

SCICOM PROGRESS REPORT 2018

ICES SCIENCE COMMITTEE

CM 2018 DEL-7.1.1

REF COUNCIL

SCICOM Progress Report 2018

An annual report to the ICES Council to describe
the scope, scale and impact of ICES science and
plans for future science delivery

FINAL DRAFT



ICES

International Council for
the Exploration of the Sea

CIEM

Conseil International pour
l'Exploration de la Mer

International Council for the Exploration of the Sea Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2018. SCICOM Progress Report 2018. An annual report to the ICES Council to describe the scope, scale and impact of ICES science and plans for future science delivery. ICES CM 2018 Del-7.1.1/SCICOM:03. 95 pp.

The material in this report may be reused for non-commercial purposes using the recommended citation. ICES may only grant usage rights of information, data, images, graphs, etc. of which it has ownership. For other third-party material cited in this report, you must contact the original copyright holder for permission. For citation of datasets or use of data to be included in other databases, please refer to the latest ICES data policy on ICES website. All extracts must be acknowledged. For other reproduction requests, please contact the General Secretary.

© 2018 International Council for the Exploration of the Sea

Contents

1	Summary.....	3
2	Introduction	4
2.1	Purpose of the progress report	4
2.2	Role of the Science Committee.....	4
2.3	Summary review of 2018	5
2.4	Science Committee operational structures.....	5
2.5	Science Committee work plan 2018-2019	7
3	Science priorities, planning and delivery	8
3.1	Science Plan	8
3.2	Science Plan implementation and science delivery	9
3.3	Linking science and advice.....	9
3.4	Guidelines for ICES groups.....	12
3.5	Emerging work areas	13
4	Steering Groups	14
4.1	Aquaculture SG (Mike Rust, USA, term started in June 2017)	14
4.2	Ecosystem Processes and Dynamics SG (Silvana Birchenough, term started January 2017).....	17
4.3	Human Activities, Pressures and Impacts SG (Henn Ojaveer, term started in January 2015)	20
4.4	Integrated Ecosystem Assessments SG (Mette Skern-Mauritzen, term started January 2017).....	23
4.5	Ecosystem Observation SG (Sven Kupschus, UK, term started January 2017).....	27
5	Operational Groups.....	33
5.1	Data and Information Group (DIG; Jens Rasmussen, UK)	33
5.2	ICES Training Group (TG, Daniel Duplisea, Canada).....	35
5.3	Science Impact and Publication Group (SIPG, SCICOM Chair/Secretariat).....	37
6	Strategic Initiatives.....	40
6.1	ICES/PICES Strategic Initiative on Climate Change effects on Marine Ecosystems (SICCME; Myron Peck, Germany, John Pinnegar, UK, Jacquelynne R. King (Canada, PICES), Shin-ichi Ito (Japan, PICES)	40
6.2	Strategic Initiative on the Human Dimension (SIHD; Jörn Schmidt, Germany, Eva-Lotta Sundblad, Sweden, Alan Haynie, USA).....	43
7	Expert Groups.....	45

7.1	Interaction with expert groups	45
7.2	Authorship of Expert Group reports	45
7.3	Peer-reviewed publications linked to Expert groups 2017–2018	46
7.4	Science highlights	47
8	ICES viewpoints.....	48
9	Annual Science Conference 2018	49
9.1	ASC 2018 overview.....	49
9.2	Theme Session reports	50
9.3	Open Sessions reports	51
9.4	ASC 2019	51
10	Symposia	53
	Annex 1: Full list of SCICOM Expert Groups.....	54
	Annex 2: Draft science plan.....	66
	Marine ecosystem and sustainability science for the 2020s and beyond	67
	1. Understanding ecosystems.....	70
	2. Impacts of human activities.....	71
	3. Observation and exploration.....	72
	4. Emerging techniques and technologies	73
	5. Seafood production.....	74
	6. Conservation and management science.....	75
	7. Sea and society	76
	Annex 3: Implementation of the ICES science plan (draft)	77
	Introduction	77
	Links between implementation plan and science plan.....	77
	Assessing progress.....	78
	Annex 4: Attendance at ICES groups.....	89
	Annex 5: Peer-reviewed publications 2017–2018	90

1 Summary

This annual report to the ICES Council summarises the scope, scale and impact of ICES science in 2018 and the plans of the Science Committee (SCICOM) for supporting future science delivery. The science committee is the main scientific body in ICES. SCICOM is ultimately responsible for the scope, scale and impact of ICES science and for implementing the science plan with the support of the ICES community and Secretariat. The general objectives of SCICOM are to keep the science programme dynamic, internationally relevant, and impactful; to ensure seamless links between science, data and advice; and to engage with scientists in ICES member countries and beyond by planning an annual cycle of meetings, workshops and conferences as well as the Annual Science Conference (ASC).

ICES science outputs and activities during 2018 included reports, books and papers from 104 expert groups; an ASC hosted by Germany and attended by 650 scientists from 34 countries; three co-sponsored symposia covering topics related to climate change, sustainable development goals and historical ecology; five training courses; publication of seven Co-operative Research Reports (CRR), one ICES Techniques in Marine Environmental Sciences (TIMES) and four Identification Leaflets. Many new scientists were welcomed into the ICES community during 2018 as they joined three additional expert groups focusing on aquaculture or the first meetings of expert groups addressing economics and social indicators respectively. Capacity to track and highlight science outputs facilitated by ICES was improved with the introduction of a new database of ICES-facilitated peer review publications and the finalisation of a plan to recognise authors on the covers of expert group reports.

Throughout the year, SCICOM focused on building closer working relationships with the Advisory Committee (ACOM) and more actively engaging with expert group chairs. Interaction with ACOM is being formalised by bringing all expert groups in ICES under the parentage of steering groups, and all steering groups will now report to ACOM and SCICOM. ACOM and SCICOM chairs have developed draft guidance on accelerating uptake of science into advice. For expert groups, ACOM and SCICOM have sought to emphasise more strongly their central role in the delivery of ICES science and to better understand and provide the support they need to work effectively. Additional support is being provided by a new forum, additions to the guidelines for ICES groups, and expanded annual chairs meeting (69 attendees in 2018) and other regular meetings and events to bring chairs together from across steering groups and committees.

A primary SCICOM task in 2018 was development of the science plan “Marine ecosystem and sustainability science for the 2020s and beyond”. The science plan was developed through an inclusive and consultative process that drew on expertise throughout the ICES network and constituent bodies, science priorities identified by member countries and a review of national and international policy drivers and science opportunities for ICES. The science plan will guide the conduct and delivery of science in support of the vision and mission of ICES. It will be a public document with an audience comprising the wider marine science community. The science plan identifies work-streams to advance understanding of marine ecosystems, improve assessments of the effects of human activities, improve observations of the seas and oceans and provide evidence and solutions to support conservation and management. Supporting tasks will increase the visibility and impact of the science, provide a rewarding and efficient working environment, engage new scientists, increase training and networking opportunities, and strengthen collaboration with regional and global partners.

SCICOM have also drafted an implementation plan to accompany the science plan. The specific actions in the implementation plan will be refined following discussions and decisions about resourcing. Implementation of the science plan is intended to lead to the following outcomes: marine science with a high and beneficial impact on society; engaged and productive scientists from the natural and social sciences; increased visibility of, and access to, ICES science, data and advice; stronger and more dynamic links between science and advice; and a secure position for ICES as a world-class marine science organisation.

2 Introduction

2.1 Purpose of the progress report

This annual report to the ICES Council summarises the scope, scale and impact of ICES science in 2018 and SCICOM plans for future science delivery. The primary purposes of the report are to update Council on the work of SCICOM and to provide context for the SCICOM request to Council to consider and provide feedback on strengthening linkages between the science plan and the developing strategic plan.

The report covers activity in the steering groups, expert groups, strategic initiatives and operational groups and outcomes of the Annual Science Conference (ASC) as well as progress by SCICOM in relation to the SCICOM work plan. It also summarises ICES contributions to co-sponsored conferences, training courses and publications. Plans for future science delivery are described in a draft science plan and an associated implementation plan. The report is relatively long because it also serves as a reference document for the use of SCICOM members, the Secretariat and the ICES network more widely.

2.2 Role of the Science Committee

The science committee is the main scientific body in ICES and is ultimately responsible for the scope, scale and impact of ICES science and implementing and monitoring the progress of the science plan with the support of the ICES network. Through effective planning of the work of ICES groups the science committee strives to ensure there are effective working relationships between all parties contributing to implementation of the science plan.

The general objectives of SCICOM are:

- (1) To keep the science programme dynamic, internationally relevant, and impactful
- (2) To ensure seamless links between science, data and advice
- (3) To engage with scientists in ICES member countries and beyond by planning an annual cycle of meetings and workshops as well as the Annual Science Conference

The current priorities for SCICOM are to:

- (1) Identify and promote science priorities within a science programme that is dynamic, internationally relevant and impactful, while fully taking account of national needs and providing added value to national programmes.
- (2) Collate information on ICES science outputs in accessible and interrogatable formats and develop and publicise metrics of impact. Ensure expert group outputs acknowledge ICES contributions.
- (3) Develop and regularly update website text relating to science, SCICOM, steering groups and personnel to increase awareness, visibility and impact of our people and work
- (4) Develop and run an engaging training programme that achieves cost recovery and enables participants to develop their careers, broaden their knowledge base, widen their professional network and add value nationally
- (5) Promote and support frequent and effective communication between expert groups, steering groups and SCICOM to increase network engagement and efficiency in all activities relevant to SCICOM
- (6) Promote science activity and collaboration within and beyond the ICES network
- (7) Ensure effective communication and seamless links between science, data collection, storage and processing, and advice
- (8) Lead development of ICES viewpoints to highlight ICES capacity to advise on new and emerging issues and capitalize on the science done in ICES (large fish stocks, Arctic fish production, invasive species).

2.3 Summary review of 2018

SCICOM continues to strive to increase the scope, scale and impact of ICES science. In addition to meeting the general objectives and addressing the priorities listed in Section 2.2, our main practical task for 2018 was to complete consultation on the new science plan and to develop a draft of this plan, and the associated implementation plan, as described in Sections 3.1 and 3.2.

Outputs during 2018 included reports, books and papers from the 104 expert groups and more active and visible links between science, data and advice, as supported by joint planning activities and workshops and adoption of a proposal to bring all expert groups in ICES under the parentage of steering groups reporting both to ACOM and SCICOM.

The Aquaculture Steering Group was increasingly visible as it ended its first year, with three new expert groups established and engagement from many scientists new to the ICES community. In the social sciences, we have focused on attracting new experts with potential to contribute to future ICES products and advice. Expert groups focusing on economics and social indicators were formed and met for the first time in 2018.

The ICES/ PICES Strategic Initiative on Climate Change effects on the Marine Environment (SICCME) has led the organisation of conferences and international processes that yielded collaborations across the globe. The Strategic Initiative on the Human Dimension (SIHD) linked effectively with the expert groups on economics and social indicators as well as defining a more forward and outward facing role.

The Annual Science Conference (ASC) in Hamburg was attended by at least 650 attendees from 34 countries, and featured 18 theme sessions, 5 open sessions and three keynote presentations. Three ICES co-sponsored symposia were/ will be run in 2018 (Symposium on Climate Change and Impacts on the World's Oceans, Management tools and standards in support of Sustainable Development Goal 14, and Oceans Past VII). Five training courses have/ will be run (Statistically sound inference for commercial catch sampling programmes, Advanced stock assessment, Introduction to stock assessment, Geostatistics in R for fisheries and marine ecology applications)

ICES published seven Co-operative Research Reports (CRR), one ICES Techniques in Marine Environmental Sciences (TIMES) and four Identification Leaflets in 2018. The CRR are "Geostatistics in R for Fisheries and Marine Ecology", "ICES Report on Ocean Climate 2016", "Using underwater television surveys to assess and advise on Nephrops stocks", "The SONAR-netCDF4 convention for sonar data", "Bowtie analysis of marine legislation: A case study of the Marine Strategy Framework Directive", "Marine recoveries of tags from Atlantic salmon" and "Acoustic target classification"

A new database of ICES-facilitated peer review publications has been developed and plans are advancing to recognise authors on the covers of expert group reports and to publish these in a series with an ISSN. These and related actions are intended to increase the visibility of ICES science.

Looking to 2019, the primary focus for SCICOM will be promoting and implementing the science plan. This requires that the science priorities identified in the plan are used to guide the formation and dissolution of expert groups, the terms of reference for expert groups, the content of future ASC, and ICES role in co-sponsored conferences.

2.4 Science Committee operational structures

Seven types of groups contribute to the work of SCICOM and will contribute to the implementation of the science plan from 2019. Other temporary groups are also formed to develop content for conferences and symposia and to address other transient actions. In 2018, SCICOM provided short definitions of the roles of these groups, and these are included in this report for information. We intend to add these descriptions to the next edition of the 'Guidelines for ICES groups' to help increase understanding of the ways in which different groups can, and do, contribute to delivery of ICES science.

Expert groups. Expert groups are groups of scientists who collaborate during scheduled meetings, and often intersessionally, to advance understanding of marine systems by tackling fundamental and applied scientific questions and developing analyses that underpin state-of-the-art advice on meeting conservation, management and sustainability goals. The questions they address are defined by terms of reference that are reviewed and signed off by the science and advisory committees. Reports on their work are published annually.

Steering groups. Steering groups addresses broad and enduring areas of science and advice and 'parent' a number of expert groups. They are responsible for guiding and supporting expert groups and helping to ensure their work is effectively co-ordinated, conducted and reported.

There are currently five SCICOM steering groups each of which addresses a broad and enduring area of science and advice and currently 'parent' 104 EG.

The Aquaculture Steering Group is responsible for guiding and supporting five (update to seven if finalised in November) expert groups that are working on science and advisory topics contributing to the sustainable development of aquaculture.

The Human Activities, Pressures and Impacts Steering Group is responsible for guiding and supporting 23 expert groups that seek to describe the diversity of pressures affecting marine ecosystems and the impacts that follow.

The Ecosystem Processes and Dynamics Steering Group is responsible for guiding and supporting 22 expert groups that study the state and resilience of marine ecosystems and food webs, as well as the life histories, diversity and interactions of component biota.

The Integrated Ecosystem Assessments Steering Group is responsible for guiding and supporting 18 expert groups that develop ecosystem modelling and assessment methods, contribute to state of the environment reporting and underpin guidance on meeting ecological, social and economic objectives.

The Ecosystem Observation Steering Group is responsible for guiding and supporting 36 expert groups that are meeting immediate data demands and contributing to the running and further development of effectively co-ordinated, integrated, quality assured and cost-effective monitoring in the ICES region and beyond.

Data and Information Group. The data and information group advises on all aspects of data management, including data policy, data strategy, data quality, technical issues, and user-oriented guidance. Their work is closely coordinated with the ICES Data Centre and helps to ensure that expert groups have access to the data that is essential to their work.

Science Impact and Publication Group. The science impact and publication group coordinates and supports the publication and dissemination of research conducted under the auspices of ICES. The group is responsible for guiding, monitoring and sharing ICES publication output and increasing the reach and impact of ICES publications.

Training Group. The training group develops the structure and content of the ICES training programme and then guides and supports the provision of training.

Strategic Initiatives. Strategic initiatives develop and co-ordinate cross-cutting science activities that impact and interact with the science of many expert groups. They also focus on building science collaborations outside ICES member countries. Currently, there are two strategic initiatives: the ICES/PICES Strategic Initiative on Climate Change effects on Marine Ecosystems (SICCME) and the Strategic Initiative on the Human Dimension (SIHD).

[illegible]

3 Science priorities, planning and delivery

3.1 Science Plan

A significant focus of SCICOM work in 2018 was defining and signing-off the science priorities and tasks in the science plan. The science plan describes the scientific priorities and goals of ICES, and the science and other tasks to be undertaken to meet them. The science plan will be a public document with an audience comprising the marine science community in ICES countries and beyond.

As described in our 2017 report to Council the science plan was developed through an inclusive and consultative process that drew on expertise throughout the ICES network and constituent bodies, science priorities identified by member countries and a review of national and international policy drivers and science opportunities for ICES. The science priorities and associated topics in the science plan received final review and sign-off by the Science Committee on 5 October 2018. The text of the draft plan (Annex 2) is subject to ongoing review, with sign-off expected on the Science Committee forum after feedback from the Council meeting and finalisation of the ICES strategic plan. Subject to finalisation of the strategic plan SCICOM intend to implement the science plan from 1 January 2019.

The science plan is intended to lead to the following outcomes: marine science with a high and beneficial impact on society; engaged and productive scientists from the natural and social sciences; increased visibility of, and access to, ICES science, data and advice; stronger and more dynamic links between science and advice; and a secure position for ICES as a world-class marine science organisation.

The science plan commits the ICES community to work in seven areas of marine science, each with related objectives and purpose.

