

Codes for mapping terms of reference and Annual Science Conference theme and network session proposals to the ICES science plan

Science plan code	Task linked to code	Associated priority in science plan
1.1	Assess and report on trends in ocean climate.	Ecosystem science
1.2	Improve understanding of the oceanography of semi-enclosed and shelf seas and the wider north Atlantic ocean.	Ecosystem science
1.3	Describe links between the physical and biological environment and their influence on production, biogeochemical cycles and other ecosystem functions, and consequences for the stability and resilience of ecosystems and the services they provide.	Ecosystem science
1.4	Describe connectivity within and among ecosystems, of many species and life stages at a range of spatial scales, and assess the ecological consequences.	Ecosystem science
1.5	Develop methods to map and predict the distribution of seabed and pelagic habitats and biodiversity and their sensitivity to environmental variation and change.	Ecosystem science
1.6	Develop and apply molecular, morphological and other taxonomic methods to describe and identify species.	Ecosystem science
1.7	Describe life histories, their links to the environment and responses to environmental change, including phenotypic and genetic adaptation.	Ecosystem science
1.8	Build on and challenge existing assumptions about population and community structures and interactions, by searching for new insights using molecular methods, physiology and behavioural science.	Ecosystem science
1.9	Conduct comparative analyses of the structure, function and dynamics of ecosystems in ICES regions and beyond.	Ecosystem science
2.1	Describe the distribution and intensity of pressures that result from contaminants and pollutants, eutrophication, invasive species, litter, shipping, noise, oil and gas extraction, mining, construction, renewable energy, aquaculture, fishing, climate change, acidification and habitat loss.	Impacts of human activities
2.2	Explore how pressures on the marine environment act, independently and collectively, to modify the variety, quantity and distribution of marine life and the structure, function and dynamics of food webs and marine ecosystems (including cumulative pressures and their cumulative impacts).	Impacts of human activities
2.3	Develop methods to better characterise and map the sensitivity and role of seabed and pelagic habitats, from close to the coasts to the deep sea.	Impacts of human activities
2.4	Describe the exposure of habitats to pressures, their vulnerability and resilience, and develop and test indicators of pressure, state and function.	Impacts of human activities
2.5	Develop methods and models for assessing and projecting ecological impacts of diffuse pressures (e.g. climate change, pollution, litter and acidification) spanning different levels of biological organisation and at a range of time and space scales.	Impacts of human activities
2.6	Model the transport of litter and pollutants to link sources to areas of impact, especially when these span long distances (e.g. Arctic and deep sea) or many trophic levels (e.g. impacts on predatory fishes, birds and mammals).	Impacts of human activities

2.7	Assess and project implications of emerging human activities for existing management systems and marine industries and advise on options for mitigation and adaption.	Impacts of human activities
3.1	Develop and co-ordinate, integrated, quality assured and cost-effective monitoring programmes.	Observation and exploration
3.2	Evaluate and optimise survey design, connectivity of observation systems, and survey data handling, access and analysis — to meet existing demands for data and to meet emerging data, science and advisory needs; with a focus on supporting fisheries assessment, integrated ecosystem assessment and ecosystem-based management.	Observation and exploration
3.3	Conduct analyses and testing of techniques, sensors and the logistical and statistical aspects of survey design to increase the efficiency, scope and accuracy of monitoring and the relevance of monitoring programmes to science and advisory needs.	Observation and exploration
3.4	Conduct an ambitious co-ordinated programme to further explore and report the ecological characteristics of the ICES region, with a focus on the distribution of habitats.	Observation and exploration
3.5	Develop more effective mechanisms to ensure that monitoring and surveillance data (e.g. VMS, AIS) can be reused or reprocessed to support ICES scientific and advisory needs.	Observation and exploration
3.6	Identify, design and make use of opportunities for public participation in observation and exploration through citizen-science; and identify and make use of opportunities for marine industries and other stakeholders to contribute to research design, data gathering and interpretation.	Observation and exploration
4.1	Horizon scan, test, develop and where appropriate harness new and emerging techniques and technologies that have potential to progress the ICES vision and mission; with an emphasis on data gathering, processing and interpretation.	Emerging techniques and technologies
4.2	Develop more efficient ways of analysing, sharing and presenting big data from observation and monitoring; especially using data from remote sensing of the seas and monitoring of human activities.	Emerging techniques and technologies
4.3	Develop and apply a wide range of analytical and statistical tools, such as machine learning, to describe the state and dynamics of the marine environment and the distribution and dynamics of human activities, and assess their strengths and weaknesses.	Emerging techniques and technologies
4.4	Investigate the benefits and costs of techniques that may supplement or replace existing approaches to biological 'sampling', including the applications of acoustics, image analysis, molecular methods (e.g. eDNA, genetic barcoding and genetic close-kin mark-recapture method) as well as sensors for chemical and physical sampling.	Emerging techniques and technologies
4.5	Track the emergence of new technologies in marine industries and assess how these technologies affect the interactions between those industries and the marine environment.	Emerging techniques and technologies
5.1	Improve methods of single-species and multi-species stock assessment, including data-limited methods. Develop and conduct management strategy evaluations, address uncertainty, and improve the transparency, robustness, efficiency and repeatability of stock assessment.	Seafood production
5.2	Increase understanding of stock structures, migrations, life histories, natural mortality, and climate and food web impacts on marine and diadromous	Seafood production

