplankton information and data that would be useful for modelling lower trophic level rate processes and food web linkage. WGZE is interested in a dialogue between zooplanktologists and modellers- (dialogue/joint ToR with WGIPEM) not only about data requirement for models but also about the kind of models that would be most suitable to understand the complexity of ecosystems and zooplankton trends in the context of climate change. In addition to consideration of the list that WGIPEM presented, recent recommendations in the literature about plankton modelling data requirements and applications (e.g. Grigoratou et al. 2022: Bull. Limnol. Oceanogr. 31(1): 22-26. https://doi.org/10.1002/lob.10479) will be assessed as next action steps for implementation.	1.1, 1.2, 1.3, 1.4	Years 1-3	Recommendations for standards in collection, reporting and dissemination of zooplankton data to facilitate marine ecosystem and biodiversity modelling. Recommendations for process-oriented experiments and field observations needed for data generation Steps to implement recommendations: Maintain dialogue with WGIPEM to achieve a solid collaboration platform.
E	Automated image analysis for zooplankton monitoring	Imaging is an increasingly common approach for sampling zooplankton and can provide new types of plankton data (e.g., continuous data as opposed to discrete, or in situ size). Each imaging instrument has individual characteristics, advantages and disadvantages, and each instrument produces slightly different types of images. New methods are required to harmonise data and intercalibrate between devices to determine how full advantage can be taken of system or suite of systems. A platform where information is collated on the instrument's description, its associated limitations and a record of captured images will be a useful tool to help selecting which instrument or combination of instruments are best suited for addressing specific ecological questions. The ecological insight obtained from these meth-	1.4, 4.3, 4.4, 3.2	Years 1-3	An up-to-date comparison table of existing instruments properties (e.g., size range, towed, static etc.) and who are using those instruments. A list of ecological knowledge gaps which may be better answered by imaging methods Identifying existing (and new potential) image-based time series that may benefit

		ods may enable answering long-standing ecological questions unanswerable with traditional methods. Canvassing experts in the field to detail these questions might provide guidance for how to best deploy these tools. A list will be drawn up with existing and new research questions that may be resolved by these instruments. As sampling becomes increasingly digital, it is prudent to ensure new time series or time series where methods are migrating to digital solutions, can be integrated into existing time series and repositories. These repositories exist (e.g. Copepod database, ICES data portal) but image data remains absent. Developing a pipeline that can be used to migrate existing image-based time series to online databases, following the FAIR principles, will result in increased data accessibility.			from being uploaded to existing repositories.
F	Improving representation of under-surveyed macrozooplankton and non-crustacean taxa	Marine zooplankton is a diverse assemblage spanning 15 phyla and covering wide size spectra as well as several trophic niches from filter feeders to grazers and predators. Yet, zooplankton surveys are traditionally highly biased towards crustacean mesozooplankton, particularly the numerically dominant copepods, resulting in a relatively narrow representation of the existing phylogenetic, ecological, and functional diversity, and potentially missing ongoing changes concerning the other taxa. There are several reasons for this, such as methodological constraints in sampling, sample processing and preservation, subsampling practices resulting in a poor representation of the less numerous predatory species, lacking taxonomic expertise, and general down-prioritisation. With the marine systems facing rapid human-induced environmental changes, likely to result in altered structure and functioning of zooplankton communities, there is a need to expedite the accumulation of ecological and biodiversity data across the entire plankton community. ToR F contributes to improved data acquisition on macrozooplankton, including non-crustacean zooplankton, and other under-surveyed groups. Taxa of interest include e.g. cnidarians, ctenophores, tunicates, chaetognaths, gastropods, polychaetes, mysids, euphausiids, as well as various meroplanktonic larvae.	1.6, 3.1	Years 1-3	<p>Joint report outlining the current monitoring practices, challenges and a roadmap towards improved representation of undersurveyed taxa; Openly available resources for improved data acquisition on target taxa, such as: methods/protocols; identification materials (in collaboration with WGIMT); reference sequences/images.</p> <p>Propose relevant theme sessions to conferences (e.g. ICES ASC, 7th ZPS).</p>
G	Outreach, mentoring and training	Outreach activities in WGZE are extremely important to connect all researchers working on zooplankton in the ICES area, spreading knowledge and expertise within the group and transferring it to other scientists in the ICES community and to the public. This ambition is connected to the present ICES Science Plan as one of its outcomes is to have marine science with a high and beneficial impact on society. On the other hand, training is becoming more and more a necessity through the zooplankton science community, especially in terms of assessing biodiversity and integrative identification of plankton species that are key to many ecology studies. Finally, mentoring is regarded as a way to bring early career scientists to the group and ICES, in order to expand the current pool of experts. This ToR will also support the editors of the ID Leaflets for Plankton and the development of theme sessions for the ICES ASC within the WGZE community.	1.2, 1.4, 1.6	Years 1-3	<p>Submission of theme sessions to the ICES ASC.</p> <p>To have WGZE members as mentors in the ICES ASC and 7th ICES/PICES Zooplankton Production Symposium (ZPS).</p> <p>Support to the organisation of training courses and workshops on zooplankton (e.g. <i>WS4: Zooplankton morphological identification. Is it still necessary?</i> at the 7th ZPS).</p>

ICES/IOC Working Group on Harmful Algae Blooms (WGHABD)

Approved on the resolutions forum in April 2024

2023/MT/EPDSG04 Working Group on Harmful Algal Bloom Dynamics (WGHABD), chaired by Dave Clarke, Ireland, and Lars Johan Naustvoll, Norway will work on the following ToRs for the 2024–2026 cycle, and generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2024	16–18 April	Ifremer, Nantes, France	Interim e-evaluation	
Year 2025	8-10 April	Gothenburg, Sweden	Interim e-evaluation	
Year 2026	April - TBC	Marine Institute, Galway, Ireland	Final report by 1 May 2026 to SCICOM	

ToR descriptors

TOR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a)	Deliver National Reports on harmful algal events and bloom dynamics for the years 2023, 2024 and 2025	HAB events may affect human activities and marine ecosystems at different levels. Understanding can best be achieved by integrating multiyear data sets. This links to ICES Science Priorities <i>Ecosystem Science, Seafood Production, Conservation and Management Science</i> .	1.3, 5.6, 6.5	Year 1,2,3	Yr 1-3 Summary of national reports in Annex in WGH-ABD annual scientific report. These will also support events reported in ICES-PICES-IOC. HAEDAT database and annual HAEDAT maps that will be used.
b)	Identify and access the interactions of HAB dynamics with multidimensional environmental stressors on marine faunal mortalities and morbidity	Marine mortalities are a common factor linked to HAB events within the ICES region and thereby collectively reported within HAEDAT under ToR (c). Within this ToR, fish-killing algal blooms will be considered in the functional content of caged-fish aquaculture, wild fish populations and other collateral damage to marine fauna and coastal ecosystems. Focus will be directed on defining the specific mode of action of dynamic ichthyotoxic blooms on salmonid aquaculture, the major fish aquaculture group impacting socioeconomic interests in the ICES region.	5.6	Year 1,2,3	Activities under this ToR would network with initiatives under the IOC-IPHAB Task Team on Fish-Killing Algae and Ecosystem Effects, ICES WG on Pathology and Diseases of Marine Organisms (WG PDMO) and ToR on HAEDAT and emerging toxin detection methods.
c)	The ICES-PICES-IOC harmful algal event database (HAEDAT) will be updated by delegates on an annual basis. HAEDAT can be used to produce 'products' such as spatial descriptions of	The ICES-PICES-IOC database plays a key role in the production of the first ICES Harmful Algal Event Status Report and remains an important source information about the global distribution of Harmful Algal Events. This will continue to be updated so that the ICES area can contribute to future HAB reporting initiatives such as updates to the IOC	1.3, 5.6, 6.5	Year 1,2,3	Yr 1-3 Delegates update HAEDAT. Liaise with IOC about HAEDAT as required. Yr 1 Entry forms reviewed, particularly in relation to fish mortalities, and recommendations passed to IOC.