1. Understanding ecosystems

Advance and shape understanding of the structure, function and dynamics of marine ecosystems — to develop and vitalize marine science and underpin its applications

2. Impacts of human activities

Measure and project the effects of human activities on ecosystems and ecosystem services — to elucidate present and future states of natural and social systems

3. Observation and exploration

Monitor and explore the seas and oceans — to track changes in the environment and ecosystems and to identify resources for sustainable use and protection

4. Emerging techniques and technologies

Develop, evaluate and harness new techniques and technologies — to advance knowledge of marine systems, inform management and increase scope and efficiency of monitoring

5. Seafood production

Generate evidence and advice for management of wild-capture fisheries and aquaculture — to help sustain safe and sufficient seafood supplies

6. Conservation and management science

Develop tools, knowledge and evidence for conservation and management — to provide more and better options to help managers set and meet objectives

7. Sea and society

Evaluate contributions of the sea to livelihoods, cultural identities and recreation — to inform ecosystem status assessments, policy development and management

SCICOM would also seek to add some flagship activities or action areas to the Science Plan once priorities for these have been further discussed in the ICES network. The previous SCICOM work on these topics as well as proposals from all other parts of the ICES network can provide inputs to the discussions.

SCICOM consider that such flagship activities or action areas will be essential to bring colour and focus to our science plan over and above the general swathe of science we will address. Any activity selected should have the desirable characteristics identified in the science prioritisation process e.g. a collective activity that creates a shared sense of purpose, benefits all member countries, achieves a step change in the profile of ICES, strengthens links and opportunities to build partnerships, provides valuable outcomes and legacy, mobilises people and resources, and leads to outcomes more impactful than the sum of the parts.

3.2 Science Plan implementation and science delivery

SCICOM have drafted an implementation plan that describes how the new science plan will be implemented and how progress with implementation will be monitored and reported. The implementation plan will be finalised via the SCICOM forum. The implementation plan is intended as an internal ICES working document and would not be published in the same format as the public-facing science plan. The intended audience for this implementation plan are the people and groups in ICES who are involved in implementing, monitoring and reporting on implementation of the science plan, principally members of SCICOM and associated groups and the ICES Secretariat. The implementation plan defines objectives and actions to:

1. Catalyse, shape, facilitate and promote marine science which has a high and beneficial impact on society and addresses all priorities identified in the science plan
2. Ensure expert groups have flexibility to innovate and explore new topics and encourage and support cross-cutting science activity
3. Increase the visibility of, and access to, our science, data and advice and recognise, promote and use the science outputs from expert groups
4. Provide an efficient, collaborative, respectful and rewarding working environment for all scientists, as well as the resources and infrastructure needed by ICES groups to develop and share knowledge and expertise
5. Provide more and better networking and training opportunities and encourage engagement of a new and emerging generation of scientists with ICES and expert groups
6. Exchange knowledge and expertise with regional and global partners through collaborative projects, networks and training: to shape and advance marine science and advice and meet joint scientific goals
7. Monitor and report on progress towards meeting the goals of the science plan

Specific actions supporting these objectives are tabulated in the plan (Annex 3) and responsibility for these actions will be widely distributed throughout the ICES community. For actions involving the ICES Secretariat, the actions in this table will be transposed to the joint work plan, subject to the availability of resources needed to support them. Progress reports to SCICOM and ICES Council will summarise progress with implementation using metrics described in the implementation plan

3.3 Linking science and advice

3.3.1 Steering group structure

SCICOM and ACOM have continued to forge closer working relationships between science and advice in 2018. These committees have now signed-off a proposal to place those expert groups previously reporting to ACOM within new steering group(s). They have also run a workshop to define ways to

increase the uptake of science into advice and brought together expert group chairs focused on science and advice at the same meetings.

In relation to the decision to establish a new steering group(s), all expert groups will now operate under the same structure, by allocating the existing ACOM-affiliated expert groups to the new steering group(s) and bringing all current and new steering groups under joint SCICOM and ACOM affiliation. The ACOM-SCICOM subgroup that put forward this plan and provided justification for the new steering group(s) is now working on a proposal for the allocation of specific expert groups to the new and existing steering groups. Approval for their proposal will be sought from SCICOM and ACOM. The allocation of groups to the Ecosystem Observation Steering Group, which currently oversees 36 expert groups, will be considered as part of this review.

The ACOM-SCICOM subgroup also proposed revision of the generic terms of reference (ToR) for steering groups, to ensure that they reflected the requirement for all steering groups to report to both ACOM and SCICOM and the potential for all expert groups to contribute to advice. These general ToR describe: the role of the steering group in supporting and nurturing the associated expert groups; facilitating communication to and from the expert groups and with other groups in ICES and externally; identifying and communicating science priorities; encouraging quality control and reviewing; and evaluating, handling and documenting expert group contributions to ICES science objectives and advisory needs (as primarily articulated in the strategic plan and science plan).

Generic Terms of Reference for all steering groups (SG) from 2019:

- a) Engage with and work with Chairs of expert groups (EG), SCICOM and ACOM to enable and support EG contributions to both the science objectives and advisory needs of ICES.
- b) Review and report on the science being undertaken within EG to SCICOM and ACOM, with a focus on identifying science highlights and priorities and demonstrating the impact of their science, including how science was used in ICES advice (method development, advisory products)
- c) Provide feedback to SCICOM and ACOM on research priorities (including Strategic Initiatives) and implementation of ICES strategy.
- d) Identify shortfalls in expert availability, skills and knowledge needed to achieve ICES objectives within the SG area and work within the SG and through SCICOM, ACOM, Strategic Initiatives and operational groups to develop capacity and capability.
- e) Identify gaps and overlaps in the work of EGs, and propose consolidation, rationalization or forming of new EGs to SCICOM and ACOM as appropriate
- f) Facilitate active horizontal and vertical communication, collaboration and co-ordination between EG and all other parts of ICES and identify, in cooperation with EG Chairs, opportunities for internal and external collaboration
- g) Help EG Chairs to adopt working practices which ensure scientific information generated by EG is receiving adequate quality control consistent with scientific norms
- h) Review EG reports and activities and, in dialogue with the SCICOM chair and ACOM leadership, provide feedback on ways to improve the impact, communication and influence of their work.
- i) Encourage EGs to come forward with proposals and initiatives for longer-term science development in support of ICES advice.
- j) Help EG Chairs to formulate and prepare their draft ToR and Resolutions for research-oriented work.
- k) For advisory ToR: to work closely with the ICES secretariat, ACOM leadership and the EG chairs in preparing the research and advisory work plans for the upcoming year to ensure the advisory ToR are allocated to EGs and addressed adequately and within the advisory request timeframe.

l) To give Special Requests received during the year immediate and rapid attention to inform the decision about whether or not the Special Request can be accepted and addressed.

m) To support the ICES Secretariat and/or the ACOM leadership in liaising directly with the Chairs of relevant EG when processing Special Requests.

n) Represent the SG in SCICOM and ACOM meetings, SCICOM/ACOM leadership meetings, WGCHAIRS and at the ASC.

Justifications for revised ToR:

ToR a, b and c reflect the need to ensure the work of EG meets the science objectives and advisory needs of ICES and that EG receive adequate support and guidance when developing work plans.

ToR d, e and f reflect the need to support the expert groups in accessing the expertise they need to conduct their work and ensuring that the EG system operates as rationally and efficiently as possible to meet ICES objectives.

ToR g recognises that EG should operate as scientific groups, which pursue and apply knowledge and understanding of the natural and social world following a systematic methodology based on evidence and with appropriate control of the conduct of members and quality of process, including data, methods and interpretations.

ToR h and i reflect the need develop, track and report on the science conducted in EG, to describe progress in relation to ICES science objectives and advisory needs, to highlight impactful and influential outputs and to ensure science priorities identified and generated in the network are captured and shared.

ToR j recognises the importance of helping EG chairs to develop scientific ToR that follow the approach outlined in the guidance for ICES groups and meet the requirements of the ICES Science Plan.

ToR k, l and m reflect the importance that all SG and EG should attach to the handling of advisory ToR and special requests.

ToR n recognises that active communication between SG Chairs, EG Chairs and other parts of the ICES network is essential to ensure positive experiences for people in the ICES network, successful operation of the EG and a responsive and timely science programme. The ToRs also recognise the importance of SG visibility and engagement to the success of the SG and ICES.

3.3.2 Translation of science into advice

The ACOM and SCICOM chairs arranged and ran a workshop (1) to identify factors that influence the rate and extent of uptake of science conducted in projects and expert groups into ICES advice and to evaluate their relative influence, and (2) to produce a short guidance document for expert groups and our wider network of scientists and advisers on the working practices and other considerations that accelerate uptake.

Twenty-seven factors that had potential to influence uptake and were applicable to projects and/ or expert groups were identified and were loosely clustered into groups relating to (1) the behaviours, diversity and working practices of people involved in the project or expert group, (2) the analytical approaches applied by scientists, and their accessibility, repeatability, quality assurance and consistency with expectations in the advisory systems, (3) the fitness for purpose of science in relation to advisory needs or priorities, as influenced by the methods used for commissioning projects or the development of terms of reference and (4) the legitimacy of the science, as influenced by the extent of engagement between scientists and advisers, the strength of scientific consensus and trust in the impartiality and credibility of the scientists working in projects and expert groups.

The uptake of science into advice from 27 projects and expert groups was evaluated in relation to these factors.

Results from the evaluation demonstrated that there were substantial differences in science uptake into the advisory system among projects and expert groups. Consequently, for those projects and expert groups seeking to see the science they are developing used in the ICES advisory system there are many actions they can take to advance uptake. This is especially true for expert groups where there were very strong differences in the behaviours, working practices and networks of those expert groups that conducted science that was ultimately used to support advice and those that were not. The assessment of the relative impact of different factors on uptake was used to inform the drafting of two guidance documents (one for projects and one for expert groups), because the factors having the greatest influence on uptake differed between expert groups and projects. For projects, the most important factors influencing uptake were the effectiveness of stakeholder engagement, the extent to which the diversity of people engaged in translation of science to advice span science, advice, advice recipients and knowledge brokers, and the salience of the science in relation to advisory needs and priorities. For expert groups the most important factors were the extent to which advisory community is willing to accept and assimilate science subjects and evidence base; the effectiveness, resourcing and relevance of stakeholder engagement in relation to product or advisory needs; and the clarity of, support for and durability of follow-up processes after terms of reference are completed.

The workshop also considered it likely, although it could not be tested directly, that the full involvement of people who understand advisory needs and priorities is essential during call development and review of project proposals if project science is expected to lead to advice. One guidance document is intended for project leaders and participants who would want to see the science they are developing used in the ICES advisory system. This will be made available to project commissioners or project leaders who contact ICES to ask how they can contribute to the provision of advice. The other guidance document is intended for expert group chairs and members who would like to see the science they are developing used in the ICES advisory system, or consider that the science they have developed is sufficiently mature to be used to support advice. After review by ACOM and SCICOM, it is intended that these guidance documents will be added to the “Guidelines for ICES groups”.

It was also recommended by the workshop that the role descriptions for ACOM and SCICOM members in the “Guidelines for ICES groups” should be modified to include the role: “To identify science relevant for ICES advisory services and to contribute to the uptake of the science into advice by planning, supporting and participating in processes to facilitate uptake”. ACOM and SCICOM members’ approval for adding this role will be sought at the 2019 meetings.

3.4 Guidelines for ICES groups

The original “Guidelines for ICES Expert Group Chairs” have been substantially revised in 2018 and retitled as “Guidelines for ICES Groups”. The latest iteration of this document, to be published towards the end of 2018, now describes the working practices and membership of all groups contributing to the ICES community: expert groups, steering groups, operational groups (data and information group, science impact and publication group, training group), strategic initiatives, advisory committee, science committee and ICES secretariat, as well as the roles of Bureau and Council. The intention is for this document to contain all the essential information needed by those chairing and participating in these groups. We have increasingly solicited feedback from the community on content, through steering groups, meetings of expert group chairs and ACOM and SCICOM. Recent additions to the guidelines include job descriptions for ACOM and SCICOM members. We will usually release two updates of the guidelines every year. Following from decisions taken at the 2018 Council meeting we also intend to update the code of conduct and conflict of interest policy for participants in ICES work, which will clarify occasional but important issues raised by expert group chairs about the suitability of potential

attendees or the behaviour of people who already attend expert groups. In 2018, the Secretariat also worked with ACOM and SCICOM to produce an introductory presentation, based on the guidelines, that expert group and other chairs can use to induct new members and explain ICES work. This presentation was introduced and promoted, along with changes to the guidelines, at the 2018 ASC.

3.5 Emerging work areas

The main emerging areas in 2018 are aquaculture and social science. The Aquaculture steering group is increasingly well established and now parents six expert groups with diverse leadership and membership, including many scientists new to the ICES community (note that five of these expert groups are currently visible on ICES systems and a seventh is in the late planning stages: offshore aquaculture). In the social sciences, we have focused on attracting new experts with potential to contribute to future ICES products and advice. Expert groups focusing on economics and social indicators were formed and met for the first time in 2018.

4 Steering Groups

4.1 Aquaculture SG (Mike Rust, USA, term started in June 2017)

4.1.1 Introduction

The Aquaculture Steering Group (ASG) is responsible for guiding and supporting expert groups that are working on science and advisory topics contributing to the sustainable development of aquaculture.

Topics covered include:

- evaluating the social and economic dimensions of aquaculture operations
- types, transmission and prevalence of diseases affecting cultured species and actions that can be taken to address them
- understanding positive and negative environmental impacts of aquaculture, approaches to monitor and mitigate them and methods of aquaculture risk assessment
- carrying capacity and relative efficiencies of alternate aquaculture systems
- genetics of cultured species, and application of molecular techniques to aquaculture questions
- projecting the future development of aquaculture and its implications for the food system and food security

4.1.2 Summary of progress in relation to Terms of Reference

Terms of Reference	Progress
ToR a) Engage with and work with Chairs of EG to ensure that EG work supports and meets the science objectives and advisory needs of ICES	Engaged in person, by phone and/or over email with all existing and prospective chairs. Two new EG starting (WGEIA and WGSPA), a third being considered by a prospective chair (WGECCA) and a fourth (Offshore) being developed as a resolution. Exploring work products as prototypes for advice.
ToR b) Help EG formulate and prepare their draft terms of reference and resolutions	Worked with new and existing EG Chairs to ensure ToR are feasible and their work is supported. The major focus has been on the new groups.
ToR c) Review and report on the science being undertaken within EG to SCICOM, with a focus on identifying science highlights and priorities and demonstrating the impact of their science	Developing opportunities for groups to work together and to articulate a vision for ASG. We are exploring an ecosystem approach to marine aquaculture to provide a common vision. This topic was the focus of a session at ASC 2018.
ToR d) Review scientific products/deliverables of the EG and provide feedback on ways to improve the impact and influence of their work	Ongoing as EG meetings occur.
ToR e) Provide feedback to SCICOM on research priorities and implementation of ICES strategy	Working to fill out EG to implement ICES strategy.
ToR f) Identify shortfalls in skills and knowledge needed to achieve ICES objectives within the SGs area and work within the SG and through SCICOM and operational groups to develop capability	Working on cross EG ToR and workshops. Added two new groups this fall with two more coming to provide science needs and develop capacity.
ToR g) Identify gaps and overlaps in the work of EG, and propose consolidation, rationalization or forming of new EG to SCICOM as appropriate	Mostly expanding at this time. No overlaps. However, there are some opportunities for shared ToR between groups. For example, work on the use of eDNA to model disease transmission could lead to a shared ToR for WGAGFA and WGPDMO.

Terms of Reference	Progress
ToR h) Help EG Chairs to adopt practices which ensure scientific information generated by EG is receiving adequate quality control consistent with scientific norms	Ongoing.
ToR i) Facilitate active horizontal and vertical communication, collaboration and co-ordination between EG and all other relevant ICES groups and identify, in cooperation with EG Chairs, opportunities for internal and external collaboration	We have had some joint EG chair calls and meetings. EG chairs were co-conveners of the ASC 2018 session on Ecosystem Approach to Aquaculture and have proposed a session at ASC 2019, and at least one joint workshop. Members from WGSEDA are also actively interacting with the new WGSOCIAL and WGECON to help ensure aquaculture is a part of these group's discussions. Considering an ASG webinar series to improve communication among EG.
ToR j) Represent the SG at SCICOM meetings and SCICOM/ACOM leadership meetings in spring and at the ASC	Attended meeting at ASC 2017 and in Spring 2018. Unexpectedly had to miss meeting at ASC 2018.
ToR k) Establish a core group of ASG Expert Group Chairs who, together with the ASG Chair, will share responsibility for implementing the work of ASG	Working with existing and new chairs to develop a coordinated SG with a common vision.
ToR l) Generate a position paper on the contribution of ASG to ICES science, data and advice	Formulating outline. Structure and text will follow once a common vision is achieved.

4.1.3 List of EGs

A full list of expert groups under this Steering Group is provided in Annex 1.