	species, as well as multi-species interactions and the consequences of stock recovery, to strengthen the inputs and evidence base for assessment and advice.	
5.3	Further understanding and operationalisation of ecosystem-based fishery management and MSY concepts and their application, especially in mixed, multispecies and emerging (e.g. mesopelagic) fisheries.	Seafood production
5.4	Examine fisheries spatial dynamics, performance and impact of gear, links between catch and effort, mixed fishery interactions, role and impacts of recreational and small-scale fisheries and the consequences of responses to management measures.	Seafood production
5.5	Assess aquaculture production potential and carrying capacity, development scenarios, and methods of risk and benefits assessment; for rearing or full production systems including low trophic level and seaweed aquaculture, integrated multi-trophic aquaculture and offshore production facilities.	Seafood production
5.6	Assess interactions between aquaculture and the environment including the risks posed by diseases and pathogens and their mitigation, harmful algal blooms and the effects of escapees and nutrient and organic loads.	Seafood production
5.7	Develop aquaculture overviews to describe the distribution, ecosystem interactions, benefits and impacts of aquaculture production.	Seafood production
5.8	Assess the wider role of seafood production in society, including resilience of the food system, interactions between food systems in the sea and on land, the effects of the changing expectations of seafood consumers on practices in aquaculture and fishing.	Seafood production
6.1	Develop an evidence base and assessment tools to support existing and potential demands for advice on conservation and management. To cover activities and pressures including fisheries and aquaculture, contaminants and pollutants, eutrophication, invasive species, litter, shipping, noise, oil and gas extraction, construction, renewable energy, climate change, acidification and habitat loss.	Conservation and management science
6.2	Develop methods to support implementation, and evaluation of the suitability and effectiveness of, national and international commitments and governance relating to marine spatial planning; coastal zone management; protection of species, habitats and marine ecosystems; mitigation; restoration; and the delineation, management and monitoring of marine protected areas.	Conservation and management science
6.3	Develop methods to support implementation of marine policies and commitments applying to ICES member countries, including the UN Sustainable Development Goals, the Common Fisheries Policy and the Marine Strategy Framework Directive.	Conservation and management science
6.4	Provide evidence to inform policy developers as they seek to set objectives and to address and reconcile use and conservation of the sea.	Conservation and management science
6.5	Develop and publish integrated ecosystem assessments and ecosystem overviews to describe and report on regional status and uses of the sea, and associated challenges and risks.	Conservation and management science
6.6	Further develop ICES capacity to provide ecosystem-based advice by adding quantitative analyses of more activities, pressures and impacts, as well as social, cultural and economic information, to fisheries and ecosystem overviews; and by developing and integrating aquaculture overviews.	Conservation and management science

7.1	Develop, test and apply methods and indicators to assess the social and economic status and dependence of coastal communities on aquaculture, commercial and recreational fishing, tourism and other marine industries.	Sea and society
7.2	Trial and improve social and economic indicators for use in fisheries and ecosystem overviews and the emerging aquaculture overviews.	Sea and society
7.3	Investigate the social and economic risks and opportunities provided by alternate uses of the sea.	Sea and society
7.4	Investigate the social and economic consequences of human responses to management actions and the role of spatial planning in resolving conflicts and supporting co-existence of human activities and livelihoods.	Sea and society
7.5	Assess the effects of alternate models of engagement on the success of participatory processes and the perceived salience, credibility and legitimacy of outcomes that result, as well as the practicality and performance of resulting conservation and management options.	Sea and society
7.6	Describe alternate futures and management options for marine socio-ecological systems and assess the vulnerability and resilience of marine industries and society to climate change.	Sea and society
7.7	Develop understanding of how traditional and historical knowledge can inform conservation and management and how this understanding influences the effectiveness of contemporary conservation and management.	Sea and society