<p>harmful algal events in the ICES area. Examples include maps of incidence of management actions associated with toxicity and/or mortalities which can be fed into ICES Ecosystem Overviews that can be updated annually or as required. The processes of using HAEDAT during the production of the IOC Global HAB report will be reviewed. The feasibility of compiling a parallel dataset of phytoplankton and toxicity data from selected stations in the ICES area as a supplement to event data and to build time series of HAB and toxicity occurrences will be investigated.</p>	<p>Global HAB Status Report, OSPAR assessments and more.</p> <p>This ToR links to Science Priorities Ecosystem Science, Seafood Production, Conservation and Management Science as well as contributing to the 'Safe Ocean' objectives of the UN Decade for Ocean Science for Sustainable Development.</p>			<p>Yr 2 Identify time-series of phytoplankton counts and toxin concentrations and products to be generated.</p> <p>Yr 3 Review of reporting products from HAEDAT and time series datasets. Presentation at ICHA conference.</p> <p>Production of factsheets from the ICES area to promote information from HAEDAT.</p>
<p>d) HABS: Mitigation and Bloom Control</p>	<p>Progressive climate-driven changes over the next decades are expected to increase demand on wild fisheries and aquaculture-based food supplies to maintain food security. There is thus an escalating industry and societal desire to have safe and effective bloom control options that can minimize or prevent HAB problems. Despite great advances in our understanding of HAB dynamics and our ability to detect and quantify HABs and their toxins, however, there are only few successful examples where HAB control approaches have been implemented due to public concerns. The societal, economic, geographic, and environmental impacts from marine HABs have increased in areas over the last 30 years, as has the demand for acceptable, effective, and scalable HAB control approaches.</p>	<p>2.1, 2.7</p>	<p>Year 1,2,3</p>	<p>1) An overview of actions 2) assessment of risk 3) Relevance for ICES areas 3) Final report governing control methods, risk and relevance within ICES areas.</p>
<p>e) Report on new findings in the area of harmful algal bloom dynamics</p>	<p>The dynamics and impacts of HABs and the technologies to monitoring them are evolving rapidly. WG members report new findings on the topic of algal bloom dynamics in the ICES area. This ToR feeds into ICES Science Priorities Ecosystem science, Emerging Technologies and Techniques, Observation and Exploration.</p>	<p>1.3, 3.3, 4.1</p>	<p>Year 1,2,3</p>	<p>Yr 1-3 A report on new findings in the area of harmful algal bloom dynamics will appear in the WG HABD science report.</p>

f)	Early Warning Systems: for HAB forecasting	Early warnings of HABs are important for society, e.g. for the aquaculture industry, tourism, and desalination plants. A combination of early detection of HAB organisms with models forecasting growth and advection of HABs are already in operation or in development in some ICES countries. Novel methods for observations combined with high resolution physical oceanographic models and AI-based forecasting are in development or pre-operational.	1.1, 2.5, 4.2	Year 1,2,3	<p>Yr 1. An overview of existing HAB early warning systems in the ICES region is compiled.</p> <p>Yr 2. Focus topics:</p> <ol style="list-style-type: none"> 1. How do we move from “nowcasts” to “forecasts”. 2. Challenges of obtaining/incorporating industry data. 3. Automated systems vs microscopy <p>Yr 3. Focus topic: The potential for AI in supporting early warning systems.</p> <p>Deliverable in the form of a manuscript submitted to a scientific journal.</p>
g)	HAB distribution and frequency in a changing climate	<p>Plankton are sensitive indicators of short- and long-term change, and as such, are classed as an Essential Ocean / Climate Variable (EOV, ECV).</p> <p>Climate change consequences stemming (but not limiting) from elevated seawater temperatures, changes in pH, salinity, nutrients and weather patterns (such as winter storms) are expected to influence plankton dynamics. There is also the potential for changes in planktonic diversity due the threat of the occurrence of non- native/invasive species.</p> <p>This ToR will investigate and review case studies on present and potential future changes of phytoplankton abundance, diversity, and distribution in the ICES NE Atlantic Arc region with respect to climate change.</p>	1.1, 2.1, 2.5	Year 1,2,3	<p>Yr 1: Collate regional/country timeseries data on phytoplankton diversity and abundance.</p> <p>Yr 2: Examine trend data for HAB causative dinoflagellate species.</p> <p>Yr 3: Examine trend data for other HAB species.</p> <p>Deliverable: Summary overview document with potential case studies.</p>
h)	Produce protocols and guidelines for qPCR methodologies for the study and monitoring of HAB species using eDNA	The use of environmental DNA approaches is becoming routine for microbial community and species distribution studies. Work undertaken in the previous two reporting cycles have led WGHABD to identify the qPCR method based on eDNA as the most appropriate method for HAB species ecological studies and monitoring. WGHABD have taken a longer-term view here with this ToR and see it lasting two reporting cycles. The final outcome will be agreement on common protocols and assays and on the potential of applying of qPCR in routine HAB monitoring. This has direct relevance to ICES Science priorities Ecosystem Science and Emerging Techniques and Technologies.	1.6, 1.8, 4.4	Year 1,2,3	<p>Yr 1 – Production of guidelines and protocols for the ICES area for qPCR methods.</p> <p>Yr 2 – Discussion and feedback from the monitoring systems about the feasibility of the application of the protocols.</p> <p>Yr 3 – Organization of a practical qPCR workshop to show the chosen protocols.</p>

Summary of the Work Plan

Year 1	Present national reports, new findings and update HAEDAT database with regional HAB events on annual basis. Review HAEDAT reporting forms and report to IOC with recommendations. Collate and present information on identifying the interactions of HAB dynamics with environmental co-stressors on observed/reported mortalities – particularly fish caged aquaculture. Production of guidelines and protocols for the ICES area for qPCR methods. Collate regional/country timeseries data on phytoplankton diversity and abundance. An overview of existing HAB early warning systems in the ICES region is compiled. Review and report on global progress on HAB control/bloom mitigation.
Year 2	Present national reports, new findings and update HAEDAT database with regional HAB events on annual basis. Review products from HAEDAT and presentation at ICHA conference in 2025. Discussion and feedback from the monitoring systems about the feasibility of the application of the qPCR protocols. Define the specific mode of action of dynamic ichthyotoxic blooms on salmonid aquaculture, the major fish aquaculture group impacting socioeconomic interests in the ICES region. Examine current and potential application of in-situ remote sensing platforms for HAB species detection and their accuracy when compare. Examine trend data for HAB causative dinoflagellate species. Review and report on global progress on HAB control/bloom mitigation. Focus topics: 1. How do we move from “nowcasts” to “forecasts” 2. Challenges of obtaining/incorporating industry data 3. Automated systems vs microscopy.
Year 3	Present national reports, new findings and update HAEDAT database with regional HAB events on annual basis. Organization of a practical qPCR workshop to demonstrate the selected and validated protocols. Present evidence that multifactorial environmental stressors, plausibly linked to climate change and/or anthropogenic factors, can amplify and attenuate the effects of HABs on fish mortalities and health status. Examine trend data for other HAB species with the deliverable: Summary overview document with potential case studies. Review and report on global progress on HAB control/bloom mitigation. Automated systems vs microscopy - Focus topic: The potential for AI in supporting early warning systems. Deliverable in the form of a manuscript submitted to a scientific journal.