4.1.4 Science highlights

- At its first meeting in Oban, Scotland WGSEDA tested a new method to capture social dimensions of aquaculture with multi-level social indicators on a case study basis, drawing on expert knowledge. The method was evaluated to determine if it helps operationalize the social dimension of aquaculture, while acknowledging that the social interactions with marine resource users in each region are influenced by the local context. The latter includes local knowledge of traditional use of marine resources and oceans that needs to be transferred if sustainable aquaculture development under various Blue Growth strategies is to be fostered. These various aspects of operationalization of social indicators require further investigation and will be one central point of discussion during the next annual meeting of WGSEDA in 2019. WGSEDA has two joint papers in draft addressing 1) the availability and usefulness of economic data on effects of aquaculture on public policy, and 2) methods to capture the multi-level social effects of aquaculture.
- At its first meeting in Brest, France WGAGFA discussed issues related to 1) the genetic risks posed by escaped farmed organisms and the potential benefits of genomic selection, 2) use of genetic approaches to evaluate discards (full landings), and 3) the potential use of eDNA for understanding and managing marine issues. Synthesis papers and non-technical reviews are being prepared to assist managers wanting to explore these topics. A workshop on the value of genetic and genomic tools for identifying species in mixed landings, fish products and by-products (SWSGenoTools) has been proposed. WGAGFA is also in discussions with WGPDMO on a workshop or joint ToR addressing the use of eDNA as a pathogen tracer in disease transfer models.
- At its third meeting in Riga, Latvia the WGPDMO continued its annual surveillance and report of disease trends in wild and cultured fish and shellfish in the ICES region. This is the only ongoing report of its kind. The group produced a report on new disease trends in the ICES area based on national reports from 15 member countries. The considerable number of new and

emerging disease trends in wild and farmed marine organisms, all relevant to important capture and/or culture industries, highlight the urgent need to continue disease monitoring of wild fish populations in the ICES region, and to review the current approaches to ensure biosecurity. WGPDMO has finished its three-year term and has submitted a resolution to continue for a new term. In addition to the joint effort with WGAGFA on eDNA, they propose a workshop on Emerging Mollusc Pathogens (WKEMP), using the OsHV-1 microvariant herpesvirus as a model for improving international management of aquatic disease in general.

4.1.5 Communication with EG

While the entire SG with new chairs is yet to meet face to face, portions of the SG have met at the ASM 2017, World Aquaculture 2018, and ASM 2018. In addition, we have had several phone calls, and email chains. As the new groups come on line, I intend to start a bimonthly webinar for EG chairs so all ICES aquaculture scientists can get to know the workings of the various groups.

4.1.6 Summary of new EG proposals and EG closing

The Working Group on Environmental Interactions of Aquaculture (WGEIA) will meet in December 2018 and seeks to prioritize areas where aquaculture management can lead to better environmental performance of the industry. Better understanding of the interactions between aquaculture and the environment, as well as the resulting effects, is needed to develop the science-based tools for sustainable development and management of this industry. The working group will develop risk/benefit assessment methods and models to support informed sustainable industry management. Since aquaculture has many interactions with the environment, improved understanding, management and mitigation of risk, and optimization of ecosystem benefits is essential both for the industry and society.

The Working Group on Scenario Planning on Aquaculture (WGSPA) will meet in November 2018 to develop and apply methods of analysis to understand potential environmental, economic, and social trade-offs that can be used to aid planning for aquaculture. The work of WGSPA will help managers, industry, and society understand the implications of different possible pathways of aquaculture development in specific locations of the ICES region. It will also enable descriptions of production potential to be provided. To meet its goals, the group will bring together experts in marine spatial analysis, economics, environmental carrying capacity and growth models, social systems, and food security.

A Working Group on Ecological Carrying Capacity in Aquaculture (WGECCA) is being established under Jeff Fisher and will work on ecological carrying capacity including lower trophic aquaculture, use of aquaculture to enhance ecosystem services and integrated multi-tropic aquaculture.

A Workgroup on Offshore Aquaculture is being formulated by Dr. Bela Buck and the ASG. We have circulated a draft resolution for this group.

WGPDMO has finished its three-year term and has submitted a resolution to continue for a new term.

4.1.7 Forward look (including actions for SG and SCICOM/ ACOM)

We will continue to structure the ASG to support an Ecosystem Approach to Aquaculture Management. This requires interaction among EG. This process was supported at ASC 2018 and will be continued with the development of an ASG webinar series to foster cross-group understanding and to develop a common vision.

With two EG starting, one EG renewing and one EG forming, this year has been active for the ASG. In addition, there were sessions at ASC 2018, three possible workshops in the pipeline and a proposed session for ASC 2019. As the science expertise builds within ICES it will be increasingly important to make a clear linkage to ACOM and be able to develop, demonstrate and transfer useful tools and advice products to ICES member countries and others.

There has also been recent interest by PICES in developing an aquaculture focused working group. The ASG chair will continue the dialogue with PICES.

4.2 Ecosystem Processes and Dynamics SG (Silvana Birchenough, term started January 2017)

4.2.1 Introduction

The Ecosystem Processes and Dynamics Steering Group is responsible for guiding and supporting Expert Groups that study the state and resilience of marine ecosystems and food webs, as well as the life histories, diversity and interactions of component biota.

Topics covered include:

- oceanographic characteristics of marine systems and their influences on population, food web and ecosystem dynamics
- origins and transformations of matter in biogeochemical and production cycles.
- measuring, understanding, reporting and forecasting the dynamics of populations, food webs and ecosystems
- life histories, diversity and ecology of microbes, phytoplankton, zooplankton, benthic invertebrates, crustaceans and fish
- ecosystem services
- ecosystem resilience

4.2.2 Summary of progress in relation to Terms of Reference

Terms of Reference	Progress
ToR a) Engage with and work with Chairs of EG to ensure that EG work supports and meets the science objectives and advisory needs of ICES	On track- with regular correspondence with EG chairs to discuss and support production of deliverables (e.g. deadlines and production of annual reports, Self-evaluations documents, setting new ToRs, several theme sessions proposals developed) and agreeing work priorities.
ToR b) Help EG formulate and prepare their draft terms of reference and resolutions	On track- with regular e-mail discussions with EG chairs on ToR and deliverables associated with ICES priorities. Regular feedback and help with formulation of resolutions.
ToR c) Review and report on the science being undertaken within EG to SCICOM, with a focus on identifying science highlights and priorities and demonstrating the impact of their science	Ongoing- regular correspondence with EG chairs to alert and inform on recent products and highlights. Communication with EG chairs to inform and encourage the use of ICES Communication department, Tweeter and press releases opportunities for wider publicity of scientific outputs. Several EG chairs have been proactive in sending highlights and promoting their scientific outputs.
ToR d) Review scientific products/deliverables of the EG and provide feedback on ways to improve the impact and influence of their work	Ongoing- regular feedback provided on annual reports, ToR and self-evaluation documents to improve visibility, influence, realistic delivery and products.
ToR e) Provide feedback to SCICOM on research priorities and implementation of ICES strategy	Attended the Chairs meeting in January, SCICOM meeting in March. Several comments to ICES documents and WebEx participation on several ICES initiatives as requested.
ToR f) Identify shortfalls in skills and knowledge needed to achieve ICES objectives within the SGs area and work within the SG and through SCICOM and operational groups to develop capability	Ongoing- there are clearly more opportunities for integration between EG through ongoing initiatives (e.g. ecosystems overviews, advisory requests), joint open sessions, viewpoints and dedicated, helping to generate new viewpoints publications (across common topics of interest)

Terms of Reference	Progress
ToR g) Identify gaps and overlaps in the work of EG, and propose consolidation, rationalization or forming of new EG to SCICOM as appropriate	Ongoing- new ideas to integrate with Aquaculture SG, still a discussion needs to be organised. New ideas for joint sessions with new HAPISG chair.
ToR h) Help EG Chairs to adopt practices which ensure scientific information generated by EG is receiving adequate quality control consistent with scientific norms	As requested by EG- several queries have been dealt with (e.g. contribution to external meetings, proposal participation and development). These activities are often done by requests and during formulation of documents.
ToR i) Facilitate active horizontal and vertical communication, collaboration and co-ordination between EG and all other relevant ICES groups and identify, in cooperation with EG Chairs, opportunities for internal and external collaboration	Several activities planned for 2018 and included in the budget of the EPD SG chair to support EG and represent ICES across several activities. Mostly these activities occur during dedicated requests.
ToR j) Represent the SG at SCICOM meetings and SCICOM/ACOM leadership meetings in spring and at the ASC	Completed with representation at WGCHAIRS meeting in January, SCICOM meetings in March and September. Also representing ICES at the PICES Annual meeting in Japan.
ToR k) Establish a core group of EPDSG Expert Group Chairs who, together with the EPDSG Chair, will share responsibility for implementing the work of EPDSG	On track- there is a core of 4-5 EG chairs that are always supportive, active and engage on dedicated requests, correspondence and feedback.
ToR l) Generate a position paper on the contribution of EPD to ICES science, data and advice	Task not started. Need to discuss with HAPISG and see if several points from the joint open session at the 2018 ASC could be used as a starting point.

4.2.3 List of EGs

A full list of expert groups under this Steering Group is provided in Annex 1.

4.2.4 Science highlights

Some examples of highlights are summarised (e.g. mostly peer reviewed publications and reports and seeking collaborations for scientific networking). A summary of key outputs is provided below:

WGEVO:

- Baulier, L., Morgan, M. J., Lilly, G. R., Dieckmann, U., and Heino, M. 2017. Reproductive investment in Atlantic cod off Newfoundland: contrasting trends between males and females. *FACETS*, 2: 660-681.
- Díaz Pauli, B., Kolding, J., Jeyakanth, G., and Heino, M. 2017. Effects of ambient oxygen and size-selective mortality on maturation and growth in guppies. *Conservation Physiology*, 5: cox010.

WGBIODIV:

- Rambo, H., Stelzenmueller, V., Greenstreet, S.P.R., Moellmann, C. 2017. Mapping fish community biodiversity for European marine policy requirements. *ICES Journal of Marine Sciences*, 74: 2223–2238.

WGPME:

- Developed a joint funding proposal to the BIODIVERSA call on scenarios for Arctic ecosystem services. This proposal aims to bring together players in the Arctic working with or holding plankton data combining different technologies e.g. molecular to provide pan-arctic inventory of Arctic plankton diversity.
- A Marie Curie ITN proposal for testing different methodologies in the context of their possible deployment in routine marine monitoring activities. This proposal brought together

several WGPME partners and external collaborators. The proposal included a course at ICES headquarters.

- Stern *et al.* (under revision) Molecular analyses in protist long-term observation programs-current status and future perspectives. Submitted to Journal of Plankton Research.
- Kraberg *et al.* (under revision) First records of a potentially new autotrophic species in the North Sea: The importance of image-referenced data, Submitted to Marine Biodiversity record

WGDAM:

- Completed their ToRs and producing a CRR (currently in progress).

WGOH:

- Currently working on IROC report and expected to be ready for ICES ASC.

4.2.5 Communication with EG

The EG under EPD have been actively working towards meeting their ToR. There are no major issues relating to the work identified and delivered by the EG. Some aspects to consider are associated with the numbers of attendees, although this concern was only flagged by some EG. There have been some delays with EG submitting their annual reports and self-evaluations. Some EG have been lacking active communication with their members, so the EPDSG chair been active in sending reminders to ensure the information is cascaded in a timely way.

Two EGs chairs developed and submitted theme sessions to collaborate across EGs for the 2019 ASC. These are:

- **Harmful algal blooms and jellyfish: Impacts on ecosystems and ecosystem services-** Eileen Bresnan- WGHABD, Sophie Pitois - WGZE, Mike Rust – Aquaculture theme lead, Bengt Karlson – WGHABD
- **Drivers of sustainability in fisheries for non-quota and data-poor species: environmental change, market forces and fishery management**” Graham Pierce (WGCEPH- Spain), Jean-Paul Robin (WGCEPH- France), Anne Marie Power (WGCEPH- Ireland).

4.2.6 Forward look (including actions for SG and SCICOM/ ACOM)

There are several activities planned to support EG under EPD and for the SG Chair to represent ICES. These activities were submitted for approval for 2018. These are:

- Joint Open Session for the 2018 ASC was submitted with EPD and HAPISG chair entitled: “*Methodological advances to evaluate ecosystem impacts of human activities*”. This was completed successfully.
- Further collaborative discussion to explore potential integration opportunities with Aquaculture SG Chair and EPD EG (still to be organised with Mike Rust).
- WGPME is revising a Marie Curie ITN proposal. One of the activities is to organize a course at ICES Headquarters in Copenhagen. This will provide the opportunity to disseminate science across ICES EG.
- The EPDSG chair will be supporting an International Symposium on Ocean Acidification on 28 October 2018 in Tokyo.
- The EDP Chair will also co-chair the topic session: Ocean acidification and deoxygenation and their impact on ocean ecosystems: Synthesis and next steps (25-4th November, Yokohama, Japan) at the PICES Annual Meeting.
- A request from NASCO to consider an ICES / NASCO Data Workshop to explore how best to integrate Atlantic salmon marine survival and population data with relevant ICES

marine databases. The relevant EG will be WGDIAD. The EPD chair will help to scope the resolution.

- A request to the BEWG to peer review of the OSPAR Case Report for the addition of *Haploops* communities to the OSPAR List of Threatened and/or Declining Species and Habitats. The EPD chair will help compiling and checking the advice.

4.3 Human Activities, Pressures and Impacts SG (Henn Ojaveer, term started in January 2015)

4.3.1 Introduction

The Human Activities, Pressures, and Impacts Steering Group is responsible for guiding and supporting Expert Groups that seek to describe the diversity of pressures affecting marine ecosystems and the impacts that follow.

Topics covered include:

- describing and projecting trends in human pressures and impacts on marine ecosystems, including analysis of historical change
- understanding and quantifying multiple impacts of human activity on populations and ecosystems, and proposing options for mitigation
- prevalence and effects of contaminants, invasive species, shipping, noise, renewable energy, fishing, climate, acidification and habitat loss
- estimating the vulnerability of marine ecosystems to pressures and impacts, including risk assessment and identification of limits and thresholds
- developing indicators of pressure and impact and testing their role in management systems
- assessing human impacts on ecosystem goods and services and developing approaches to mitigate undesirable impacts

4.3.2 Summary of progress in relation to Terms of Reference

Terms of Reference	Progress
ToR a) Engage with and work with Chairs of EG to ensure that EG work supports and meets the science objectives and advisory needs of ICES	Work carried out on routine basis mostly by electronic means. Physical attending WGCHAIRS, WGITMO and WGHIST meetings.
ToR b) Help EG formulate and prepare their draft terms of reference and resolutions	The activity includes helping to prepare draft resolutions of the following working groups ending their MA period in 2018 (WGSFD, WGBMBRED, WGBOSV, WGVHES, WGBEC and MCWG) and modifying the already approved ToR for WGITMO.
ToR c) Review and report on the science being undertaken within EG to SCICOM, with a focus on identifying science highlights and priorities and demonstrating the impact of their science	An e-mail was distributed among all EG chairs to submit candidate science highlights. Unfortunately, the response rate was very low. On cumulative effects, there are recent publications by ICES scientists. A draft resolution for a Workshop on Spatial and Temporal Distribution of Pressures (WKSTDP), which incorporates elements of cumulative effects analysis was prepared and submitted.
ToR d) Review scientific products/deliverables of the EG and provide feedback on ways to improve the impact and influence of their work	This ToR is achieved through communication with EG chairs during finalisation of EG resolutions with an aim to secure manuscripts submitted to peer-reviewed scientific journals as an output of as many ToR as possible.

Terms of Reference	Progress
ToR e) Provide feedback to SCICOM on research priorities and implementation of ICES strategy	Discussions on research priorities were held at the SCICOM mid-term meeting; and linked to providing feedback to the new ICES Science Plan.
ToR f) Identify shortfalls in skills and knowledge needed to achieve ICES objectives within the SGs area and work within the SG and through SCICOM and operational groups to develop capability	<p>Cumulative effects of human activities has recently received increasing attention, essentially in the ICES community. The proposed workshop (WKSTDP) is hopefully a strong move towards motivating further efforts in ICES.</p> <p>The workshop on Integrating historical data into modern stock assessment (WKIHSD) was postponed for one year (2019) due to a lack of nominations. Making better use of historical data to define historical baselines has been identified as a priority by WGHIST, but also by SCICOM. Further coordination and proactive efforts are required to get WKIHSD organised next year.</p>
ToR g) Identify gaps and overlaps in the work of EG, and propose consolidation, rationalization or forming of new EG to SCICOM as appropriate	<p>A Workshop on Spatial and Temporal Distribution of Pressures (WKSTDP), chaired by Vanessa Stelzenmuller, Germany, and Roland Cormier, Canada.</p> <p>Dissolving of WGMABS has resulted in a situation that there is no expert group in ICES dealing with impacts and risks of shipping. A core group of interested scientists was formed and initial ideas for the objectives and tasks collected. The draft resolution will be hopefully ready in 2019.</p> <p>Discussions on how to solve the situation of the (slight) overlap of ToR of the recently created WGML with MCWG were started with respective EG leads to try to identify an appropriate solution.</p>
ToR h) Help EG Chairs to adopt practices which ensure scientific information generated by EG is receiving adequate quality control consistent with scientific norms	The mechanism still needs to be developed, perhaps as a co-ordinated effort of all SG.
ToR i) Facilitate active horizontal and vertical communication, collaboration and co-ordination between EG and all other relevant ICES groups and identify, in cooperation with EG Chairs, opportunities for internal and external collaboration	<p>The variety of collaborations include, for instance: WGMRED-WGMBRED, MCWG-WGMS-WGBEC-WGML, WGITMO-WGHAB, WGBOSV-WGITMO, SIMWG-NWWG), WGMHM-BEWG and WGDEC, WGMRE-WGMPCZM, WGSFD-WGDEC, WGECON-SIHD, WGBEC-WGEEL, and WGSAM with multiple assessment and modelling EGs.</p> <p>Under consideration cooperation between WGHIST-WGFTFB.</p>
ToR j) Represent the SG at SCICOM meetings and SCICOM/ACOM leadership meetings in spring and at the ASC	SG representation in all SCICOM and SCICOM/ACOM leadership meetings.

