

Working Group on Zooplankton Ecology (WGZE)

The **Working Group on Zooplankton Ecology (WGZE)**, chaired by Sophie Pitois, UK, and Lidia Yebra, 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 2021	22–25 February	Online meeting		
Year 2022				
Year 2023			Final Report by DATE to SCICOM	

ToR descriptors

TOR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
A	Review the suitability of existing zooplankton time-series data in the ICES area to develop indicators addressing global biodiversity conservation challenges and ecosystem functioning.	Zooplankton time-series are an important tool in the development of indicators addressing global biodiversity conservation challenges, by this contributing to the international biodiversity conservation frameworks and ecological assessments. In the past, zooplankton data have rarely been used for conservation and management of marine ecosystems and services they provide. However, they could effectively contribute to the development of zooplankton indicators, which would fill in gaps in the regional and global assessments. The basis to effectively utilise zooplankton data in decision making on the ecosystem health of the ocean includes common data sharing protocols among existing regional zooplankton monitoring programs to ensure quality-controlled data on a global scale.	1.3, 2.5, 6.3	Years 1-3	Inventory of variables recorded in the existing zooplankton time-series in the ICES area Identification of gaps in ongoing monitoring programs with respect to the variables recommended to serve as basis for the development of ecological indicators Recommendations for future monitoring strategies that support the development of biodiversity indicators.
B	Assessing changes and trends of zooplankton community properties.	Zooplankton community structure and production are strongly influenced by ocean circulation and environmental conditions (e.g., water column mixing and water temperature), which have been changing significantly over the last few decades. Changes in zooplankton communities have been observed at sites across the North Atlantic, but the common or contrasting patterns of community change have not yet been fully assessed across WGZE time-series stations at the basin scale. This ToR will explore long-term data on the distribution (spatial and temporal), abundance, composition, and species diversity of zooplankton in the ICES regions. In addition to the traditional mesozooplankton, this work will look at changes in the macrozooplankton, microzooplankton, and gelatinous zooplankton communities. (Through its collaborative work with WGPME and the ICES Plankton Status Report, elements of the phytoplankton and microbial plankton community may also be considered).	1.3,1.4,1.9	Years 1-3	Update content (additional years, new summaries, new time series site) in the WGZE/WGPME time-series metabase (https://wgze.net/time-series) Publication of the ICES Plankton Status Report, and submission of an ICES JMS article introducing and summarizing its key findings Peer-reviewed publication on changes in species-level rank and composition changes in the ICES area.

		Tracking and understanding changes in zooplankton community composition across time series stations and at the basin scale has applications to understanding the inter-connection of pelagic systems and their potential management and preservation.			
C	Compile data on zooplankton key traits in the ICES area and continue development of the WGZE Zooplankton Biometric Atlas.	Zooplankton individual traits (e.g., average size and carbon content, herbivore vs predator, respiration and fecundity rates), and understanding how environmental factors structure zooplankton communities and affect their functioning are key components to predict potential zooplankton community reorganizations under changing environmental conditions. A database allowing the systematic analysis of zooplankton trait distributions along various environmental gradients in physical parameters, primary productivity or nutrient concentrations increases the mechanistic understanding of the structure and function of zooplankton communities. An integration of zooplankton traits measured and collected at different monitoring sites represented in the WGZE, as well as already available online databases, will be an important tool in the analysis of zooplankton traits along various environmental gradients. It will also provide an important resource for potential future developments of ecosystem models that explicitly represent zooplankton physiology in order to predict the role of oceans in global climate regulation.	1.7, 2.2, 2.5	Years 1-3	A peer reviewed publication based on a comprehensive database of zooplankton traits and physiological rates to present an exhaustive state of the art and highlight key gaps in our knowledge in this field.
D	Review of plankton sampling and analytical methodologies with emphasis on emerging methods in image analysis and machine learning.	Methods of automated plankton identification are recognised for benefits brought to the study of zooplankton in the field and laboratory. Field applications include in-situ measurements and capturing information on spatial distributions of zooplankton. In the laboratory, characterisation of zooplankton communities can be very time consuming, costly and requires a high level of training. Increasing demands for zooplankton data, under a climate of diminishing budgets for monitoring, has driven the development of cost-effective technologies. The use of image analysis combined with identification algorithms used in machine/deep learning and artificial intelligence is a rapidly growing field of research and can have a direct impact on the rate at which changes in zooplankton communities can be evaluated. This ToR will build on previous WGZE work intended to provide advice about identifying new tools to be applied for ICES zooplankton monitoring sites.	4.1, 4.4	Years 1-3	Literature review on the progress in development of software / hardware for "automatic" identification List of software tools and identification methods used in different laboratories within the ICES area A document listing the main challenges/ bottlenecks faced by zooplankton researchers in moving forward A table identifying potential problems and solutions in the use of different tools applied to monitoring of zooplankton communities A peer-reviewed publication highlighting the new tools in this field, which may be applied in zooplankton monitoring at ICES sites.
E	Development of zooplankton outreach and training.	Outreach activities in WGZE are extremely important to connect between all people working on zooplankton in the ICES area, bringing knowledge and expertise within the group but, primarily, transferring it to other	1.2, 1.4, 1.6	Years 1-3	Updated Taxonomic Leaflets uploaded to the web page. Preparation and

		<p>scientists in the ICES community and to the general public. This is clearly connected with the present ICES Science Plan as one of the 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 issues for all ecology studies. This ToR will support the editors of the ID Leaflets for Plankton, to continue the organization of the Zooplankton Production Symposium and the development of theme sessions for the ICES ASC within the WGZE community.</p>			<p>organisation of theme sessions of the next Zooplankton Production Symposium Submission of theme sessions to the ICES ACS Collaboration with other EGs on the organization of training courses on zooplankton and linking to the ICES Training Course Scheme.</p>
F	Design and carry out coordinated and collaborative activities with other EGs.	Synergy is expected based on development of the common activities strategy with WGIMT, WGPME, WGACEGG, WGIPEM, WGSPPF and WGWEAWESS.	1.6, 5.2	Years 1-3	Plan of activities to be developed and evaluated during the 3 years, as the EG keeps seeking new collaborations.

Summary of the Work Plan

Year 1	All ToRs, review available information, define way forwards from discussion among group
Year 2	Integrate all information/data gathered
Year 3	Output: reports, peer-reviewed publications, etc.

Supporting information

Priority	<p>The current activities of WGZE will continue along the main priority within WGZE ToRs: long-term series, trends and climate change, zooplankton community structures, functioning and properties; distribution and indicators for policy directives, ecosystem modelling, and outreach activities; the application of the latest technologies for the monitoring of zooplankton; and finally outreach and collaborative activities with other ICES expert groups.</p> <p>The WGZE work and ToRs are aligned with the ICES Science Programme and are of high priority. The WGZE are active contributors and aim to report their outcomes directly to ICES in their annual report, Plankton Status Report, Ecosystem Overviews, ICES ASC, and in parallel as peer reviewed literature.</p>
Resource requirements	Group contribution
Participants	The group is normally attended by 20-30 members and chair-invited guests
Secretariat facilities	Standard support
Financial	None
Linkages to ACOM and groups under ACOM	No obvious direct linkages
Linkages to other committees or groups	WGIMT, WGPME, WGACEGG, WGIPEM and WGSPPF.
Linkages to other organizations	OSPAR, IGC-COBAM