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. Harmful algal blooms can negatively impact ecosystems and ecosystem services within the ICES area. ICES-IOC WGHABD has developed a suite of ToRs that address the rising issues associates with HABs in the North Atlantic. The current activities of WGHABD address multiple science priorities within ICES. These are Ecosystem Science, Observation and Exploration, Emerging Techniques and Technologies, Seafood Production and Conservation and Management Science. In addition, WGHABD is also involved with a number of global initiatives via the IOC Intergovernmental Panel for HABS and the IOC Global HAB Status Report which is placing ICES Science on a global stage.
Resource requirements	The research programs which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 20–25 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and group under ACOM	Output from HAEDAT and ICES Harmful Algal Event Status report will provide material for ACOM should requests for advice require consideration of impacts from HABs.
Linkages to other committees or groups	There is a close working relationship with all the groups within EPDSG, in particular with WG PME, WG ZE, WG ITMO and WG BOSV. During the coming reporting cycle linkages with WG

	PDMO and WG OH will be strengthened and relationship with the Aquaculture Steering group enhanced.
Linkages to other organizations	WGHABD is co-sponsored by the IOC and works closely with it under several HAB initiatives including Task Teams under Intergovernmental Panel on HABs and links to Global HAB Scientific Steering Committee

Benthos Ecology Working Group (BEWG)

Approved on the resolutions forum May 2024

2023/MT/EPDSG07 The **Benthos Ecology Working Group (BEWG)**, chaired by Johan Craeymeersch, the Netherlands; and Paolo Magni, 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	13–17 May	Bremen, Germany	E-evaluation	
Year 2025	12-16 May 2025	Oostende, Belgium	E-evaluation	
Year 2026	TBD	TBD	E-evaluation and scientific report to SCICOM	

ToR descriptors

ToR	Description	Background	SCIENCE PLAN CODES	Duration	Expected Deliverables
A	Long-term benthic series		1.1; 1.3; 1.4	Years 1-3	
	1.To review knowledge on drivers for changes	The need for the BEWG to work on current tools and techniques associated to the understanding of natural variability changes and climate changes onto the benthos is of importance			Review paper drafted on current knowledge on impacts of Climate Change
	2.To identify methodological issues in long-term series comparability	There is a need to review and compile methodological issues (e.g. methods, tools) associated to long-term series comparability in marine assessments. Actions linked with ToR C (effective monitoring programs)			Report on comparisons of running programs (selection will be based on the updated table onlong-term benthic series on hard and soft sediments) and consequences of new methodologies (including new preservatives , new identification techniques, etc.)
B	Species distribution, modelling and mapping		1.6; 1.7; 1.9	Year 1-3	
	1.BEWG will analyze shifts in taxonomic and functional (i.e. composition in bioturbation and bioirrigation traits) composition in different European regions	BEWG will report on distribution and connectivity of species on different scales, e.g. using new data and population genetics, and of the performance of different qualitative and quantitative approaches and will consider new methods and applications , e.g. processes and			Research paper

		functions as tools to support modelling and mapping approaches,	
	2. Micro-scale habitat use	Micro-scale habitat use might be related to differences at very fine scale in e.g. sediment characteristics, other species (e.g. commensalism)	Research paper
C	Benthos and legislative drivers		7.1; 3.1; 3.2 Year 1-3
	1. To report on the use of benthic indicators and targets for management: Compatibility and complementarity	ICES BEWG will focus on the practical implementation of the MSFD D6 criteria for determining the benthic seafloor status across spatial scales, based on existing indicator approaches through case studies. This should further underpin the scientific development of the concept of 'adversely affected' in relation to the MSFD assessment framework, to be published in a viewpoint paper.	NEW-Position paper
	2. To evaluate the development of effective monitoring techniques and programmes, e.g. design, techniques for species identification (e.g. molecular, imagery), improvements, harmonisation and quality assessments	Management of larger water bodies need harmonized monitoring to allow proper assessments.	Year 1-3: reports on the status of new techniques; year 2-3; report on how do different techniques fit together in monitoring programs
	3. To explore relationships between pressures and status of the benthos	Management of the marine environment is dependent on the understanding of the relationships between pressures and status. BEWG will deepen the knowledge on a selected set of pressure state relationships evaluating appropriate methodological approaches. Also extending to new areas under pressure, such as the deep-sea.	-Scientific paper on methodological approaches to investigate pressure state relationships.
D	Benthic biodiversity and ecosystem functioning	Disentangling the link between biodiversity and ecosystem functioning is currently considered to be key to fully understand the health of marine ecosystems. This topic hence became a cross-cutting theme since the BEWG 2012 meeting. The BEWG will therefore review and identify benthic indicators to reflect the link between biodiversity and ecosystem functioning and review how ecological function and diversity relates to different parts of the benthic communities at different spatial scales, taking account of e.g. ecological processes and biological	2.2; 2.3; 2.4 Years 1-2

	traits. BEWG will also scope for research on the functional diversity of macrobenthos in relation to ecosystem functioning.	
	1.To report on the ongoing case studies to assess ecological responses across sediment gradients.	Research paper to report on a selected case study.
	2.To consider new functional indicator needs to support MSFD requirements.	Viewpoint paper
E	Benthic biodiversity and conservation: to review the role of benthic ecology in MPAs	6.1; 6.2; 6.4 Years 1-3
	To review the role of benthic ecology, conservation in relation to ongoing issues (e.g. fisheries, NNIS, etc.) in relation to Marine Protected Areas (MPAs)	NEW- Review paper
	Understanding ecological issues associated to the development/proposal of MPAs and how effective MPAs are for the conservation of priority benthic species is key to support conservation and management strategies. This TOR is relevant with regards to ongoing issues (i.e. management measures) being applied within MPAs. This work brings understanding to safeguard the species in need of protection, creating further repercussions to the ecosystem function and processes in specific habitats and species. This ToR will consider issues associated with conservation/restoration, Autecological/environmental as well as human issues.	

Summary of the Work Plan

YEAR 1	TORs A1-2, B.1-2, C.1-3, D.1-2, E.1.
Year 2	ToRs A1.-2, B.1-2, C.1-3, D.1-2, E.1.
Year 3	ToRs A.1-2, B.1-2, C.1-3, D.1-2, E.1.

Supporting information

Priority	The current activities of BEWG will continue along the main priority within BEWG ToRs, based on long-term series and climate change, benthic indicators and EU directives, and species distribution modelling, and one cross-cutting (horizontal) axis on benthic biodiversity and ecosystem functioning (including issues directly in connection to MPAs). The BEWG work and TORS are aligned with the ICES Science Programme and are of high priority. The BEWG are active contributors and aim to report their outcomes directly to ICES in their annual report, Biodiversity highlights and in parallel as peer reviewed literature. Some of the outputs will be submitted to ICES JMS, Ecological Indicators, Marine Pollution Bulletin, etc.)
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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 some 20-30 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and group under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	There is a possibility for interaction of several ICES expert groups, among which WGBIOD, WGCEA, WGDEC, WGVMS, WGEKO, WGMHM and WGEXT.
Linkages to other organizations	The group has had also interaction with OSPAR IGC-COBAM.

Joint ICES/ PICES Working Group on Sustainable Pelagic Forage Communities (WGSPF).