4.3.3 List of EGs

A full list of expert groups under this Steering Group is provided in Annex 1.

4.3.4 Science highlights

- Archambault *et al.* 2018. Using a spatially structured life cycle model to assess the influence of multiple stressors on an exploited coastal-nursery-dependent population. *Estuarine, Coastal and Shelf Science*, 201: 95–104 (WGVHES).
- Bennema, F. 2018. Long-term occurrence of Atlantic bluefin tuna *Thunnus thynnus* in the North Sea: contributions of non-fishery data to population studies. *Fisheries Research*, 199: 177–185 (WGHIST).
- Cormier *et al.* 2018. The science-policy interface of risk-based freshwater and marine management systems: From concepts to practical tools. *Journal of Environmental Management*, 226: 340–346 (WGMPCZM).
- Cormier *et al.* 2019. Putting on a bow-tie to sort out who does what and why in the complex arena of marine policy and management. *Science of the Total Environment*, 648: 293–305 (WGMPCZM).
- Gee, K. *et al.* 2017. Identifying culturally significant areas for marine spatial planning. *Ocean & Coastal Management*, 136: 139–147 (WGMPCZM).
- Klein, E. *et al.* 2016. A complex past: historical and contemporary fisheries demonstrate nonlinear dynamics and a loss of determinism. *Marine Ecology Progress Series*, 557: 237–246 (WGHIST).
- Krone R. *et al.* 2017. Mobile demersal megafauna at common offshore wind turbine foundations in the German Bight (North Sea) two years after deployment - increased production rate of *Cancer pagurus*. *Marine Environmental Research*, 123: 53-61 (WGMBRED).
- Ojaveer *et al.* 2018. Historical baselines in marine bioinvasions: Implications for policy and management. *PLoS ONE* 13(8): e0202383 (WGITMO).
- Puckett, B.J. and Eggleston, D.B. 2016. Metapopulation dynamics guide marine reserve design: importance of connectivity, demographics, and stock enhancement. *Ecosphere* 7(6):e01322 (WGVHES).
- Willstead *et al.* 2017. Assessing the cumulative environmental effects of marine renewable energy developments: Establishing common ground. *Science of the Total Environment* 577: 19–32 (WGMBRED).

4.3.5 Communication with EG

Communication with EG chairs over e-mail, phone and Skype proven fully sufficient and efficient. As most EG chairs are extremely time-limited, the content of most e-mail communications initiated by the HAPISG chair has been either i) encouragement-type for timely submission of reports/draft resolutions or ii) provide input for HAPISG reporting in terms of science highlights and future planning.

4.3.6 Forward look (including actions for SG and SCICOM/ ACOM)

1. There seems to be sufficiently wide interest and willingness to start coordinated work on cumulative impacts of human activities. The momentum should be utilised and the field strongly incorporated into ICES science (please see report of the ICES ASC Open Session on 'Methodological advances to evaluate ecosystem effects of human activities')
2. Contribution to the following advice requests from OSPAR: Peer review of the OSPAR Case Report for the addition of Haploids communities to the OSPAR List of Threatened and/or Declining Species and Habitats
3. Advice on the current state and knowledge of studies into the deployment and environmental impacts of wet renewable technologies and marine energy storage systems.

4. Revising the viewpoint on 'Evaluating and mitigating introduction of marine non-native species via vessel fouling' according to reviewer's comments and facilitating drafting the advice.
5. Continue planning WKIHSD with taking proactive measures to identify interested stock assessment experts to participate.
6. Continue planning to establish the shipping impacts EG and draft ToR for the group.
7. Proposing topics for new candidate viewpoints.
8. Identifying opportunities to further contribute for ICES Ecosystem and fisheries overviews (essentially considering historical perspective).

4.4 Integrated Ecosystem Assessments SG (Mette Skern-Mauritzen, term started January 2017)

4.4.1 Introduction

This Steering Group is responsible for guiding and supporting Expert Groups that develop ecosystem modelling and assessment methods, contribute to state of the environment reporting and underpin guidance on meeting ecological, social and economic objectives.

Topics covered include:

- Development of integrated ecosystem assessments for the Arctic, Baltic, Barents, Celtic, North, northwest Atlantic and Norwegian seas
- Comparative analyses of marine ecosystems
- Ecosystem modelling
- Methods and application of ecosystem-based management and risk assessment
- Linking ecological, economic and social models and analyses to understand interactions and trade-offs between management objectives
- Defining data needs to support integrated ecosystem assessment
- Development of integrated advice to support ecosystem-based management

4.4.2 Summary of progress in relation to Terms of Reference

Terms of Reference	Progress
ToR a) Engage with and work with Chairs of EG to ensure that EG work supports and meets the science objectives and advisory needs of ICES	The IEASG chair has engaged in defining EG ToR, participated in EG meetings, discussed EG output and reports with EG chairs and ICES Secretariat. Also, the chair has organized 2 IEASG meetings (during WGCHAIRS and ASC), and participated in EG meetings (WKEAMA, WGSOCIAL, WGIBAR, WKECO-FRAME).
ToR b) Help EG formulate and prepare their draft terms of reference and resolutions	The IEASG chair has engaged in the drafting of ToR for several EG to be approved in 2018
ToR c) Review and report on the science being undertaken within EG to SCICOM, with a focus on identifying science highlights and priorities and demonstrating the impact of their science	The IEASG chair has communicated with EG chairs regarding science highlights, and discussed these with both EG chairs, ICES Secretariat, and presented and discussed some of these on international meetings, including the PAME/AMAP/CAFF/SDWG/ICES WKEAMA on Ecosystem Approach Guidelines and Integrated Ecosystem Assessment, and The 4th international symposium on the effects of climate change on world oceans (ECCWO).

Terms of Reference	Progress
ToR d) Review scientific products/deliverables of the EG and provide feedback on ways to improve the impact and influence of their work	The IEASG meetings foster discussions across EG on how the work in one EG can support challenges in others. The interest in collaboration between EG is high.
ToR e) Provide feedback to SCICOM on research priorities and implementation of ICES strategy	The IEASG chair has participated in WKECOFRAME on development of ecosystem advice in ICES, and lead two group discussions during WGCHAIRS on next generation Ecosystem Overviews. Future priorities are outlined below.
ToR f) Identify shortfalls in skills and knowledge needed to achieve ICES objectives within the SGs area and work within the SG and through SCICOM and operational groups to develop capability	Within the IEASG, and with the support from SIHD and the newly established WGSOCIAL and WGECON, there is no major gaps in skills to address the IEASG objectives. However, it takes time to bridge disciplines and establish the required collaboration among EG. Stronger collaboration with EOSG and HAPISG is discussed below.
ToR g) Identify gaps and overlaps in the work of EG, and propose consolidation, rationalization or forming of new EG to SCICOM as appropriate	There is limited overlap between the EG. WKs are organized for topics of interest across groups; e.g. IEA methods, ecosystem modelling for supporting IEAs. We are also planning a WK bringing together chairs of IEA EG, WGSOCIAL and WGECON to help bridge disciplines.
ToR h) Help EG Chairs to adopt practices which ensure scientific information generated by EG is receiving adequate quality control consistent with scientific norms	The IEASG chair engaged in the planning of WKINTRA on IEA methods, to ensure consistent and proper use of these methods across the IEAs, and also to support the proposed EG on ecosystem modelling for IEAs and ecosystem reference points (see details below).
ToR i) Facilitate active horizontal and vertical communication, collaboration and co-ordination between EG and all other relevant ICES groups and identify, in cooperation with EG Chairs, opportunities for internal and external collaboration	This ToR is addressed more or less continuously in discussions with EG chairs, and specifically during IEASG meetings. EG have also had back-to-back meetings to focus on shared interests and challenges. Several IEA EG and the IEASG chair are involved in an EU proposal on a whole-Atlantic IEA.
ToR j) Represent the SG at SCICOM meetings and SCICOM/ACOM leadership meetings in spring and at the ASC	Unfortunately, the IEASG chair could not participate in the 2018 SCICOM and leadership meeting in spring, but will join these meetings during the 2018 ASC
ToR k) Map the EGs and their ToR against the information and data that ICES needs to deliver the Science Plan and its advisory work, suitably prioritized	IEASG EG are targeting major Action areas, such as Arctic research, Ecosystem overviews (EO), IEAs and MSFD, and collaborate with SIHD to bring in the human dimension. These activities also include progressing on the Baltic EO, and on a Viewpoint on future Arctic fisheries. There is less focus on data needs and feedback to ecosystem monitoring, and further collaboration with ecosystem modelling EGs is required for inclusion of forward projections with testing of management strategies into the IEA framework.
ToR l) Promote the development of the Regional Ecosystem Descriptions in standardized formats along the lines proposed by WKECOVER, and WKDECOVER. Propose additions and improvements to those guidelines in collaboration with constituent EG	The IEASG chair lead two group discussions during WGCHAIRS on next generation Ecosystem Overviews. Also, the IEASG chair has been involved in identifying and motivating relevant persons in the IEA network to assist in the development of the Ecosystem Overviews.

Terms of Reference	Progress
ToR m) Promote the development of outline Integrated Ecosystem Assessments with the IEA EG. It is recognized that a variety of approaches to IEA exist, and different approaches will be appropriate to the different IEA EG based on skill sets and local conditions. IEASG will promote innovative approaches including using partial component based analyses, and use of combination quantitative and expert judgement approaches	<p>A workshop following the ASC 2018 on IEA methods, WKINTRA, will present and discuss approaches relevant for the IEA groups, and assist the IEA groups in both selecting the appropriate methods as well as securing the quality of IEA analyses and conclusions.</p> <p>More IEASG groups are focusing on scoping and identifying management objectives, trade-offs among sectors and cumulative impacts, as well as indicators reflecting system vulnerability and resilience. Qualitative and quantitative approaches are being developed and implemented. A workshop combining WGSOCIAL, WGECON and IEASG EG will be proposed for early 2019 to further support the inclusion of Human Dimension. Finally, several IEASG groups are in the process of including multispecies and ecosystem modelling in the IEAs, to e.g. test indicators, address climate change scenarios and impact on ecosystem vulnerability and resilience. The IEASG chair strongly support these developments.</p>
ToR n) Maintain a watching brief over initiatives in IEA in the wider community beyond ICES. This should include new approaches or methods for IEA, and broadening of the IEA concept to potentially include economic and social drivers and impacts	The IEASG chair participated in the above-mentioned ICES/PICES/PAME WKEAMA workshop on developing guidelines for EA and IEA of the Arctic, based on experiences on IEAs from ICES regions and other regions. Also, ICES IEA work was presented and discussed at the ECCWO. We recruited Marcos Llope from the ICES IEA network to join the World Ocean Assessment, to bring ICES perspectives into this assessment. The IEASG chair is a lead author on the coming IPCC assessment, on a chapter on Ecosystem services, and will bring ICES perspectives into this process, as well as IPCC perspectives back to the ICES IEA EGs.
ToR o) Promote the development within EGs of standards and guidelines for good practice and Quality Assurance in the collation and use of data. This should extend to the maintenance of archived data used in the IEAs, and documentation of all the steps taken to arrive at a conclusion for a given IEA, and the possible involvement of the ICES Data centre	There is variable use of data from the ICES Data centre among the IEA groups, and this is a topic needs to be followed up. It is a challenge for several IEA groups that data are stored nationally and not in the ICES data base.

4.4.1 List of EGs

A full list of expert groups under this Steering Group is provided in Annex 1.

4.4.2 Science highlights

- Bossier *et al.* (2018): A new modelling framework for the Baltic is implemented, with a spatially-explicit end-to-end Atlantis ecosystem model linked with the HBM-ERGOM high-resolution physical-chemical-biological-and hydrodynamic model and the FISHRENT model of fisheries economics. By simulating scenarios of nutrient load reductions, oxygen levels and testing sensitivity to different fishing pressures, the authors demonstrated that the model framework is useful for evaluating the impacts of these pressures on different trophic levels, fish stocks, and fisheries. The Baltic Atlantis model framework thus forms an initial basis for

- strategic management evaluation suited for conducting medium to long term ecosystem assessments in relation to anthropogenic pressures such as eutrophication, climate change and fishing pressure, as well as changed biological interactions between functional groups.
- Bossier, S. *et al.* (2018). The Baltic Sea Atlantis: An integrated End-To-End Modeling Framework for Testing Ecosystem-Wide Effects of Human-Induced pressures. *PLOS ONE* 13(7):1-39.
 - Maar *et al.* (2018): The responses of summer phytoplankton biomass to changes in top-down forcing (expressed as zooplankton mortality) in three ecosystems (the North Sea, the Baltic Sea and the Nordic Seas) across seven different 3D ecosystem models, was assessed. Model results showed overall dampened responses of phytoplankton relative to zooplankton biomass. Phytoplankton responses varied depending on the food web structure and trophic coupling represented in the models. Hence, a priori model assumptions were found to influence cascades and pathways in model estimates and, therefore, become highly relevant when examining ecosystem pressures such as fishing and climate change.
 - Maar, M., Butenschön, M., Daewel, U., Eggert, A., Fan, W., Hjøllø, S.S., Hufnagl, M., Huret, M., Ji, R., Lacroix, G., Peck, M., Radtke, H., Salliey, S., Sinerchia, M., Skogen, M., Travers-Trolet, M., Troost, T., van de Wolfshaar, K. (2018) Responses of summer phytoplankton biomass to changes in top-down forcing: Insights from comparative modelling. *Ecol Model.* 376:54-67.
 - Peck *et al.* (2018) review and compare four broad categories of spatially-explicit modelling approaches currently used to understand and project changes in the distribution and productivity of living marine resources. Statistical (correlative) approaches can be used to detect historical patterns which may not be relevant in the future. Advancing predictive capacity requires explicit modelling of biological and physical mechanisms. New formulations are needed which (depending on the question) will need to strive for more realism in ecophysiology and behaviour of individuals, life history strategies, as well as trophodynamic interactions occurring at different spatial scales. Fundamental advancements are needed to address key issues such as the adaptive capacity of species/groups and ecosystems. The continued development of end-to-end models (e.g., physics to fish to human sectors) will be critical to assess how multiple pressures may interact and trade-offs of different spatial management strategies. Given the strengths and weaknesses of the various types of models reviewed, confidence in projections will be increased by assessing model structural uncertainty through biological ensemble modelling.
 - Peck *et al.* (2018). Projecting changes in the distribution and productivity of living marine resources: A critical review of the suite of modelling approaches used in the large European project VECTORS. *Estuarine Coastal and Shelf Science* 201, 40-55.
 - Pedreschi *et al.* (In press). The ODEMM (Options for Delivering Ecosystem-based Marine Management) approach provides an integrated ecosystem assessment that traces the sectors affecting the marine environment, the pressures they create, and the ecological characteristics affected. This research presents the first application of the ODEMM framework outside of the ODEMM project, completed for Ireland's marine waters. The assessment places fishing in the context of other anthropogenic pressures and highlights areas of threat to Marine Strategy Framework Directive (MSFD) descriptors. From 1,879 impact chains, just 60 (45 of which were attributed to the fishing sector) account for 64% of the Total Risk score, highlighting areas for management action with a high risk-reduction return. The analysis showed Waste Water to have the highest average risk of all sectors, followed by Land-based Industry, Fishing and then Shipping. In terms of total risk, Fishing was the most important sector, due to its high connectance to many ecosystem components and widespread influence, even though many of the impacts are relatively low and the components impacted show a high degree of recoverability. Litter was found to be the highest risk pressure due to its persistence, and widespread reach.

- Pedreschi, D., Bouch, P., Moriarty, M., Nixon, E., Knights, A., Reid, D. Integrated Ecosystem Analysis in Irish waters; Providing the context for ecosystem-based fisheries management. Fisheries Research, In Press.

4.4.3 Communication with EG

The IEASG chair has communicated with EG chairs on diverse matters, including;

- following up EG reporting
- developing ToR (WKINTRA Workshop on integrated trend analyses in support to integrated ecosystem assessment, WKEWIEA Workshop on operational EwE models to inform IEAs, WKSABI Workshop on methods to develop a swept-area based effort index)
- joined EG meetings (WGIBAR, WGSOCIAL, WKECOFRAME, WKEAMA)
- lead group discussions during WGCHAIRS; topic Next generation Ecosystem Overviews
- organized two IEASG meetings in 2018

4.4.4 Forward look

The processes of developing next generation Ecosystem Overviews needs to be followed up, by both ACOM/ICES secretariat and by the IEASG chair.

There is much cross fertilization among EGs within the IEASG, and further development of IEAs along two axes, in particular, it is anticipated; i) including socioeconomic aspects through collaboration between IEA EG, WGSOCIAL, WGECON, and SIHD, and ii) including ecosystem modelling and scenario testing, through bringing in modelling skills into the IEA EG and through collaboration between IEA EGs and WGIPEM. Targeted WK could facilitate this development.

Several IEA EG are focusing on cumulative impacts of human activities across sectors in ecosystem risk assessment frameworks (e.g., WGEAWESS, WGIAB, WGIBAR). Targeted WK in collaboration with HAPISG EG could support this development.

There is still a lack of communication across IEASG EG and EOSG EG on data needs to support IEA, and options for EOSG EG to provide the required data. This is a complex matter, as the IEA EG are covering many different ecoregions with varying monitoring effort, data availability and subjects of interest. One possibility is to focus on one specific region to start advancing on these challenges. The IEASG chair will discuss this matter and possible approaches with IEASG EG chairs and the EOSG chair.

4.5 Ecosystem Observation SG (Sven Kupschus, UK, term started January 2017)

4.5.1 Introduction

The Ecosystem Observation Steering Group is responsible for guiding and supporting Expert Groups that are meeting immediate data demands and contributing to the running and further development of effectively co-ordinated, integrated, quality assured and cost-effective monitoring in the ICES region and beyond.

Topics covered include:

- Evaluating and optimising survey design to meet the needs of member countries and support advisory requests
- Design, planning and co-ordination of egg and larval, acoustic and trawl surveys
- Identifying and evaluating new technologies for observation and monitoring
- Advising on the design, deployment and efficiency of sampling methods and gears and the use of resulting data for assessment and advice

- Aging and estimating life history parameters of sampled fauna
- Developing monitoring to meet emerging data, science and advisory needs, with a focus on integrated ecosystem assessment and ecosystem-based management

4.5.2 Summary of progress in relation to Terms of Reference

Terms of Reference	Progress
ToR a) Engage with and work with Chairs of EG to ensure that EG work supports and meets the science objectives and advisory needs of ICES	This is still difficult for the SG, due to the large and increasing number of EG with comparatively low attendance at the ASC and WGCHAIRS. The SG chair has made efforts at both meetings to make the most of the available opportunities to develop the SG further.
ToR b) Help EG formulate and prepare their draft terms of reference and resolutions	The SG chair has worked with 19 expert groups, (8WG, 11WK) to prepare ToR since January. He has used this opportunity to communicate with the chairs and to develop a common vision around the SG and its place in ICES, as well as ensuring the ToR are coherent and complementary between EG.
ToR c) Review and report on the science being undertaken within EG to SCICOM, with a focus on identifying science highlights and priorities and demonstrating the impact of their science	WGFAST and WGRTEFB are the primary science focused groups in the SG they once again held their symposium style meeting in 2018. WGRTEFB with over a 100 participants this year, an ICES record and more of a conference than an EG. WGELECTRA provided a sound basis for advice on electro fishing, WGISUR met in Canada to cooperate in the development of a new survey with a greater ecosystem focus. WGISDAA continues to provide its analytical support to survey WGs and had active participation from two stock assessment groups wishing to better understand the impact of surveys on their assessments.
ToR d) Review scientific products/deliverables of the EG and provide feedback on ways to improve the impact and influence of their work	Two SISP manuals have been reviewed and published, and the third one was sent back to the WG for improvements prior to sending out for external review.
ToR e) Provide feedback to SCICOM on research priorities and implementation of ICES strategy	<p>The SG chair participated in all SCICOM meetings and fed back to SCICOM on ways to ensure EGs focus on the ICES needs (science and advisory) in their work.</p> <p>The SG chair provided feedback and suggested action areas in the development of the ICES science plan. He worked with EGs to develop their roles in this.</p>
ToR f) Identify shortfalls in skills and knowledge needed to achieve ICES objectives within the SGs area and work within the SG and through SCICOM and operational groups to develop capability	<p>EOSG expert groups are generally adequately resourced to perform the current ToR. Limits become apparent when trying to develop new and scientifically more challenging tasks often resulting in avoidance of setting such ToR. There is room for more cooperative workshops to solve the issue. These have been actively supported but with mixed success.</p> <p>There have been several requests for external experts to be invited to WK financed by ICES. When challenged it seems more about the applicability of the work and less about a skills shortage (reputation)</p>

Terms of Reference	Progress
ToR g) Identify gaps and overlaps in the work of EG, and propose consolidation, rationalization or forming of new EG to SCICOM as appropriate	Data collection EG have worked in comparative isolation in the past, for operational reasons. Despite this, few overlaps have developed because the focus is usually very specific and the data reporting work-load is substantial. However, the continuity of understanding and the synthesis of science across this large pool of evidence has suffered. The SG chair has focused on developing a plan to restructure EG to emphasise the value of information across different data sources, while ensuring continued data quality, timely advice delivery and ensuring resource availability.
ToR h) Help EG Chairs to adopt practices which ensure scientific information generated by EG is receiving adequate quality control consistent with scientific norms	Most of EOSG EG scientific work is around reporting of data collection for which there is an extensive QA QC procedure including careful documentation in place. Other more science oriented groups seem to be operating at a higher scientifically rigorous level with significant peer to peer review within the group. The SG chair has tried to ensure that this expectation is inherent in the ToR as the discussions around ToR are the most frequent form of communication with EG chairs given the size of EOSG.
ToR i) Facilitate active horizontal and vertical communication, collaboration and co-ordination between EG and all other relevant ICES groups and identify, in cooperation with EG Chairs, opportunities for internal and external collaboration	The chair has used his knowledge of the ICES structure to aid communication by highlighting similarities and synergies between EG. In particular, he has focused on the ACOM groups which have been comparatively isolated from the science elements. There are now EOSG EG that are connecting with benchmark groups (WGISDAA, WGCATCH) and assessment groups (WGBEAM, IBTSWG). Success so far has been achieved at the level of the individual rather than the group but it is hoped that this will develop more broadly. Further WK are planned for next term, including one across SG to co-operate on appropriate methods for use of IBTS data to calculate biodiversity metrics for MSFD.
ToR j) Represent the SG at SCICOM meetings and SCICOM/ACOM leadership meetings in spring and at the ASC	Attended both meeting and represented SG interests.
ToR k) Map the EGs and their ToR against the information and data that ICES needs to deliver the Science Plan and its advisory work, suitably prioritised.	ToR are mapped against the science plan headings at time of inception. This process is also done for the ACOM ToR (direct advisory requests, indirect products used by ACOM EGs). The large number of largely indirect "high priority" ACOM ToR received by the group make it necessary to appropriately prioritise the SCICOM ToR.
ToR l) Promote continued improvements and innovation in the design and technology of surveys and other data collection schemes implemented in support of stock assessments and ecosystem studies, leading to gains in survey efficiency, increased diversity and resolution of data collected, and improvements in the interpretation, quality, utility and impact of the data in ICES advice.	<p>The survey groups continue to evaluate new technologies to perform existing tasks and are generally best placed to evaluate these appropriately. The SG supports these efforts through WK where requested (e.g. future IBTS survey gear) and by encouraging participation of relevant EGs or individuals. WGFASST examines the acoustic technology as did WKMESO / 2.</p> <p>WGISDAA continues to develop methods to better evaluate current survey methodologies and WGISUR has looked at methods to collect new ecosystem data.</p>

Terms of Reference	Progress
ToR m) Determine how at-sea surveys can be adapted in the most cost-effective way to collect key information on ecosystem states and processes in support of the EAM, whilst maintaining the integrity of existing time-series of abundance estimates or indices used for stock assessments and advice."	WGISUR in cooperation with WGISDAA have been active in this area. This year a joint meeting with Canada and the US has looked into helping the develop a greater ecosystem focus in the merger of two national surveys to a joint international effort. The WGISUR CRR is in review.
ToR n) Evaluate methods to mitigate the impacts of fishing on marine ecosystems through innovative gear design and technology, with a particular focus on by-catch reduction and development of fishing and survey gears which minimise fuel consumption and habitat damage;	WGFTFB and WGELECTRA are the main EGs dealing with this TOR. The former is one of the most scientifically prolific EGs with a diverse set of expertise and back grounds. ICES provided advice this year on the basis of the WGELECTRA work, and the ways in which WGFTFB science is making its way into the advice is being checked. Possibly, there are opportunities to improve this element of the EGs work.
ToR o) Encourage cooperation and collaboration with the fishing industry and other stakeholders in addressing ToR l), m), and n) and develop specific ToR as appropriate	WGFTFB is the group that most frequently and regularly cooperates and interacts with the industry and they are driving this ToR forward. Also this year we had a workshop on Methods for Stakeholder Involvement in Gear Development (WKMSIGD). The Working group on Recreational Fisheries Surveys (WGRFS) works with the recreational fishermen and a couple of WK are in development in this area for the upcoming year.
ToR p) Promote the development within EGs of standards and guidelines for good practice in data collection covering the design and implementation of surveys, fishery and other related data collection programmes, the archiving and interpretation of data and samples, the analysis of data, provision of data quality indicators, and the documentation of procedures."	The work on SISPs is continuing with new versions and entirely new manuals published this semester. A major omission (WGBEAM SISP) has been reinvigorated with a final version approaching completion. Most EGs are now routinely updating the information annually and full reviews are usually done at the end of an EG term unless there are major changes. PGDATA (as part of their new ToR) has adopted some responsibility for documenting and reviewing methodologies, acting as a repository of past information and assisting EGs with advising on statistical approaches.
ToR q) Organize SG meetings which will take place during the ASC and WebEx's, as appropriate, to discuss EG accomplishments and plans, with a focus on the overarching ToR specified above.	The EOSG chair attended WGCHAIRS and the ASC and used associated events / opportunities to communicate with the EG chairs. WebEx has proven to be an inefficient means of communicating across EOSG, the group is too large to get a significant number of chairs to engage and there is currently insufficient overlap / cooperation between groups to make this effective. EOSG chairs still see their role primarily in organising the EG meeting and writing the report.

4.5.3 List of EGs

A full list of expert groups under this Steering Group is provided in Annex 1.

4.5.4 Science highlights

As usual the EOSG EG have done an excellent job in providing the advisory groups with the necessary scientific evidence to provide their advice. Data quality checks have been performed giving greater confidence in the advice. Work continues on updating survey manuals and one new manual has been added this term, with another undergoing update revisions. Significantly, work on manuals has become

a routine part of working groups when discussing or changing methods. This suggests the QAQC process has bedded in well.

WGFTFB had its largest meeting to date with over a 100 participants, which incidentally is an ICES record for an expert group. Lots of cutting edge science on fishing gears is presented evaluating conservation credentials, possible impacts on management and fish stocks. This science is frequently published (see publications), and although usually linked to the ICES WG formally possibly more could be done to use this information more directly in advice.

WKMLEARN has examined the potential benefits to ICES and its member of machine learning techniques. The workshop represented a balanced approach between the potential uses and the likelihood of implementation. The SG hopes that ICES will help support and further develop this initiative, particularly since currently they are not aware of a recommendation to develop a more permanent presence in this area. There is a lot of relatively quickly realisable potential in this methodology for sample analysis and interpretation, which is why EOSG will continue to provide a home for such work if required.

WGELECTRA provided a comprehensive review on the effects of electrofishing. This formed the basis of advice in response to a direct request from the EU customer.

WGISUR met with in Canada and spent two days of their four-day meeting joining up with a planning group developing a new coordinated (US and Canada) aiming to provide consistent evidence with previous survey series, but also new information on other ecosystem components in support of more holistic ecosystem advice.

Both WGCATCH and WGISDAA have taken the initiative to develop better data availability / use for benchmark assessments. To date most often benchmark groups are presented with only one final version of data, where different methods of deriving these estimates will significantly interact with the assessment methodologies a better understanding and the availability of different options of combining the data / indices will be a great asset to the benchmark process. The work done by the groups will culminate in two meetings ahead of the Celtic Sea gadoid benchmark.

4.5.5 Communication with EG

In an attempt to create more fluent communication between the WG the SG has encouraged the use of joint workshops and the increasing number of such workshops, not only between EOSG groups but also working with ACOM groups and stakeholders, reflects this initiative. Communication among survey EG could still be improved considerably within EOSG with significant benefits for the development of science and improvements in ecosystem and fisheries management advice.

Heavy reporting workloads, behavioural patterns and resource needs appear to be at least some of the barriers to communication in the EG and the survey EG in particular. The main downside of this is that the full potential of the regional perspective across our most costly data sources is not realised or at least not quickly. While the potential is obvious in the ecosystem context, it is also significant in the current fisheries advice process, but the solution is not simple because of the variety of causes.

A more regionally based grouping of surveys (as opposed to the currently more technical / gear based structure within the SG) would significantly improve the productivity of the EOSG EG but it is an oversimplification of the complexity of the task. There are a large number of things to consider beyond communication, including scheduling for advisory needs, the DCF reporting needs of member states, roles of existing EG chairs, workloads and expertise needed. Tackling these issues will require the support and input of the current EG chairs, so the next step is to discuss these issues more widely. The size and diversity of the SG in conjunction with the complexity of the task makes this difficult (impossible by WebEx), but without genuine consultation and inclusion of the EG chairs this is likely to cause more problems than solutions.

4.5.6 Forward look (including actions for SG and SCICOM/ ACOM)

Solving the communication issues within the SG are the most important challenges looking forward. Important progress has been made in starting a dialogue between demersal assessment EG and data EG. This has operated very much on the individual level and we plan to find ways to make this more general / normal amongst EG. Mechanisms for communication exist, what we need are the right incentives and conditions to get up-take and support:

The size of EOSG needs to be addressed, as does its operation at the ICES Secretariat level.

The potential for more regional data groups has to be explored, while considering the data quality aspect and ACOM deliverables needed for advice.

5 Operational Groups

5.1 Data and Information Group (DIG; Jens Rasmussen, UK)

The data and information group advises on all aspects of data management, including data policy, data strategy, data quality, technical issues, and user-oriented guidance. Their work is closely coordinated with the ICES Data Centre and helps to ensure that EG have access to the data that is essential to their work.

DIG has continued close collaboration with ICES Data Centre, both in terms of identifying strategic areas most likely to impact ICES work, and in concrete steps to apply governance principles and evaluations to different development projects to ensure considerations of all relevant data management principles.

Future Challenges and Opportunities Progress

In March, DIG and ICES Data Centre presented the initial Future Challenges and opportunities paper to SCICOM, that identified Machine learning, Cloud technology, and Open data and code sharing as the three biggest areas of challenge and opportunity. Initially, this was a document for discussion, but DIG and the Data Centre worked further on the approach during and after the May DIG meeting. This has now translated to four main headings (Machine learning, Cloud, open data and code and transparency of process) which will be used by DIG to list and track more specific challenges and opportunities in a risk management style approach. This has been built into the ICES SharePoint facility, and will allow more continued tracking and reporting on the most important challenges and opportunities moving forward.

Data Management and governance principles

DIG has previously presented a list of governance principles or areas of awareness. These are specifically designed to touch on all relevant areas of managing data within an organisation, and can be used to evaluate the readiness and any gaps in applications and management thereof. The DATRAS governance group was proposed to start evaluating trawl survey data against these principles, and have met twice informally (via WebEx) since January 2018. A resolution has now been proposed to establish the governance group. The initial aim was to introduce the principles and ensure dialogue in the survey working groups, before work progresses this year to provide more concrete suggestions to ICES Data Centre.

DIG also recognised that there was an opportunity to incorporate the governance principles at an earlier stage in newer projects to catch any potential issues earlier. Thus, DIG will this year establish a dialogue and quick review of the Transparent Assessment Framework (TAF) and European Seabird at Sea ESAS data platforms. In addition, a governance group for the development of the SmartDots product has also proposed as a resolution, which will help guide management of data and the SmartDots age reading platform in general.