2023/MT/EPDSG08 A Joint ICES/ PICES Working Group on Sustainable Pelagic Forage Communities (WGSPF), chaired by Susana Garrido, Portugal (ICES), Rebecca Asch, USA (ICES), Chris Rooper, Canada (PICES), and Motomitsu Takahashi, Japan (PICES) 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	Summer	Hybrid/ Copenhagen, Denmark		Inter-sessional WG meeting, funding mechanisms being explored. Location dependent on success of funding raising efforts.
Year 2024	Oct 26–Nov 1	Honolulu, USA		One-day topic session titled: “Advances in observational, analytical, and modeling tools that lead to better observations and improved understanding of small pelagic fish” and one day WG meeting at the 2024 PICES Annual Meeting
Year 2025	25-27 February	Lisbon, Portugal	Final report by October 2027	Annual WG meeting
Year 2025	September	TBD		ICES ASC
Year 2025	November 7- 16	Yokohama, Japan		PICES AM
Year 2026	Early May	La Paz, Mexico		SPF Symposium (resolution to be submitted to ICES & PICES) and Annual WG meeting immediately after
Year 2026	September	TBA		ICES ASC
Year 2026	October	TBA		PICES AM
Year 2027	Spring	TBA		Synthesis writing workshop planned (depending on successful funding applications)

ToR descriptors

ToR	Description	Background	SCIENCE PLAN CODES	Duration	Expected Deliverables
a	Foster international and interdisciplinary collaboration to establish similar study frameworks and comparative analyses of forage species, their ecology, and fisheries.	Forage fish have been shown to exhibit out-of-phase oscillations in abundance across ocean basins and may be expanding their ranges into new regions and fisheries management zones. Therefore, international	1.9, 5.2	3 years	Meeting reports submitted to ICES and PICES, Perspective paper(s) submitted to peer-reviewed journal(s)

		collaboration to understand and compare their dynamics is needed.			
b	Assess recent progress on understanding fluctuations of forage species (abundance, distribution, diversity, and characteristics) and their impacts on the structure and function of ecosystems, particularly upper trophic levels.	Competition between capture fisheries and upper trophic levels for forage species can become intensified during periods of low abundance. Understanding the mechanisms behind these fluctuations will allow us to anticipate changes with increased accuracy, allowing for improved decisionmaking from an ecosystem fisheries management standpoint.	1.2, 1.3, 2.2	3 years	Review paper(s) within peer-reviewed journal
c	Identify, prioritize, and recommend research most needed to advance our knowledge and capacity to forecast ecosystem responses to changes in forage species.	This goal is timely given recent progress in the development of higher-resolution regional climate models, increased skill of ecological forecasts, and growing capacity to couple different types of ecological, biogeochemical, and climatic models.	1.3, 7.6	3 years	Meeting reports submitted to ICES and PICES, Perspective Paper(s) submitted to peer-reviewed journal(s)
d	Recommend strategies for studying and monitoring socio-ecological systems and improving ecosystem-based management to contribute to the sustainable harvest of forage species.	An increased focus on socio-ecological systems and ecosystem-based management is needed under climate change as population productivity for many stocks may decline at the same time as an increased demand for fish due to human population growth.	2.5, 3.1, 4.1	3 years	Meeting reports submitted to ICES and PICES, Perspective Paper(s) submitted to peer-reviewed journal(s)
e	Describe how climate change and other anthropogenic factors impact forage species and examine how these factors will affect economies, nutrition of	While knowledge about climate change impacts on forage communities is growing, we do not have a good	1.3, 7.6	3 years	Meeting reports submitted to ICES and PICES, Perspective Paper(s) submitted to peer-

	human communities, aquaculture, fishery portfolios, and/or transboundary management, and recommend options for adaptation.	understanding of how cumulative impacts and synergistic interactions affect these living resources due to the multifaceted nature of climate change and other anthropogenic factors, such as habitat degradation and pollution.			reviewed journal(s)
f	Organize a joint ICES/PICES/FAO symposium on forage species	This symposium will build upon the Small Pelagic Fish symposia held in 2017 (March 6–11, 2017, Victoria, Canada) and 2022 (November 7–11, 2022, Lisbon, Portugal). The symposium, tentatively scheduled for spring 2026, will showcase integrative analyses of this working group. Working group members will also propose and convene topic sessions and/or workshops at the PICES Annual Meetings and ICES Annual Science Conferences, as well as at FAO-sponsored meetings focused on key questions and recent advances in the dynamics of forage species in ecosystems and the impact of forage species on higher trophic levels.	1.3, 7.6	3 years	Joint ICES-PICES theme sessions. An International ICES-PICES SPF symposium Special issue(s) in peer-reviewed journal(s)

Summary of the Work Plan

Year 1	Initial meeting will take place in Summer 2024 of members from both ICES and PICES communities including a broader array of scientists from non-ICES and PICES regions (e.g. Humboldt EBUS, Mediterranean Sea). The ToRs will be clarified and collaborative opportunities related to the ToRs will be explored. Emphasis will be on summarizing ongoing work in various regions and scoping of joint research activities such as comparative analyses to be conducted by participants. Two additional meetings will take place at the ICES ASC and PICES AM. A one-day topic session titled: “Advances in observational, analytical, and modeling tools that lead to better observations and improved understanding of small pelagic fish” will be convened at the 2024 PICES Annual Meeting in Honolulu, USA (TOR#3).
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Year 2	An international Symposium will be convened in La Paz, Mexico immediately followed by a writing workshop to start producing synthesis articles stemming from activities in Year 1 and outcomes of the SPF symposium. The group will also meet at the ICES ASC and PICES AM.
Year 3	Meetings will take place at the ICES ASC and PICES AM. Final reporting of this 3-year phase of this group will be prepared. It is anticipated that a resolution will be submitted to extend the life-time of this joint group beyond this three-year phase.

Supporting information

Priority	<p>Forage species are critical ecosystem components, occupying mid-trophic levels with the potential to impact most commercially important piscivorous fish species, marine mammals, and seabirds. Additionally, directed commercial fishing on forage species accounts for more than 30% by weight of the total landings of fisheries globally. These landings are used both for human consumption and as protein for aquaculture and agriculture operations around the world. Many forage species are also culturally important and support local and indigenous communities.</p> <p>Examples of forage species and community members to be considered by the working group include small, schooling, low- or mid-trophic level, pelagic fishes that are planktivorous throughout their life history (e.g., herring, anchovy, sardine), mesopelagic fishes (e.g., myctophids), euphausiids, and squids. Forage species are difficult to manage sustainably. Historical populations have often oscillated through “boom and bust” cyclical dynamics attributed to both bottom-up processes (e.g., regime shifts or changes in marine productivity due to climate variability) that are amplified by top-down impacts (e.g., natural mortality due to increasing predators or overfishing). As a group, forage taxa have relatively short life spans, potential for high recruitment, compensatory mortality, and density-dependent dynamics, are sensitive to both climatic and anthropogenic impacts and may exhibit rapid responses to changing conditions. Climatic and anthropogenic impacts are likely to change marine and estuarine systems and their forage communities in unanticipated ways, which will require adaptive and flexible management systems to maintain both sustainable fisheries and the ecosystem services that forage species provide.</p> <p>From 2019-2023, a joint ICES-PICES working group on Small Pelagic Fish (WGSPF/WG 43) focused on establishing a multidisciplinary and global community of researchers to compare and contrast ecosystem-level approaches to determining the cause of fluctuations in SPF populations and synthesize mechanisms linking climate and ecosystem variability and population dynamics of SPF. These efforts culminated in an international symposium on “Small Pelagic Fish: New Frontiers in Science for Sustainable Management” (November 7–11, 2022, Lisbon, Portugal).</p> <p>The synthesis of the WGSPF/WG 43 noted several areas of emerging technologies and methods that can be used to better manage and adapt to changing forage dynamics. These include innovative technologies such as genetics, acoustics, underwater imagery, predator-inferred distributions, and isotopes, as well as novel and emerging analysis techniques such as artificial intelligence, management strategy evaluation, social network modeling, and simulation testing methods. In particular, international collaboration on the development of novel technologies to survey and monitor forage fish populations, simulation testing of management in the face of climate changes, and inclusion of climate and other anthropogenic drivers into management would be useful on a global scale to develop strategies that could lead to robust and sustainable ecosystem approaches to management of forage species. To that end, we are proposing to build on and expand the work of WGSPF, with the establishment of a new joint ICES-PICES working group with a three-year term beginning in mid-2024 that will address the following terms of reference.</p> <p>The platform for international collaboration will allow the marine science community to more rapidly address challenging goals such as to:</p> <ol style="list-style-type: none"> 1. Perform a synthesis of mechanisms linking climate variability to population dynamics of forage communities among different ecosystems to reconcile recruitment hypotheses;
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2. Gain an holistic, ecosystem-level view of the causes and consequences of fluctuations in forage communities such as how different factors (physical forcing, trophodynamics, and fishing pressure) interact to control the dynamics of populations;
3. Unite various fields, such as, but not limited to, climate science, oceanography, plankton and fish ecology, quantitative fisheries stock assessment, sociology and economics, to build interdisciplinary approaches to examine forage communities in social-ecological systems;
4. Incorporate new monitoring and modelling technologies to better understand and manage forage communities;
5. Provide projections of the effects of climate change on the distribution and productivity of forage communities;
6. Propose strategies to safeguard marine ecosystem services stemming from forage communities including conservation concerns related to foragers and their predators.