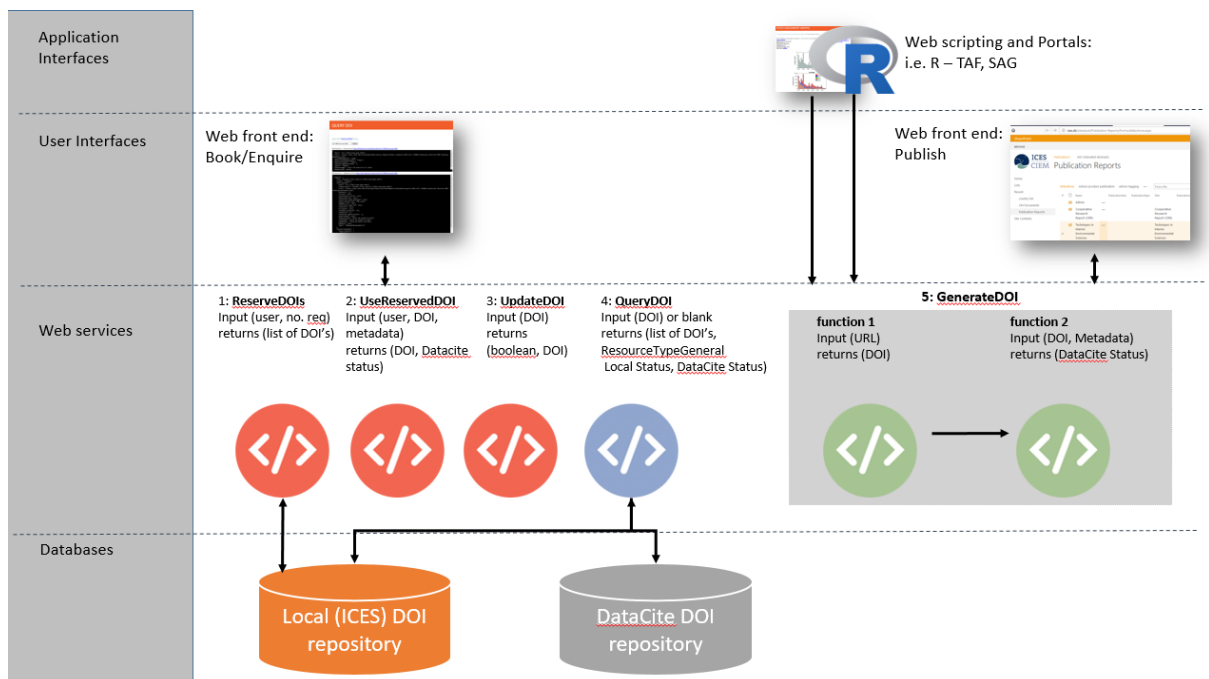
Data Guidelines process review

DIG inherited ownership of the ICES data guidelines from its former expert group format, but have struggled to progress the review. While the current Data Guidelines remain relevant, there is a need to expand the scope of these guidelines to capture the more dynamic documentation and coding that is happening in parallel (or instead of). WGFAST has had some experience in this area, and is looking to DIG for guidance on this. Thus there is a recognised need to review the process to ensure the community can work iteratively and responsively on developing guidance, while there is also a desire to retain a recognised ICES publication. A smaller group of DIG members is developing a process that will enable both mechanisms to exist, while ensuring quality and citation of recognised ICES Data Guidelines. The draft proposal will be ready for the SCICOM March 2019 meeting. While this work is ongoing, there will be no attempt to revise or update existing guidelines.

Progress with Digital Object Identifiers

The importance of persistent identifiers for both scientific publications and data that are used in assessment is now well accepted in the ICES community. ICES have adopted the DataCite DOI standard and the roll-out, which has focussed on publications so far, will soon include data products. Currently, ICES has the ability to mint unlimited DOIs and the technical framework has now been developed in-house to support this for all types of publications (documents, datasets, URL's of data queries etc.)

The approach builds on a number of web services, which means the DOIs can be created/updated/populated with meta-data from trusted programmes and scripts. All publications in Sharepoint can in practice have DOs assigned relatively easily, and likewise for other systems such as the Transparent Assessment Framework (TAF), Acoustic and DATRAS portals etc. The implementation at each node is to be specified within the governance mechanisms for the different systems.



First Hackathon in ICES

In May 2018, ICES hosted its first hackathon – WKINVITED. A hackathon is a semi-structured event that focusses on rapid development of an idea into a product. Teams work together, bringing different skills in terms of domain knowledge, technology or design, and aim to produce a prototype or more developed idea of how to approach and solve a problem.

WKINVITED mixed physical and remote participation, with a total of 16 participants, and a total of 5 ideas were developed during the one-and-a-half-day event. Overall, there was positive feedback from the participants, and the general consensus was that the event was a success, although lessons were also learned about the time and resources needed for preparation.

DIG discussed if a follow up event should be proposed, but at the same time, an opportunity arose for ICES to participate in the 2019 EMODNET hackathon instead. This is a well-resourced event on a much larger scale, and it was recommended that ICES should try a broader event with a scope for wider integration of data, to learn which format suits best. Neil Holdsworth has progressed discussions with EmodNet, and ICES participation in the event in (most likely) May 2019 will go ahead.

ICES Linked Data becoming a Reality

With the redevelopment and revision of the ICES Vocabulary services, the underlying model for how keywords and vocabularies are stored and served has changed to enable better linkage between terms,

both from inside and outside of ICES. This enables data to be connected to terms, which in turn are also connected to other keywords and concepts. At the outset, this may seem like a modest change, but it has the potential to enable ways of integrating and analysing data that would previously have required huge efforts. Concretely, there are already ideas emerging, and a dedicated subgroup in DIG is developing 2–3 potential use cases that will help demonstrate the versatility and potential use of these capabilities.

One key aspect of enabling linked open data, apart from the work on vocabularies, is the ability to establish persistent identifiers or locations for data – otherwise, you cannot link together the terms and the data. ICES is already working towards enabling digital object identifiers for reports and IDG has recommended that new or revised data submission formats incorporate the ability for national data submitters to include persistent identifiers.

Upcoming Policy reviews

DIG is responsible for managing the process of evaluation and review of the ICES policy of management and dissemination of data. The group looked at initial challenges of the EU regulation on personal data protection (GDPR) and its impact on the existing data policies. The GDPR is most likely to affect data where natural persons can be identified; so Vessel Monitoring System (VMS) and AIS data are the data types most likely to be under scrutiny. While the initial analysis would indicate that ICES has well documented policies and procedures in place, this will be considered when the VMS data policy is updated as part of a scheduled review in the 2019 work cycle.

As noted by DIG, the data policy for the Regional Database (RDB) was revised by the SC-RDB in December 2017, it is currently being tabled to the Regional Coordination Groups (RCG's) for acceptance by the participating countries. In brief the changes are:

- Reference to both RDB and RDBES
- Reference to the new DCF regulation (EU) 2017/1004, and specifically as this now refers directly to a regional database
- Stronger reference from the DCF on quality directed towards member states
- New Annex 1 developed to summarise all main articles from regulation that are relevant
- New Annex 2 developed that specifies more precisely what is meant by use of data and public outputs of aggregated data

5.2 ICES Training Group (TG, Daniel Duplisea, Canada)

The training group develops the structure and content of the ICES training programme and then guides and supports the provision of training. The ICES training programme was initiated in 2009 to help build capacity in ICES and to support the scientists involved in the advisory process. ICES offers training courses by high-profile scientists and instructors to ensure that those involved in advisory process, have the skills necessary to complete such work. The objective of ICES involvement in training is quality assurance in the advisory process.

Over 30 courses have been offered on a range of topics, including stock assessment (introductory and advanced), ecosystem modelling, model building, management strategy evaluation, Bayesian inference, fisheries advice, trawl survey design and evaluation, integrated ecosystem assessment, analysis and visualization of Vessel Monitoring Systems, communication of science and advice, and how to lead an effective technical meeting. Each course was taught within the context of the ICES science and advisory system to demonstrate best practices as well as state-of-the-art technical skills. More than 700 students have attended ICES courses from over 30 countries. Most students have been from ICES member countries, representing all member countries but one. Many students and several instructors are from other countries and cooperating organizations.

Progress Report

In 2018, the ICES Training Programme planned seven open training courses

ICES training courses 2018

- [Statistically sound inference for commercial catch sampling programmes](#)
18–22 June, Copenhagen, Denmark
- [Genomics in support of fisheries and aquaculture management](#)
26–28 June, Ispra, Italy (postponed, due to too few applicants)
- Introduction to the R environment
29 October–2 November, Copenhagen, Denmark (cancelled, due to too few applicants)
- [Advanced stock assessment](#)
5–9 November, Copenhagen, Denmark
- [Introduction to agent-based modelling for fisheries science and management](#)
13–15 November, Copenhagen Denmark (cancelled, due to too few applicants)
- [Introduction to stock assessment](#)
22–26 October, Copenhagen Denmark
- [Geostatistics in R for fisheries and marine ecology applications](#)
3–7 December, Fontainebleau, France

Courses planned for 2019

- Advanced stock assessment with Template Model Builder (TMB)
28 January – 1 February 2019, Halifax, Canada
- Marine Spatial Planning processes
18–22 February 2019, Copenhagen Denmark
- Bio-Economic Management Strategy Evaluation using FLBEIA
25 February - 1 March 2019, Copenhagen, Denmark

Promotion of training courses

E-mails are sent to specific WGs and EGs in the ICES community, who might benefit from the courses. In addition, one course is featured in each of the ICES newsletters. Course offerings are always available on the ICES website training pages. National representatives to SCICOM and ACOM are encouraged to disseminate information about ICES training courses in their own organisations. The ICES training program was present to expert group chairs during the chairs meeting at the Hamburg ASC.

ICES training and ICES projects

Through participation in H2020 projects, ICES training is contributing to training opportunities, in co-operation with other project partners

[PANDORA project](#): Paradigm for Novel Dynamic Oceanic Resource Assessments. ICES is lead partner in implementation of courses across all the projects work packages. Topics are to be defined by stakeholders at regional workshops (to be held in the autumn 2018). Broadly, courses will include survey sampling techniques, data required for assessments, training on state-of-the-art tools and stock assessment challenges.

[ClimeFish](#): Co-creating a decision support framework to ensure sustainable fish production in Europe under climate change. ICES is a contributing partner in provision of hands on training, to provide new ClimeFish tools.

All projects are offered the option to submit [training course proposals online](#), which are out through the training course selection process by the committee. If the project is able to provide funding for a specific training and only for project participants, ICES training can support the training activity, with

handling applications, administration, SharePoint etc. This is to ensure that training activities, be it through projects or standard ICES training, adhere to the aim of cost neutrality.

[LME Learn training courses](#): seeking to improve global ecosystem-based governance of Large Marine Ecosystems

ICES, NOAA and UNDP Cap-Net are joint organising three training courses on Ocean Governance:

- For the West African Region 5-6 September in Dakar, Senegal
- For the Latin America and Caribbean Region 3-4 October Panama
- For the Asian Region 23-24 January 2019, China

These courses are being funded by the project and, therefore, have not been subject to the training group selection process.

New Chair of ICES Training Group and Training Group Membership

Daniel Duplisea's three-year term on the Training Group will finish at the end of 2018. Jan-Jaap Poos (Netherlands) was nominated to fill the role which was unanimously supported by the training group and approved by SCICOM in September 2018. Eskild Kirkegaard will be replaced by Mark Dickie-Colas as Chair of ACOM in 2019 and will take over Eskild's place on the Training Group to ensure the strong link with ACOM. Daniel Duplisea will remain as a regular member of the Training Group.

Training Group Actions from September 2017

The following actions from 2017 were addressed in 2018: (1) the Training Group to review options for developing links with other training providers and (2) the Training Group will review opportunities and demand for supporting capacity building in developing countries. Discussions within the training group have identified two possibilities for joint training that may be possible: (a) to use the massive open online course (MOOC) model by partnering with organisations such as the Kiel Ocean MOOC (b) to partner with established marine science organisations, which is of interest to the Intergovernmental Oceanographic Commission (IOC). In relation to capacity building, the ICES training program is currently available to anyone although there is a registration cost difference for ICES member and non-member countries. A possibility is to offer member country registration fees for developing countries. Currently, no such decision has been made. The TG does not see a strong direct role for capacity building in developing countries. Organisations like IOC and FAO provide much of this already. That said, partnering with organisation like IOC could provide an increased role for ICES in this respect and bring the top-class ICES expertise to training outside the ICES member countries. The TG also feels that it would be essential partner with other large intergovernmental organisations if it were to further capacity building for developing countries. That would ensure sensitivity to the needs of these countries and to avoid duplication of effort.

5.3 Science Impact and Publication Group (SIPG, SCICOM Chair/Secretariat)

The Science Impact and Publication Group was established in 2017 and coordinates and supports the publication and dissemination of research conducted under the auspices of ICES. The group is responsible for guiding, monitoring and sharing ICES publication output and increasing the reach and impact of ICES publications. SIPG is chaired by the SCICOM Chair and has five external members and two members from the ICES Secretariat (ICES editor and Technical editor).

5.3.1 Update on status of Science Impact and Publication Group

SIPG work to date has primarily focused on addressing issues related to the authorship of ICES expert group reports, as raised at the 2018 WGCHAIRS meeting, and increased tracking and recording of peer-review publications linked to expert groups, as requested by SCICOM. Work is being progressed in the following areas:

1. Authorship of expert group reports: priority to work with ICES Secretariat to define series name, assign ISSN, define citation format, complete testing of template to include author names and information on 'how to cite' and to implement for 2019 expert groups reports. It will also be necessary to determine how to process interim reports for expert groups with multi-year terms of reference, as it has already been agreed that these will not form part of the report series.

2. Development of ICES bibliography: priority to work with the ICES Secretariat to make this bibliography available to users [via a portal on the ICES website](#) with a search function and to add summary graphics. Data for 2016 and 2017 are near complete. Future needs are to extend this bibliography back in time, 2010 might be an appropriate target, as well as searching for and then adding the remaining peer review publications for 2018 and 2019.

Other priorities identified in the terms of reference and which SIPG will aim to begin in 2019 are:

3. Develop and apply methods to assess the impact of all types of publications generated by the ICES network (term of reference 1b).

4. Develop descriptions of the societal impact of ICES science for reporting and outreach (term of reference 1c)

5. Work on identifying target audiences for communicating science, advice, data and training products (term of reference 1d)

6. Review and provide guidance on the evolution of Science publication and communication and the opportunities and risks it presents for ICES (term of reference 4).

5.3.2 Review of ICES publications

ICES published seven CRRs in the past 12 months:

- 2014/1/SSGEPI07: No. 338 Report on Handbook of Geostatistics in R for Fisheries and Marine Ecology, edited by Pierre Petitgas, Jacques Rivoirard, Mathieu Woillez, Nicolas Bez, and Didier Renard. December 2017. 177 pp.
- 2013/1/SSGEF05: No. 339 ICES Report on Ocean Climate 2016, edited by Karin M. H. Larsen, Cesar Gonzalez-Pola, Paula Fratantoni, Agnieszka Beszczynska-Möller, and Sarah L. Hughes. February 2018. 110 pp.
- 2016/1/SSGIEOM05: No. 340 Using underwater television surveys to assess and advise on Nephrops stocks, edited by Ana Leocádio, Adrian Weetman, and Kai Wieland. May 2018. 49 pp.
- 2017/1/EOSG03: No. 341 The SONAR-netCDF4 convention for sonar data, Version 1.0, edited by Gavin Macaulay and Héctor Peña. May 2018. 33 pp.
- 2013/SSGHIE03: No. 342 IEC/ISO Bowtie analysis of marine legislation: A case study of the Marine Strategy Framework Directive, edited by Roland Cormier, Michael Elliott, and Andreas Kannen. July 2018. 56 pp.
- 2014/1/SSGEPI04: No. 343 Marine recoveries of tags from Atlantic salmon, edited by Niall Ó Maoiléidigh, Jonathan White, Lars Peter Hansen, Jan Arge Jacobsen, Ted Potter, Ian Russell, Dave Reddin, and Tim Sheehan. September 2018. 121 pp.
- 2015/1/SSGIEOM04: No. 344 Acoustic target classification, edited by Rolf J. Korneliussen. October 2018. 104 pp.

ICES published one TIMES in the past 12 months:

- 2014/1/SSGEPI01: TIMES 61 Guidelines for determining polymer-water and polymer-polymer partition coefficients of organic compounds by Kees Booij, Foppe Smedes, and Ian J. Allan. October 2017. 32 pp.

ICES published four new ID leaflets in the past 12 months:

- No. 65: Brown ring disease: a vibriosis affecting clams *Ruditapes philippinarum* and *R. decussatus*
- No. 66: Bonamiosis of oysters caused by *Bonamia exitiosa*
- No. 67: Disseminated neoplasms in bivalves
- No. 68. X-cell disease in common dab (*Limanda limanda*) caused by *Xcellia lamelliphila* (Perkinsea). Feist, S.W. & Bass, D.

ICES revised one leaflet:

- No. 18: *Bonamiosis* in the flat oyster (R. Carnegie & L. Madsen)

A full report from each of the series editors is on SharePoint in the [Background documents](#) folder for the September 2018 SCICOM meeting.

5.3.3 Review of Category 1 resolutions for publications

Category 1 resolutions are now submitted to ICES Editor, reviewed by the relevant series editor and then submitted along with the series editors comments to SCICOM for their consideration (either on the SCICOM Forum or at the SCICOM meeting held in Hamburg in September.

In the past 12 months, two Category 1 resolutions were submitted to SCICOM:

2017/1/EPDSG07

A report on the status and distribution of poorly understood diadromous fish species will be published in the ICES Cooperative Research Report series, edited by the Chairs and members of WGDAM and other colleagues (60 contributors by correspondence and workshops), comprising species descriptions and their distribution, identification, life history, ecology, threats, pressures and conservation status.

Status: Approved by SCICOM on SCICOM Forum.

2018/1/EOSG01

A Handbook on maturity staging of fish in the ICES areas, edited by Cindy van Damme (The Netherlands), Maria Cristina Follesa (Italy) and Francesca Vitale (Sweden) and reviewed and approved by members of WGBIOP, comprising of a collation of maturity staging protocols (based on ICES maturity staging work-shops), will be published in the ICES Cooperative Research Report series.

Status: Approval pending the submission of previous workshop reports by the authors.