The activities of this joint WG are considered to have a very high priority for both ICES and PICES. The working group activities align with at least five of the seven science priorities set in the ICES Strategic Plan, including: (1) Ecosystem science, (2) Impacts of human activities, (3) Observation and exploration, (4) Seafood production and (5) Conservation and management science. The activities of the proposed joint working group will also contribute to the first three of the six goals identified in the PICES Strategic Plan: (1) Foster collaboration among scientists within PICES and with other multinational organizations; (2) Understand the status and trends, vulnerability, and resilience of marine ecosystems; and (3) Understand and quantify how marine ecosystems respond to natural forcing and human activities.

Resource requirements	Some resources to support travel of key group members to PICES Annual Science Conferences will be requested (see below). Support from ICES as already been applied for.
Participants	The group is expected to maintain the approximately 100 members already in the sharepoint list, and to attract between 25 to 35 new members and guests with broad coverage of ecosystems within and outside ICES and PICES regions.
Secretariat facilities	The group will request meeting rooms / times associated with the ICES ASC. This will require some assistance from members of the secretariat organizing those events. Similar requests will be made of the PICES secretariat.
Financial	Travel funds to meetings will be explored within mother Institutions (PICES and FAO). For the Symposium, we expect over a dozen of funding contributors, as in the last edition.
Linkages to ACOM and groups under ACOM	The group will identify how environmental drivers influence the productivity of forage communities within ICES areas. This information will be useful to ACOM, ICES Working Group on Cephalopod Fisheries and Life History (WGCEPH), and the ICES Working Group on Anchovy, Horse mackerel and Sardine (WGHANSA). In addition, outcomes from ToR d (recommend strategies for studying and monitoring socio-ecological systems and improving ecosystem-based management to contribute to the sustainable harvest of forage species) will be useful for the ICES Human Dimensions Steering Group (HUDISG) and the Integrative Ecosystem Assessment Steering Group (IAESG).
Linkages to other committees or groups	It is anticipated that very close working relationships will be created with other groups within the Ecosystems, Processes and Dynamics Steering Group such as those working on predators (e.g. JWGBIRD) and prey (WGZE) of SPF. Similarly, the work conducted will be useful to food web modelling (e.g. WKEWIEA) and to state-of-the-art biophysical modelling (e.g. WGIPEM) within SG Integrated Ecosystem Assessments.
Linkages to other organizations	Joint partnership between ICES and PICES: the proposal is simultaneously submitted to PICES; FAO General Fisheries Commission for the Mediterranean (GFCM; http://www.fao.org/gfcm): Working Group on Stock Assessment of Small Pelagic Species; North Pacific Fisheries Commission (NPFC; https://www.npfc.int/): Technical Working Group on Pacific Saury Stock Assessment (TWG PSSA) and Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA);

The mandate of this joint ICES/PICES activity is relevant to the objectives of the UN Decade of Ocean Science for Sustainable Development (e.g., Challenge 2 – Protect and restore ecosystems and biodiversity, Challenge 3 – Sustainably feed the global population, and Challenge 4 – Develop a sustainable and equitable ocean economy) and UN Strategic Development Goals (e.g., SDG 2 – Zero Hunger, SDG 12 – Responsible Consumption and Production, and SDG 14 – Life Below Water)

OSPAR/HELCOM/ ICES/Working group on Seabirds (JWGBIRD)

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

Approved on 06 June 2024 on the ICES Resolution Approval Forum.

2023/MT/EPDSG09 JWGBIRD 3-year workplan can be found here:

https://community.ices.dk/Committees/Resolutions/Attachments/0402_draft_jwgbird-3-year-work-programme_2024-2026%20consolidated_28May.docx

Resolutions approved in 2022

Working Group on Integrated Morphological and Molecular Taxonomy (WGIMT)

2022/FT/EPDSG02 The Working Group on Integrated Morphological and Molecular Taxonomy (WGIMT), chaired by Dafne Eerkes-Medrano, UK and Aitor Albaina, 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 2023	31 March	Naples, Italy	Interim e-evaluation	Incoming chairs: Dafne Eerkes-Medrano, UK and Aitor Albaina, Spain.
Year 2024	9 February	Plymouth, UK	Interim e-evaluation	
Year 2025	28 March	Faro, Portugal	Final report to SCICOM	

ToR descriptors

ToR	Description	Background	SCIENCE PLAN CODES	Duration	Expected Deliverables
a	Evaluate the potential of integrated approaches for understanding marine plankton communities	Molecular methods are widely used for rapid assessment of species diversity and can contribute to improving our understanding of the impacts of climate change and anthropogenic effects on marine ecosystems. There is a need for inter-comparison of results to understand the impact of using different genetic markers that will allow a broader taxonomic coverage and are complementary.	1.6; 1.7; 4.4	3 years	<ol style="list-style-type: none"> 1. A report which identifies the limitations of different methods and genetic markers for zooplankton taxa (year 3) 2. A review which examines studies in pelagic ecology that effectively use integrative methods (year 3)
b	Demonstrate the advantages of using integrated methods in long-term monitoring of plankton communities	The use of integrative methods offers complementarity and a broader assessment of zooplankton diversity and community structure. Morphology alone cannot cover the whole diversity spectrum and has its known limitations (e.g. laborious, challenge for cryptic species or partial specimens). Nonetheless it offers other essential levels of detail that complement and confirm taxonomic assessments derived from optical or molecular approaches. Metabarcoding as well as eDNA metabarcoding has been used effectively for marine biodiversity assessments and more so often for biomonitoring purposes. Particular advantages of metabarcoding techniques are being relatively cheap and quick in obtaining results, with eDNA metabarcoding furthermore also being non-invasive.	1.6; 1.7; 4.4	3 years	<ol style="list-style-type: none"> 1. A list of invasive species that are detected within zooplankton communities by using integrated methods (year 2) 2. A report which compares data generated using current classical time-series monitoring vs. information from metabarcoding with a specific focus on mero-plankton (year 3)

c	<p>Initiate and support The WGIMT Resource Portal provides informational overviews and links to relevant literature and training materials, taxonomy molecular technologies (and morphological verification) for the integrative taxonomy of zooplankton. Taxonomy workshops are effective in engaging target audiences and ensuring trained technicians and researchers for applications in fisheries and ecosystem management. Co-sponsored workshops and meetings with other EGs will increase impact and likelihood of adoption of integrated methods for advisory applications.</p>	1.6; 1.8	3 years	<ol style="list-style-type: none"> 1. Expansion of the WGIMT North Atlantic barcoding Atlas (in collaboration with WGPME) (year 3) 2. Ensure provision of training materials (year 1-3) 3. Design and organize integrative taxonomy workshops (year 1-3) 4. Continue development and enhancement of the WGIMT Resource Portal (year 1-3)
d	<p>Continue to demonstrate leadership in and applications for fisheries and ecosystem management and engagement should be explained in high-visibility settings in ICES and other organisations through integrative taxonomic special sessions at scientific conferences. It is important to maintain a strong foundation and visibility in primary research literature in order to validate metagenetic approaches for analysis of zooplankton diversity. Publication in peer-reviewed scientific journals will demonstrate validity of data, protocols, and results, and allow dissemination and new applications in ecosystem management.</p>	1.6; 1.7; 1.8	3 years	<ol style="list-style-type: none"> 1. Organize & promote special sessions at national and international conferences: e.g. ICES ASC; ASLO/TOS Ocean Sciences Meetings, Zooplankton Production Symposium (year 1-3) 2. Publish peer-reviewed scientific papers on topics central to the WGIMT mission, including papers on population connectivity and phylogeography of key species in different ecosystems and the integration of metabarcoding in time-series analysis (year 1-3)

Summary of the Work Plan

Year 1	<p>Progress and reporting on all ToRs. Identification of limitations of different molecular methods and genetic markers for zooplankton taxa. Assembling list of invasive species that are detected within zooplankton communities by using integrated methods (ToRs a, b)</p>
Year 2	<p>Progress and reporting on all ToRs. Update of WGIMT barcode atlas and database in collaboration with WGPME. Carry out collaborative activities with other SCICOM EGs to promote integrative taxonomy and publish peer reviewed scientific articles on topics central to the WGIMT mission (ToRs c, d).</p>

Year 3	Progress and reporting on all ToRs. Recommend, encourage, and enable use of integrated morphological and molecular taxonomic analysis of zooplankton in integrated ecosystem assessments in ICES area seas. Complete a review which examines complementary studies in pelagic ecology that effectively use integrative methods (ToRs a, b, c, d).
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Supporting information

Priority	The activities of WGIMT will assist ICES and its expert groups with issues related to the development, dissemination and application of taxonomic knowledge and skills in support of Integrated Ecosystem Understanding. Accurate identification of species and characterization of species-level diversity are and will remain foundations of integrated ecosystem assessments of function and state. Integrated taxonomic approaches – including morphological, molecular, optical, and other – may enhance and accelerate progress toward rapid, automatable, and near real-time identification of species for fisheries and integrated ecosystem assessments; detecting the impacts of climate change on species diversity, distribution, abundance; and understanding alterations in food web structure and function and associated biogeochemical cycles. The availability of and need for new technology and techniques in taxonomic analysis make WGIMT's goals and activities important and high priority
Resource requirements	Participation in annual meetings will in the future be challenged due to the changes in working conditions since the COVID-19 pandemic and funding. Hybrid meetings will be the preferred meeting format and technical support by the ICES Secretariat might be requested
Participants	This Expert Group now includes 63 members from 20 countries, and has a balanced representation among experts in morphological and molecular taxonomic approaches covering a good range of taxonomic groups and ICES geographic regions. The group's annual meeting had to move to online meetings in 2020-2022 due to the pandemic situation and was attended by 22-27 members. New members are welcome and early career researchers are encouraged to participate. In the upcoming year, WGIMT will actively seek to include early career scientists by providing the opportunity to introduce their research during the annual meeting
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and group under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	WGIMT arose as a Study Group from the WGZE in response to perceived need, meeting in association with WGZE during 2012 and 2013. WGIMT will remain in close partnership with WGZE, WGPME, and WGEUROBUS, as well as SCOR WG 157, while promoting and supporting integrated morphological and molecular taxonomy science for the benefit of the ICES science and advisory communities as a whole. Outcomes of the work will also address topics related to e.g., WGITMO (HAPISG)
Linkages to other organizations	The work of this group relates to and is connected to a diversity of other projects and organisations, e.g. SCOR WG157 MetaZooGene, BONUS BIO-C3 project, NOAA COPEPOD and COPEPODITE, GOBI, and others.

Working Group on Cephalopod Biology and Life History (WGCEPH)

2022/FT/EPDSG03 The **Working Group on Cephalopod Fisheries and Life History (WGCEPH)**, chaired by Daniel Oesterwind, Germany, Catalina Perales-Raya, Spain, Vladimir V. Laptikhovskiy, 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	3-7 July	Instituto de Investigaciones Marinas, Vigo, Spain	Interim e-evaluation	Change in chairs: Outgoing: Ana Moreno (Portugal) and Graham Pierce (Spain) Incoming: Catalina Perales-Raya (Spain) and Vladimir V. Laptikhovskiy (UK)
Year 2024	18-21 June	Lowestoft, United Kingdom	Interim e-evaluation	
Year 2025	tbc	tbc	Final report by Date Month to EPDSG	

ToR descriptors

TOR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	Report on cephalopod stock status including fishery and survey trends: update, quality check and analyse relevant data (landings, directed effort, discards and survey catches).	Our aim is to provide an overview of the current status of fishery-relevant cephalopod stocks in the ICES areas, along with trends in abundance/biomass derived from various surveys.	5.1, 5.2, 6.1	3 years	Cephalopod stock status reports (Annual)
b	Review new and existing assessment methods for use with cephalopod fisheries and within the MSFD. Test and adapt (if available) these methods for use with cephalopod fisheries and within the Marine Strategy Framework Directive (MSFD), using data of European cephalopods (e.g. EU-Data Collection Framework, ICES coordinated fishery surveys).	Cephalopods are important ecosystem components but in the European large-scale fishery, fishing is essentially unregulated and a routine assessment does not exist for most species. Furthermore, most Member States have not included cephalopods within their MSFD status report. Both illustrate the current gap in management and assessment. The goal is advancing the assessment of European cephalopods	5.1, 5.2, 6.1	3 years	Report on advances in cephalopod stock assessment (Annual)

c	Review/update advances in knowledge of life history and ecology, identifying research priorities with the focus on cephalopod assessment methods and relevant information, including the availability of necessary data within European waters.	Cephalopods show short life-cycles as well as high variation individual life history and population abundance; understanding this variation is essential to underpin assessment and management.	1.7, 5.2	3 years	Report on relevant new knowledge and research priorities of cephalopod life-history and ecology (Y3)
d	Update best practice for routine biological data collection	It is recognized that the current standard data collection is insufficient to understand population dynamics, and to support fishery characterization and routine assessment. The sampling strategy needs to be optimized and the sampling intensity adapted to meet the needs, considering the time and budget constraints.	1.7, 3.2, 5.2	3 years	Review of biological sampling data from European programs, and identification of shortcomings (Y2). Analysis and guidelines of best practices for sampling strategy optimization (Y2); Updated data collection recommendations (Y3)
e	Review, develop and recommend tools for cephalopod species identification (ID) including image data collection.	Cephalopod species identification in fishery and survey catches remains inconsistent and incomplete. To improve species identification, simple guides need to be developed in all regions for 'easy to use' by fishers, fishery officers, inspectors, buyers, and scientists undertaking sampling. Since there is an existing effort to collect images for the regional identification guides, we could build on this effort to develop an image library that could be used to train and improve the accuracy of Artificial Intelligence and Machine Learning (AI/ML) Apps.	1.6, 3.2, 5.2	3 years	List of new/revised scientific ID guides (Annual); Simple regional ID guides for fishers (Y1); Image data management (data and metadata standards, archiving, access, dissemination) recommendations (Y2); Image data processing using AI/ML Apps recommendations (Y3).
f	Better understand the socio and economic dimensions, markets and value chains of cephalopod fisheries and explore the potential to foster transformative changes.	The European Union is one of the most important markets for cephalopod fisheries in the world. However, socioeconomic information, essential for effective management of these resources, is scarce. Plus, cephalopods value chains are global and more information is needed on markets and value chains of cephalopods.	5.8, 7.2	3 years	Paper on sustainability of the octopus value chain in the Algarve (Y1); Paper on protocol for integrated value chain analysis for cephalopod fisheries (Y2); Paper Falkland Islands Argentine shortfin squid ecopath (Y2); Octopus markets and seafood traceability (Y3).

g	Develop simple climate envelope models of cephalopod species, explore distribution shifts with climate change and long-term climate projections to aid fisheries management of cephalopods in a changing climate.	Despite high phenotypic plasticity, cephalopod distribution is limited by extremes of temperature, salinity, dissolved oxygen, etc. and it is reported that climate change has led, and will lead to, range shifts. The management community is looking for tools and decision support to manage fisheries in changing conditions and species distribution predictive modelling will be useful in this regard.	1.3, 1.5, 2.5	3 years	Paper on climate envelopes models and predicting range shifts for at least one cephalopod taxon (Y3)
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Summary of the Work Plan