5.3.4 Update on Series Editors contracts

A recruitment process in 2017 appointed Emory Anderson, US, to the position of CRR Series Editor and Neil Ruane, Ireland, to the position of Disease ID leaflets Series Editor. A lack of applications for the role of TIMES Series Editor mean this position is currently empty but due to a lack of manuscripts due in 2018, a decision was made to hold another recruitment at the end of 2018 to recruit for 2019 onwards. Claudia Castelli decided to end her role as co-editor of the Plankton ID Leaflet Series. Her Antonina dos Santos recruited Lidia Yibra to replace Castelli and they have now resumed work on the plankton leaflets. A plan for this series can be found in the [Background documents](#) folder for the September 2018 SCICOM meeting.

6 Strategic Initiatives

Strategic initiatives develop and co-ordinate cross-cutting science activities that impact and interact with the science of many expert groups. They also focus on building science collaborations outside ICES member countries.

6.1 ICES/PICES Strategic Initiative on Climate Change effects on Marine Ecosystems (SICCME; Myron Peck, Germany, John Pinnegar, UK, Jacquelynne R. King (Canada, PICES), Shin-ichi Ito (Japan, PICES))

SICCME is a joint ICES - PICES strategic initiative that was established in 2011 to examine and evaluate consequences of long-term climate change and short-term climate variability on marine ecosystems across the northern hemisphere. Specifically, the objectives of the initiative are:

- (1) To advance the scientific capacity by engaging the wider PICES and ICES scientific community in focused workshops, theme/topic sessions and symposia that target key uncertainties, and to advance the predictive skill of ocean models, used to project the impacts of climate change into the future.
- (2) To effectively communicate this capability to clients, Member Countries, stakeholders and the broader scientific community.
- (3) To facilitate international efforts to design data collection networks at the spatial and temporal scales needed to monitor, assess and understand climate change impacts on marine ecosystems.
- (4) To facilitate international collaboration to design and implement comparative analysis of marine ecosystem responses to climate change through modelling and coordinated process studies.

SICCME activities are contributing to both the ICES and PICES Science Plans. This strategic initiative is co-chaired by Drs. Jackie King (Canada, PICES), Shin-ichi Ito (Japan, PICES), Myron Peck (DE, ICES) and John Pinnegar (UK, ICES).

6.1.1 SICCME activities 2018

A detailed, 3-year (Phase 3 – 2018-2020) plan was submitted to PICES and ICES at the end of March 2018. The plan included slight modifications and additions to the SICCME mission and activities in light of the success of Phase 2 (2015-2017), including identifying and aligning climate change research activities in regional nodes across the northern hemisphere and elsewhere.

SICCME experts have contributed to several assessments of the Intergovernmental Panel on Climate Change (IPCC), including the forthcoming report on the *“Ocean and Cryosphere in a Changing Climate”*. This activity will continue in 2019-2020 in preparation for the 6th Assessment Report (AR6) due to be published by the IPCC in 2021. SICCME members have so far contributed significantly to four major conferences on *“The effects of climate change on the world’s oceans”* (in Gijón, Spain 2008; Yeosu, Korea 2012; Santos, Brazil 2015; Washington D.C., USA, 2018).

12–16 March 2018, Olhão, Portugal. SICCME members met at the CERES Annual Meeting to review progress on future scenarios for EU fisheries as well as vulnerability assessments. CERES is coordinated by Myron Peck (Univ. Hamburg) with many SICCME participants (including John Pinnegar (Cefas); Mark Payne, (DTU). Anne Hollowed, (NOAA) attended as a member of the Research Advisory Board (RAB).

16–20 April 2018. WGIPEM Annual Meeting. The Working Group on Integrative Physical-biological and Ecosystem Modelling was held at ICES Headquarters in Copenhagen, DK. In total, 29 participants from 10 countries discussed advances in spatially-explicit biophysical modeling activities conducted in ICES areas. Myron Peck provided a presented information on the coordination of regional modelling activities by SICCME and obtained updates from regional modelling groups exploring climate impacts on marine species and communities. The meeting was chaired by Morgane Travers-Trolet (FR) and Marie Maar (DK).

4–8 June 2018. The “Fourth International Symposium on the Effects of Climate Change on the World’s Oceans” took place in Washington D.C. (USA) with the support of IOC, FAO, PICES and ICES. Jason Link, USA (ICES), Shin-Ichi Ito, Japan (PICES - SICCME), Manuel Barange (FAO), and Veronique Garcon (CNRS) were the lead conveners. SICCME was represented on the scientific steering committee including Anne Hollowed (USA), Myron Peck (DE), John Pinnegar (UK), Angelica Pena (USA), and Kirstin Holsman (USA).

9 June 2018. ICES-PICES Workshop on Political, Economic, Social, Technological, Legal and Environmental scenarios used in climate projection modelling (WKPESTLE), chaired by John Pinnegar, UK; Jörn Schmidt, DE; Alan Haynie, USA; and Tyler Eddy, CA, convened in Washington D.C., USA (immediately after the 4th International Symposium on the Effects of Climate Change on the World’s Oceans). Prior to and during this workshop, invited participants: (a) Compiled and compared future scenarios currently used by different research groups projecting the socio-ecological consequences of climate change on fisheries and aquaculture; (2) Discussed the rationale and data sources employed to establish elements of “PESTLE” scenarios for bio-economic projection; (3) debated the virtues of having a common set of scenarios and outputs to facilitate region-region and region-global comparison of social-ecological impacts of climate change on fisheries and/or aquaculture. Submitted a session proposal on “Scenarios for the Future Ocean” at the Scenarios Forum 2019 in Denver Colorado (<https://www.scenariosforum2019.com/>).

July 2018. SICCME members published two expert chapters within the FAO Fisheries and Aquaculture Technical Paper 627: “Climate change implications for fisheries and aquaculture: Synthesis of Current Knowledge, Adaptation and Mitigation Options. This 628-page book was published in early July 2018. Myron Peck (Univ. Hamburg) and John Pinnegar (Cefas) contributed Chapter 5 on ‘North Atlantic and Atlantic-Arctic Marine Fisheries’ (pages 87-111) while Kirstin Holsman (NOAA), Anne Hollowed (NOAA), Jackie King (DFO) and Shin-ichi Ito (Tokyo U) contributed Chapter 6: ‘North Pacific and Pacific-Arctic Marine Fisheries’ (pages 112 to 138).

July 2018. Third Lead Author meeting for the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, Lanzhou, China. Two SICCME members were selected to participate. Anne Hollowed was selected as a lead author Chap. 3 Polar Regions (50 pages), and Manuel Barange was selected as a Review Editor for Chap. 5 Changing ocean, marine ecosystems, and dependent communities (65 pages).

August 2018. Via the ICES press office, the industry magazine *Industrias Pesquera* contacted SICCME and requested an article on climate change for the Nor-Fishing exhibition (August Norway). Myron Peck contributed a short review of scientific efforts made by SICCME and other groups to understand historical and project future changes in fisheries in northern Europe.

27–30 August 2018. The 2nd meeting of the ICES Working Group on Seasonal-to-Decadal Prediction of Marine Ecosystems (WGS2D) took place at ICES Headquarters in Copenhagen, Denmark. The group is chaired by Mark Payne (DK) and considers ocean predictions on timescales from seasons to decades in order to support marine resource management. The group contains 26 members from 10 countries. Capacity building in this ICES group meshes well with ongoing activities in a PICES/CLIVAR Study Group on Climate and Ecosystem Predictability (SG-CEP), and the IMBER/CLIOTOP Task Team.

24–27 September 2018. ICES Annual Science Conference (ASC), Hamburg, Germany- SICCME supported two theme sessions: Theme session D – “The Nordic seas and the Arctic – climatic variability and its impact on marine ecosystems, fisheries and policymaking”, conveners: Harald Gjøsæter (Norway), Agnes Gundersen (Norway), Heino Fock (Germany) and theme session H – “Preparing for change; challenges for fisheries governance”, conveners: Alida Bundy (Canada), Chris Cvitanovic (Australia), Annette Breckwoldt (Germany), and Prateep Nayak (Canada).

25 September 2018. ICES Annual Science Conference (ASC) - Open session, Hamburg, Germany. “Do participants at the ICES ASC know more about marine climate change issues compared with the wider

European populace?” chaired by John Pinnegar, UK; Myron Peck, DE. This explored whether ICES scientists expressed higher levels of awareness and concern about climate change than the public.

6.1.2 Planned SICCME activities from Oct 2018

28 October 2018. “Workshop W4 - Synthesizing projected climate change impacts in the north Pacific” chaired by Anne Hollowed (USA), Shin-ichi Ito (Japan), Jackie King (Canada) and Myron Peck (Germany). The workshop will provide a forum for discussions of: a) Projection outcomes under different modeling approaches; b) Opportunities for comparative studies looking at projected impacts on selected species or fisheries in different LMEs; c) How modeling teams addressed the uncertainty landscape including issues of scenario, parameter and model uncertainty; and d) The range of potential harvest strategies selected and their performance.

28 October 2018. SICCME business meeting. During this event, the vision of the group through 2020 will be reviewed and updated including contributions to AR6 and preliminary, longer-term planning for contributions to AR7.

26–29 November 2018. SICCME co-chairs John Pinnegar (Cefas) and Myron Peck (Univ. Hamburg) will take part in a week-long, international workshop on Global synthesis of climate impacts on fish distribution and growth held at the University of Aberdeen and co-chaired by Tara Marshall (Univ. Aberdeen) and Paul Spencer (NOAA).

21–25 January 2019. IPCC WG II - AR6 First Lead Author Meeting. (Durban, South Africa). Will be attended by John Pinnegar (lead author – Small Islands chapter); Kirstin Holsman (lead author – North America chapter); Shin-ichi Ito and Mette Skern-Mauritzen (lead author – ‘Ocean and coastal ecosystems and their services’ chapter).

11–13 March 2019. Scenarios Forum 2019 (<https://www.scenariosforum2019.com/>). Session on “Scenarios for the Future Ocean”, co-conveners: Tyler Eddy (University of South Carolina), Jörn Schmidt (University of Kiel), Alan Haynie (NOAA), John Pinnegar (CEFAS). The Scenarios Forum is open to the diverse set of communities using and developing scenarios to carry out research and policy analysis related to climate change and sustainability.

11–15 March 2019. CERES project meeting will take place in Bordum, Turkey to discuss bio-economic projections of climate impacts on European marine fisheries. CERES is coordinated by Myron Peck (Univ. Hamburg) with many SICCME participants (including John Pinnegar (Cefas); Mark Payne, (DTU). Anne Hollowed, (NOAA) and William Cheung (Univ. British Columbia) are members of the Research Advisory Board (RAB).

14–19 July. IPCC WG II - AR6 2nd Lead Author Meeting. (Kathmandu, Nepal). Will be attended by John Pinnegar (lead author – Small Islands chapter); Kirstin Holsman (lead author – North America chapter); Shin-ichi Ito and Mette Skern-Mauritzen (lead author – ‘Ocean and coastal ecosystems and their services’ chapter).

September 2019. SICCME was consulted by proposed conveners of several theme sessions to be submitted for consideration for the 2019 ICES Annual Science Conference. These include i) Friedland, Smoliński and Frelat: “Advances in habitat models to inform ecosystem-based management: From theory to practice”, ii) Elliott, Dankel *et al.* “Stakeholder involvement and social aspects of climate change adaptation in fisheries and aquaculture”, and iii) Kerr, Tommasi, Howell, “Management Strategies for Fisheries in a Changing Ocean”.

6.2 Strategic Initiative on the Human Dimension (SIHD; Jörn Schmidt, Germany, Eva-Lotta Sundblad, Sweden, Alan Haynie, USA)

6.2.1 SIHD activity

A recognition of the need to encourage the participation of economists, other social scientists and researchers from the humanities led to the establishment of the Strategic Initiative on the Human Dimension (SIHD) in 2015. The development and extension of the SIHD scientific network continues to occur through many pathways. The network encompasses an increasing number of researchers, with now over 60 members, including a number who are engaged in several ICES expert groups.

Since the ASC 2017, the SIHD has engaged in a number of diverse activities, including:

WKSIED-BESIO. Balancing Economic, Social, and Institutional Objectives in Integrated Assessments. With the cooperation of WGMARS, a workshop was held November 2017 to clarify what economic, social, and institutional objectives of marine management are contained in our core management documents. This is an essential first step for Ecosystem Based Management. The workshop was successful, providing summary documents that can be further developed for the various sea-basins and nations in the IEA groups and directly fed into a stakeholder workshop to refine the objectives identified during WKSIED-BESIO, which were then, for example, given to WGINOSE as input for further analysis. At the WKSIED-BESIO, 3-4 national experts from both Sweden and the Netherlands analyzed country-specific objectives and compared them across the two countries. One important lesson for ICES to draw regarding social disciplines is that nations and cultures vary about the core focus of their management systems. Hence, it is important that working groups have the resources to explore these differences. As there is clearly a need to continuously develop the objective framework, a new working group that can focus on this subject has been suggested by SIHD (WGBESIO), although we have also discussed first having another regional workshop as a next step.

WGECON. Working Group on Economics: a new expert group reporting to HAPISG, will address economic issues, focusing on the development of economic metrics and the development of core economic analyses for fisheries advice and contributing economic indicators for ICES ecosystem overviews. WGECON held its first meeting in June.

WGSOCIAL. Working Group on Social Indicators: a new expert group reporting to IEASG, will focus on development of social indicators in IEA. WGSOCIAL held its first meeting in June.

Co-chairs sent an update letter to SIHD network members, in December. It has become clear that in its role as a Strategic Initiative in ICES, the SIHD together with chairs of SG, need to define how SIHD can interact most effectively with scientists, chairs, and steering groups – in a rapidly changing landscape for social science in ICES.

6.2.2 SIHD Roadmap

To promote an ongoing discussion about how ICES can become a more active and influential contributor to social and economic science, SIHD-co-chairs produced a document “the SIHD Roadmap” and opened a SIHD forum in ICES website. The roadmap contains information on planned activities for both the next two years and ideas about SIHD activities over the coming decade. The roadmap has been reviewed by SCICOM and SCICOM supported the intentions of this plan.

SIHD co-chairs have encouraged SIHD-members and SCICOM members to contribute to further discussion on how to facilitate the integration of more social and economic analyses and information into ecosystem based management.

6.2.3 SIHD sessions at Conferences

To promote the development and integration of social sciences with other marine sciences, SIHD set up several platforms for scientists to meet and present SIHD-themed research:

- (1) Jörn Schmidt and Olivier Thébaud, organized and chaired the session ‘Transdisciplinary research to assess marine socio-ecological systems’ at the ASLO/AGU/TOS Ocean Sciences Meeting 2018 in Portland. The session contained a useful set of diverse presentations including case studies of socio-ecological systems research, including examples of stakeholder participation and training of early career scientists on transdisciplinary research approaches.
- (2) At the ICES/PICES conference on the Effects of Climate Change on the World’s Oceans in June in Washington DC, the ICES/PICES workshop on Political, Economic, Social, Technological, Legal and Environmental scenarios used in climate projection modelling (WK-PESTLE) was held, organized by SICCME and SIHD co-chairs. The workshop discussed how to develop frameworks to guide scenario development as input for fisheries and ecosystem models, to feed into integrated assessments of management strategies. The SIHD and other co-convenors of the workshop also developed a session for the Scenario Forum 2019 (<https://www.scenariosforum2019.com>).
- (3) Jörn Schmidt co-chaired a session with Catarina Frazao Santos from Portugal and Kathy Mills from the USA on ‘Vulnerability and adaptation of marine socio-ecological systems to climate change’.
- (4) The International Institute of Fisheries Economics and Trade (IIFET) Biennial meeting was held Seattle and co-organized by Alan Haynie. The meeting had diverse participation and session leadership from SIHD Members.
- (5) Work is underway with SIHD leadership to plan the MSEAS Symposium which will be held in 2020 in Yokohama, Japan.

7 Expert Groups

7.1 Interaction with expert groups

Both SCICOM and ACOM have continued to focus on providing stronger, more visible and more regular support for the expert groups, by providing more opportunities for expert group chairs to meet, establishing a WGCHAIRS forum, and emphasising and recognising the central role of expert groups in generating science and advice. The annual meeting of the Chairs of ICES Working Groups (WGCHAIRS) was expanded to include items of relevance to all expert group chairs in ICES and 69 people attended the January 2018 meeting. Topics covered included the development of guidelines for ICES groups, viewpoints, science highlights, roles of chairs, communications with expert groups, mentoring, development of fisheries and ecosystem overviews, science, data and advice. Several actions to better support expert group chairs were identified during discussions of these topics and have now been taken. In addition to the WGCHAIRS meeting, we hosted a lunch gathering and an introductory meeting for expert group chairs during the 2018 ASC in Hamburg. The renewed emphasis on the role of chairs in ICES has also increased day-to-day engagement, with chairs more openly identifying the support they need to fulfil their roles and more timely efforts by the steering groups, committees and ICES Secretariat to provide this support.