Year 1	Cephalopod stock status reports, including advances in stock assessment, Simple regional ID guides for fishers, Paper on sustainability of the octopus value chain in the Algarve
Year 2	Cephalopod stock status reports, including advances in stock assessment, Review of biological sampling data from European programs, and identification of shortcomings, Analysis and guidelines of best practices for sampling strategy optimization; Image data management (data and metadata standards, archiving, access, dissemination) recommendations, Paper on protocol for integrated value chain analysis for cephalopod fisheries, Paper Falkland Islands Argentine shortfin squid ecopath
Year 3	Cephalopod stock status reports, including advances in stock assessment, Report on relevant new knowledge and research priorities of cephalopod life-history and ecology, , Image data processing using AI/ML Apps recommendations, Octopus markets and seafood traceability, Paper on climate envelopes models and predicting range shifts for at least one cephalopod taxon

Supporting information

Priority	<p>The current activities of this Group will inform ICES about the status of cephalopod stocks and fisheries at a time when fishing pressure is increasing. Cephalopods are not covered by the EU Common Fisheries Policy but there is a need to identify sustainability issues and to be in a position to recommend management actions, should the need arise. Furthermore, the planned preliminary assessment of different stocks can support the MSFD reporting in several member countries. These activities are believed to have a very high priority.</p> <p>ToRs a-g are envisaged as standing ToRs. ToRs a and b are fundamental for the advancing of stock assessment of European cephalopods and will involve a Data Call. ToR a will also review stock definition, since past preliminary assessments have been based on arbitrary spatial units and there is a need to define more appropriate management units. ToR c provides a review of recent advances in knowledge of cephalopod biology and ecology; improved understanding of life history plasticity, ecological roles and the high year to year variation in abundance remains a priority. ToR d continues efforts to facilitate better routine data collection of cephalopods. ToR e provides new tools to improve species identification. ToR f aims to ensure that social and economic sustainability of cephalopod fisheries are better understood, a key requirement for integrated ecosystem assessment. ToR g addresses effects of ocean warming on cephalopod distribution.</p>
Resource requirements	As noted in several previous reports, participation in WGCEPH is limited by availability of funding, especially as many members and potential members are staff of institutions which have no access to “national funds” for attendance at ICES meetings. Although there are no specific resource requirements, funding to assist wider participation would be beneficial.
Participants	Meetings of the Group are normally attended by around 15 members and chair-invited, with wider participation via videoconferencing and e-mail.

Secretariat facilities	None.
Financial	No specific financial implications (but see “resource requirements”).
Linkages to ACOM and groups under ACOM	The results of WGCEPH are potentially relevant for advice in the case that formal assessment and management are introduced for any of these species. .
Linkages to other committees or groups	<p>Possible links with ICES groups working on predators of cephalopod (e.g. WGBIE, WGCS, WGMME).</p> <p>WGCEPH would like to encourage improved data collection on cephalopods during trawl surveys. It will make available (e.g. to IBTSWG) detailed diagrams and protocols for identifying cephalopods and collecting biological parameters during the scientific surveys.</p> <p>WGCEPH will provide information to SCICOM and its satellite committees as required to respond to requests for advice/information from NEAFC and EC DG Fish.</p>
Linkages to other organizations	WGCEPH maintains links with ongoing European and national research projects and with the Cephalopod International Advisory Council.

Working Group on the Biology and Life History of Crabs (WGCRAB)

2022/FT/EPDSG04 - The Working Group on the Biology and Life History of Crabs (WGCRAB), chaired by Ann Merete Hjelset, 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 2023	7–9 November 2023	Bangor, Wales, UK (hybrid)	Interim e-evaluation	Outgoing chair: Carlos Mesquita, United Kingdom Incoming new chair: Ann Merete Hjelset, Norway
Year 2024	5-7 November	Weymouth, UK	Interim e-evaluation	
Year 2025	4–6 November	SLU, Sweden	Final report by 31 December 2025	

ToR descriptors

ToR	Description	Background	SCIENCE PLAN CODES	Duration	Expected Deliverables
a	Compile data on landings, discards, bycatch, effort and catch per unit effort (CPUE) to provide standardised CPUE, size frequency and research survey data for the important crab and lobster fisheries in the ICES area, Atlantic Canada and Greenland.	Crab and lobster fisheries are economically important for many coastal populations in Europe and Canada, particularly where fin fish stocks declined. It is important to collate these data at a national level to ensure stock assessments can be carried out.	3.2 3.5 4.1	3 years	Landings, discards, bycatch, effort and catch data on listed species from each country. Data will be collated and included in the WG report and may be submitted to the ICES Data Centre.
b	The EG will collate stock assessment data for areas where the information is available. The working group will review methodologies to develop suitable standardized reference points for the management of the different stocks. Explore and apply common assessment methods for crab and lobster stocks using available data including length distributions and abundance indices.	The data available and management measures applied for crab and lobster fisheries vary greatly. Many stocks are data limited and their status remains uncertain. Thus, developing robust assessment methods for many fisheries is required. Consideration will be given on how to adapt the currently available and commonly used fish assessment frameworks to crustacean stocks given their biological and gear specificities. The WG will consider to use a corporate framework of experts to review the assessment work of group members.	5.1 5.3 5.4	3 years	Report on evaluation of assessment methods. WG report chapter.
c	Review the impact of environmental and ecological drivers on important crab and lobster stocks within the ICES area, Atlantic Canada and West Greenland; Consider the introduction and spread of non-native	Crabs and lobsters, as many other species are impacted by environmental parameters. In the actual situation of climate change, WGCRAB will investigate potential effects on reproduction, recruitment, growth, biomass trends and stock distribution. Crabs represent some of the major examples for invasive species in the	2.1 2.2	3 years	Highlight important issues to be considered for research on climate change impacts on important crab stocks. WG report chapter.

	crustacean species and their impact on fisheries.	marine environment, often with substantial impacts on ecosystems and other fish stocks. Work on this topic suggests a collaboration opportunity with ICES WGITMO.			
d	Review the quality of biological parameters used in stock assessments and carry out work to estimate accurate stock-specific parameters for the crustacean species considered by the WG.	Biological parameters used for crustaceans are frequently based in old studies and not specific for each stock. Biological parameters are important for stock assessments and improved data will lead to more reliable outputs.	5.1 5.2	3 years	Update knowledge on important biological parameters used in assessments (WG report).
e	Review research and generate new knowledge on vital crab and lobster population biology, genetics and stock structure.	Refine stock structure for those areas where data is available to improve current stock unit definition of crab and lobster stocks.	1.7 1.8 5.2	3 years	Any updates or new knowledge will be outputted into the WG report summary tables.

Summary of the Work Plan

Year 1	Annual standard outputs for a and b. Continue analysis for c and d.
Year 2	Annual standard outputs for a and b. Continue analysis for c and d.
Year 3	Annual standard outputs for a and b. Complete report on analysis, research and report including all work for ToRs c and d.

Supporting information

Priority	High. In Canada as in Europe, crab and lobster fisheries are among the most valuable and the livelihoods of many coastal communities are highly dependent of crustacean stocks. Moreover, available data vary depending on the country and are often limited, as such, work on fisheries monitoring and assessment methods should be continued, particularly in those member countries where existing fishing data allow for establishing or developing stock assessments. The aim is to ensure statistically sound assessments of important crab and lobster stocks in order to provide suitable conditions to develop good management practices and stability of all dependent fleets. The activity of the group is therefore considered to be of high priority, in particular if its activity can move towards resource assessment while maintaining a broader perspective on biological research. In recent years the group has moved towards exploring new stock assessment methods for crustaceans and may move towards an advisory role in the future.
Resource requirements	The research programmes which provide the main input to this group are underway, and resources are committed. The additional resources required to undertake activities in the framework of this group is not expected to be significant.
Participants	The WG is normally attended by 20–25 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	None
Linkages to other committees or groups	None
Linkages to other organizations	None

Joint ICES/PICES Working Group on Impacts of Climate Warming on Growth Rates and Fisheries Yields (WGGRFY)

2022/FT/EPDSG05 The Working Group on Impacts of Climate Warming on Growth Rates and Fisheries Yields (WGGRFY), chaired by Alan Baudron, UK, Paul Spencer, USA, John Morrongiello, Australia, and Shin-ichi Ito, Japan, 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	TBD	TBD	Interim report by dates TBD 2024	Outgoing chair: Tara Marshall, US Meeting postponed to first quarter 2024
Year 2024	October	PICES Annual Meeting	Interim report by December 2024	
Year 2025	15-18 September	ASC, Klaipeda, Lithuania	Final report by April 2026	

ToR descriptors

ToR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	Review the current knowledge on the impact of temperature on fish growth and knock-on effects on fisheries yields, and identify possible sources of funding to target to pursue further research	Describe links between environment and production, sum up info from other ICES WG and provide background to ICES strategic initiatives, identify sources of funding for WGGRFY members to ensure progress	1.3, 1.7, 6.4	3 years	Review paper, report to ICES/PICES Strategic Initiative on Climate Change impacts on Marine Ecosystems, development and submission of research project proposal to relevant funding sources
b	Assess the capacity of statistical models to detect temperature-dependency of growth and evaluate their predictive ability, and demonstrate model results across specific warming scenarios and locations	Develop models to assess and project the ecological impact of climate change, provide statistical tools to be used outside WGGRFY	1.3, 1.7, 2.5	3 years	Paper suitable for peer-reviewed fish journal, model code sharing through GitHub.
c	Quantify the impacts of ocean warming and fisheries harvest on long-term patterns of mean, maximum and CV of body size across multiple species and large marine ecosystems	Describe life history traits response to environmental changes, increase understanding of the impact of climate change, inform stakeholders and policy makers	1.7, 5.2, 6.1	3 years	Papers suitable for peer-reviewed, high impact generic journal

d	Assess the knock-on implications of warming impacts on fish growth for fisheries yield by investigating changes in yield per recruit, and perform model simulations using size spectrum models	Assess the impact of climate change on fisheries production, inform stakeholders and policy makers	1.3, 5.2, 6.1	3 years	Paper suitable for peer-reviewed, high impact generic journal
e	Identify options for expanding scientific community access to global size-at-age data that are routinely collected by fisheries agencies worldwide	Meet existing demands for data, provide a database that can be used outside, and beyond the lifetime of, WGGRAFY	3.2	3 years	Strategic plan assessing options for widening access to size(length/weight)-at-age data collected routinely (portal site development or similar to how data can be accessed via Dattras)

Summary of the Work Plan

Year 1	A meeting will be held during the ICES ASC to present and discuss the outcomes of ToR a, and review progress of ToRs b-e. Sub-groups will meet as required to progress on ToRs. A Theme Session proposal will be submitted for the subsequent ICES ASC.
Year 2	A Theme Session at the ICES ASC will be convened by WGGRAFY chairs. A meeting will be held during the ICES ASC to present and discuss the outcomes of ToR a, and review progress of ToRs b-e. Sub-groups will meet as required to progress on ToRs.
Year 3	A meeting will be held during the ICES ASC to present and discuss the outcomes of ToR a, and review progress of ToRs b-e. Sub-groups will meet as required to progress on ToRs. A workshop will be organised to finalise progress on all ToRs and plan the writing of the results obtained for publication. New resolution for the next term will be agreed upon, with a possible change of chairs (ECR participation will be encouraged).

Supporting information

Priority	<p>The Temperature Size Rule (TSR) proposes that fish at warmer temperatures have rapid early growth and lower adult size (Forster et al. 2012). Several North Sea fish stocks have exhibited a synchronous, common trend towards smaller maximum body sizes that was correlated with increasing temperature. This “shrinking” decreased per-capita yields of those stocks by ca. 23% (Baudron et al. 2014). Similarly, it has been projected that by 2050 global fish yields will decrease by 14-24% due to shifting biogeography and the TSR (Cheung et al 2012). However, other studies have found only equivocal support for the temperature size rule in wild fish populations (Audzijonyte et al. 2020). The aim of WGGRAFY is to determine whether temporal trends in individual growth rates of marine fish are consistent with the TSR and, if so, evaluate the impacts for fish yields. Length and age have been routinely measured for many commercial fish stocks on time scales that are associated with warming. These substantial data have never been compiled as a single, analytical resource for climate change research on global scales. The WG will compile size (length/weight) at age datasets for large marine ecosystems experiencing differential rates of warming or cooling or no overall trend (e.g., upwelling regions). A customised statistical approach for modelling growth will be developed to specifically test whether there is a component of the total variation in growth rates that can be attributed to temperature, and then determine whether other portions are related to the impacts of fishing. This knowledge could provide a empirical foundation for forecasting the impacts of future climate warming on yields. The unique spatial and temporal scale of size-at-age data are valuable resource for ecological research. The WG will also develop a strategic plan for archiving size-at-age data similar to how ICES archives data for European waters (Datras) or how global data on recruitment and catch are reported and maintained (e.g., RAM Legacy). This will require engaging with various agencies (ICES, EMODnet, FAO, universities, tech specialists) and national fisheries laboratories as well as potential funding sources.</p>
	<p>References</p> <p>Audzijonyte, A., S. A. Richards, R. D. Stuart-Smith, G. Pecl, G. J. Edgar, N. S. Barrett, N. Payne, and J. L. Blanchard. 2020. Fish body sizes change with temperature but not all species shrink with warming. <i>Nature Ecology & Evolution</i> 4:809-814.</p> <p>Baudron, A.R., Needle, C.L., Rijnsdorp, A., Marshall, C.T. 2014. Warming temperatures and smaller body sizes: synchronous changes in growth of North Sea fishes. <i>Global Change Biology</i> 20: 1023-1031.</p> <p>Cheung, W. W. L., et al. 2012. Shrinking of fishes exacerbates impacts of global ocean changes on marine ecosystems. <i>Nature Climate Change</i>, 3:254–258.</p> <p>Forster, J., Hirst, A.G., Atkinson, D. 2012. Warming-induced reductions in body size are greater in aquatic than terrestrial species. <i>PNAS</i> 109:19310 LP-19314.</p>
Resource requirements	None anticipated due to nature of remote working.
Participants	The Group currently has 52 members from across the globe (ICES and PICES countries)
Secretariat facilities	The group will request meeting rooms / times associated with the ASC. This will require some assistance from members of the secretariats organizing those events. It is envisioned that video conferencing facilities will be required such that non-attending WG members can participate.
Financial	Funds may be requested to support travel of key participants to the final and only meeting.
Linkages to ACOM and group under ACOM	The group will identify how climate has influenced the productivity and yields of commercial fish stocks within ICES areas retrospectively. In addition, it will develop knowledge relevant to forecasting future impacts on fish growth rates. This information is compatible with the evolving knowledge base relating to climate-driven distributional shifts. This information will be useful to ACOM in recommending adaptation options for fisheries management.
Linkages to other committees or groups	WGGRAFY is highly relevant for SICCME. Possible interactions with other WGs have been identified: WGEVO and WGSPF.
Linkages to other organizations	

EGs dissolved in 2024

Res. Code	EG Name	Chairs
2023/WK/EPDSG05	Workshop on marine Carbon Dioxide Removal (WKmCDR)	Libby Jewett (US)
2023/WK/EPDSG06	Workshop on Whelk Fisheries (WKWF)	Natalie Hold (United Kingdom)