For 2019, a WGCHAIRS meeting is scheduled for 21-25 January. Following the suggestions from last year, the meeting will be arranged to focus on the priorities of expert groups addressing advisory terms of reference on the Monday and Tuesday and those addressing science terms of reference on the Thursday and Friday. This will allow us to address cross-cutting issues on the Wednesday and not require every chair to attend a full five-day meeting. Topics to be addressed include implementation of the strategic plan and science plan, inputs from all parts of ICES to the development of fisheries and ecosystem overviews, updates and review of the guidelines for ICES groups, best practice in data handling by expert groups, development of theme and network sessions for the ASC, authorship of expert group reports, mentoring chairs and ICES viewpoints.

7.2 Authorship of Expert Group reports

The Bureau meeting on 21 February 2018 requested that SCICOM should examine options for identifying chairs and members of Expert Groups as authors of Expert Group reports and propose a favoured option. This request was a response to an action agreed at the WGCHAIRS meeting of 23–25 January 2018.

Following a review of the options the Bureau asked SCICOM and the Secretariat to progress option D “Chairs identified as editors and all attendees as authors on cover of report, but not leading on citation, all EG reports allocated to a new ICES series with ISSN”. It was considered that this provided an effective balance between more visibly recognising the contributions of scientists to the expert group reports while retaining a clear link to ICES.

Following this decision, Celine Byrne, ICES editor, has been leading and taking the practical steps necessary to make this change, as well as developing a process that would lead to all expert group “final” reports being published in a series with an ISSN. The provisional target date for introducing this change is Jan 2019.

The justifications for identifying authors are to respond to a request from the ICES network, to provide greater motivation to attend and chair expert groups by providing added visibility for contributors, and to increase the visibility of ICES science and the network in web searches and on science networking sites.

7.3 Peer-reviewed publications linked to Expert groups 2017–2018

In 2017, SCICOM made the decision to develop an ICES bibliography and to make the references listed in this bibliography available to users via the ICES website.

The purpose of the bibliography is to develop a record of all peer-reviewed publications that have been facilitated by ICES expert groups and other ICES groups. The record also supports and informs the work of the Science Impact and Publication Group (SIPG) who have a term of reference to “Monitor publication output and provide advice to SCICOM, ACOM, the ICES Secretariat and network on increasing the reach and impact of ICES publications and science, including grey literature (EG reports)”. The terms of reference for SIPG include specific actions to (a) catalogue and report on the types and quantity of published outputs facilitated by the ICES network, (b) develop and apply methods to assess the impact of all types of publications generated by the ICES network, (c) develop descriptions of the societal impact of ICES science for reporting and outreach and (d) propose approaches for increasing the impact of ICES publications and identify target audiences for communicating science, advice, data and training products. All these actions will be supported by timely and complete information on peer-reviewed publications generated.

To ensure publications linked to ICES can be captured and added to the database, SCICOM and SIPG are emphasising the importance of acknowledging ICES’ role in peer-review publications. Following SCICOM approval in 2018, guidance is now given to expert groups on acknowledging ICES facilitation of peer-review publications. The guidance is provided in Annex 8 of the “Guidelines for ICES groups”.

This guidance has successfully raised awareness of the benefits of acknowledging ICES role as a facilitator through SCICOM, the steering groups, WGCHAIRS and the WGCHAIRS Forum. The guidance is now being followed by some expert groups. SCICOM have been encouraged to maintain efforts to raise awareness of the guidance.

The guidance states:

“To allow the Science Publication and Impact Group, SCICOM, and the Secretariat to track ICES outputs and impacts it is helpful if an ICES acknowledgement is added to the acknowledgements section in papers, reports and books.

The following generic acknowledgement should be used when ICES facilitates or supports the scientific work and/ or resulting publication. The most important requirement is to name the “International Council for the Exploration of the Sea” in full as well as referring to “ICES”.

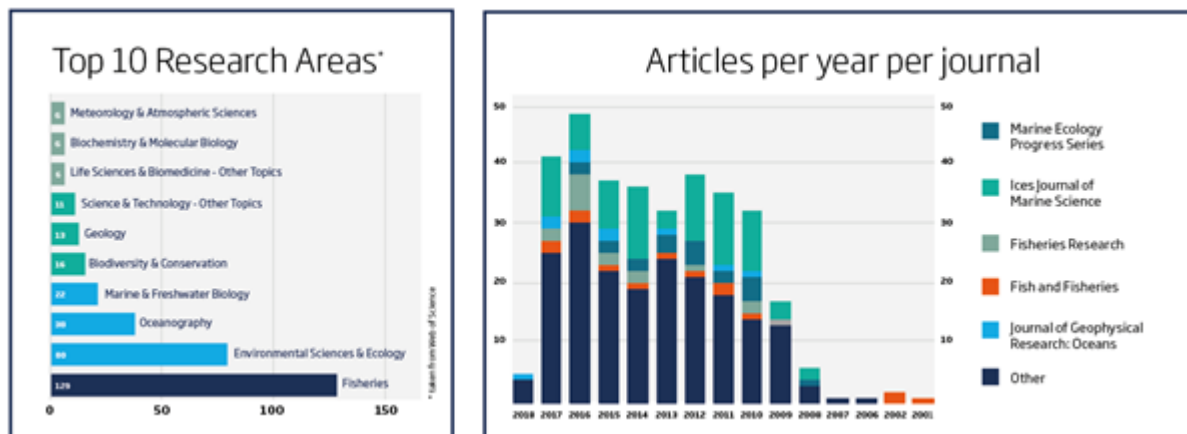
The authors thank the [XXX Group] of the International Council for the Exploration of the Sea (ICES) for facilitating this research

This generic acknowledgement should be treated as a minimum requirement when part or all of a published work is developed in an ICES Expert Group, but authors may wish to add to this acknowledgement to recognise the work of specific individuals or other services, support and data provided by ICES.

When published analyses draw extensively on the work of Expert groups that have generated and processed data it is important that their contributions to the work are also recognised. Specific citations for ICES datasets are already linked to data and data products available through the ICES data portal: <http://www.ices.dk/marine-data/dataportals/Pages/default.aspx>. These should always be used in publications, in addition to the generic acknowledgement above if the work uses ICES data and is also facilitated by an ICES Expert Group.”

The ICES Secretariat has developed an initial version of a webpage to make references to peer review papers facilitated by ICES groups available online. A screen grab of the landing page is provided below. This system is undergoing testing and review and will be further developed to add a search function and other summary graphics.

Peer-review publications facilitated by ICES in 2017 and 2018 (to date) are listed in Annex 5. Data for 2016 and 2017 are near complete. Future needs are to extend this bibliography back in time, 2010 might be an appropriate target, as well as searching for and then adding the remaining peer review publications for 2018 and 2019.



In 2017, the database identifies 41 articles that mention ICES in acknowledgements. Within these articles, more than 50% (21) mention ICES expert groups, 12% mention ICES symposia, the remaining articles mention ICES Data Centre, ICES Science Fund, projects, and ICES Advice.

In 2016, the database identifies 48 articles that mention ICES in acknowledgements. Within these articles, again more than 50% (26) mention ICES expert groups, 12% mention ICES symposia, the remaining mention ICES Data Centre, ICES Science Fund, projects, and ICES Advice.

7.4 Science highlights

Science highlights are used to draw attention to the most impactful and societally relevant science from our ICES network. Highlights serve to raise awareness of the breadth and impact of our scientific activity and expertise and to demonstrate the importance of our science for understanding marine ecosystems and securing their sustainable use. Ideally, the highlights are newsworthy because they are based on a very recent or forthcoming finding and supported with accessible images and a short biography of the scientist(s) conducting the work. Highlights are used to promote ICES science on the web and in printed and spoken communication targeted to the network and beyond.

Steering Group and Strategic Initiative Chairs have been asked to encourage their networks to provide highlights as well as actively asking for highlights if they are aware of important science being conducted in the Expert Groups they 'parent'. It is important highlights are captured in a timely way so current and forthcoming findings are still newsworthy.

A number of news stories have been published based on material provided by expert groups, especially in emerging areas like aquaculture, but the volume is small in relation to the scale of output, and the communications team are currently reviewing a submission template proposed by SCICOM as a means of capturing more material from expert groups. Such a submission template could be made available on a web link and linked from the section of the guidelines for ICES groups that describes the submission of science highlights.

Examples of highlights from the EG in each steering group are presented in the steering group reports in Section 4.

8 ICES viewpoints

Viewpoints are examples of advice that ICES could give on topics where paid advice has not previously been requested. Viewpoints are developed through the normal ICES advisory process to ensure quality control (based on a response to agreed ToR drafted by scientists and then developed into advice by an Advice Drafting Group) are relevant to a known or potential management issue of potentially high importance to managers and society.

An ideal topic for an “ICES viewpoint” is (1) relevant to a known or potential management issue of potentially high importance to managers and society, (2) not replicative of a topic for which we already give advice, (3) based on maturing science and data (ie. science not narrow, speculative or lacking peer and expert group review), (4) be linked to a point of contact in the ICES network who would be keen to engage in the process of developing advice, (5) linked to an ICES action area, such as the Arctic or ecosystem overviews, (6) based on a topic of likely interest to potential clients, and (7) based on a topic sufficiently focused that it can be succinctly and unambiguously described

Viewpoints also help scientists in the ICES network to identify opportunities to translate their work into advice and to test the preparedness of their science for application in this context. Following a call for proposals via the Steering Group Chairs, and a selection process involving the SCICOM and ACOM Chairs, Steering Group Chairs and the ICES Secretariat, three viewpoints are under development.

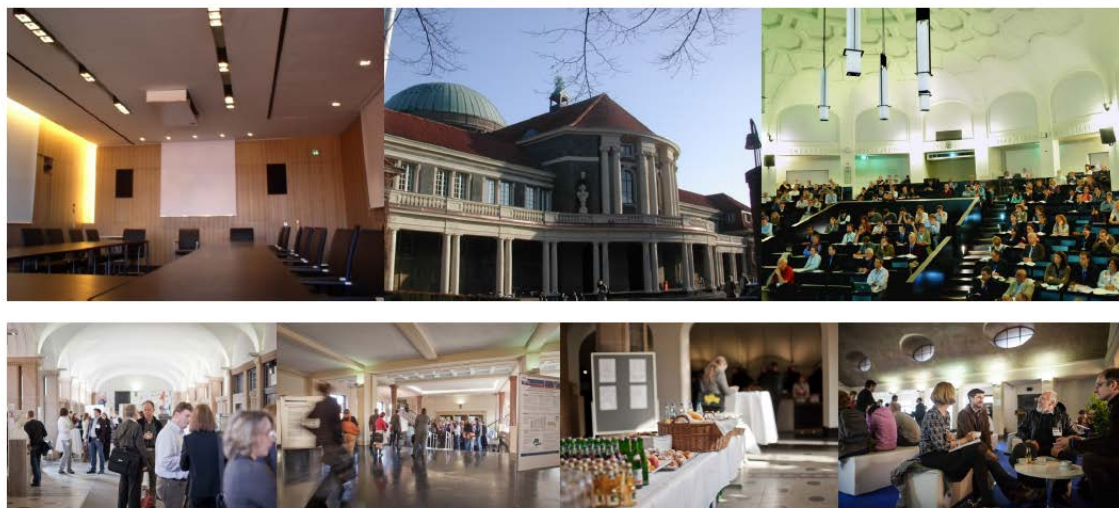
These are:

- 1) Future fish production in the Arctic. Lead: Hein Rune Skjoldal
- 2) Consequences of large fish stocks. Lead: Anna Rindorf
- 3) Vectors and management of invasive species. Lead: Bella Galil, Cynthia McKenzie with PICES and CIESM

Progress developing these viewpoints has been slower than intended but (3) is now with an Advice Drafting Group and (1) and (2) are at the early draft stage. SCICOM and ACOM intend to make another call for viewpoints in 2019. The main challenge with developing viewpoints is the pressure already on ICES experts and the advisory system, with the consequence that non-requested advice is less likely to be prioritised.

9 Annual Science Conference 2018

9.1 ASC 2018 overview



Dates and venue

The 2018 Annual Science Conference was held in Hamburg, Germany from Monday 24 September to Thursday 27 September (four days). The venue was the University of Hamburg, located in the centre of the city of Hamburg.

The conference was spread between the historical, main building of the university, and the new, modern west wing of the university building.

The theme sessions, opening ceremony, open sessions and presentations took place in the historical building, in the university lecture theatres, where the capacity of the rooms varied from 80–620 persons capacity. The largest lecture theatre, Hall A, (620 capacity), was only used for the opening ceremony.

There were four lecture theatres to facilitate the 18 theme sessions, and two plenaries each with a capacity of 80–360 persons.

The poster exhibit and poster session took place in the marquee, located behind the university.

Opening and Keynote speakers:

The opening of the conference was held on Monday morning, facilitated by ICES General Secretary Anne Christine Brusendorff and President, Cornelius Hammer. ICES were welcomed to Hamburg by the Federal Minister of Food and Agriculture, Mrs Julia Klöckner.

The Outstanding Achievement Award was awarded to Mike Armstrong, by Carl O'Brien, based on his strong and sustained contribution to ICES science and advice. This has included 24 years' involvement in the stock assessment process as chair, reviewer, and participant in multiple working groups.

The opening session was followed immediately by a keynote talk on regime shifts by Christian Möllmann and Martin Quaas from the universities of Hamburg and Kiel. Approaching the topic from both ecological and economic perspectives, they described how regime shifts (large, abrupt and persistent changes in a system) affected marine ecosystems and the fisheries that depend on them.

The second keynote was held on the Tuesday morning, on unexpected outcomes and unpredictable managers, fishers, and scientists by Ingrid van Putten, CSIRO Oceans and Atmosphere. She provided

examples of the ways in which poor understanding of human behaviour can lead to management actions with unintended and unwanted consequences – often driven by counterproductive incentives. She went on to identify solutions that improve our capacity to anticipate and pre-empt these consequences, providing policy-makers with tools to develop more effective management systems.

The third keynote was held on Thursday afternoon, on understanding deep-sea Atlantic ecosystems at ocean basin scale, by J Murray Roberts, University of Edinburgh. He highlighted advances in our understanding of deep-sea Atlantic ecosystems and the importance of transatlantic alliances in understanding ecosystem processes and connectivity at the basin-wide scales needed to support conservation of biodiversity in areas beyond national jurisdiction.

Poster session

The poster session was held on Tuesday evening 25 September, in the marquee. It was very well attended, and the space was very suitable and fitting for the large event.

Travel funds

10,000 DKK travel funds were allocated to 16 early career scientists. First-time participation at the ASC was especially encouraged.

Early Career Scientists (ECS)

As well as the travel funds, we also offered a range of activities aimed at ECS participants, including a fully subscribed breakfast workshop about how to get involved in the ICES community, pop-up scientist sessions, every lunchtime, with Q&A with invited speakers, as well as the popular mentor programme. In total 177 early career scientists attended the conference.

Conference programme and folder

The conference programme was made available online in May. The printed version of the conference programme was available as a pocket sized folder. There was no designated mobile phone app, due to budget constraints.

Registration

The registration system opened in March. The conference fees were at the increased rate, as per the SCICOM decision of 2015. Fees did not include lunch, but they did include a HVV transport pass, for public transport throughout the city. In total there were 654 registrations for the conference.

Abstracts

Following the SCICOM decision of 2015, the submission of extended abstracts was not requested. However, authors, if required by their institute, could submit an extended abstract or full paper.

The abstracts were made available online as PDF files, and could be viewed by attendees when they clicked on the titles in the timetables. The abstracts will all go online as part of the CM document collection.

Poster authors were asked to submit their posters electronically in August, for inclusion in the abstract collection and the subsequent CM document collection.

There were five open sessions (one planned session was cancelled due to lack of submissions) and eighteen theme sessions.

9.2 Theme Session reports

Theme Session reports are linked to the titles listed below:

- 9.2.1 Theme session A: Mesopelagic ecosystems: fish and invertebrate population biomass and bio-diversity, and role in carbon flux
- 9.2.2 Theme session B: Modernizing fisheries stock assessment and monitoring with genetic methods
- 9.2.3 Theme session C: Assessing and analysing marine spatial planning - knowledge - indicators - visions
- 9.2.4 [Theme session D: The Nordic seas and the Arctic – climatic variability and its impact on marine ecosystems, fisheries and policymaking](#)
- 9.2.5 [Theme session E: Cumulative effects assessment in the marine realm: approaches, examples and future needs](#)
- 9.2.6 Theme session F: Bottom-up approaches: the contribution of marine benthos to management, conservation and monitoring, taking stock and setting research direction
- 9.2.7 [Theme session G: Ocean basin-scale research and management: challenges and opportunities](#)
- 9.2.8 Theme session H: Preparing for change; challenges for fisheries governance
- 9.2.9 Theme session I: Tipping points complex nature and implications to marine socio-ecological systems management (co-sponsored by PICES)
- 9.2.10 [Theme session J: Survey data products for stock and ecosystem assessments: Challenges and future directions](#)
- 9.2.11 Theme session K: How are we managing? Developing new management tools for commercially exploited sharks and rays
- 9.2.12 [Theme session L: Future-oriented seafood markets: economic dimensions, ecological compatibility and social aspects of fisheries and aquacultures](#)
- 9.2.13 [Theme session M: Molecules and morphology: integrative taxonomic analysis of marine planktonic assemblages](#)
- 9.2.14 [Theme session N: Technical approaches to reduce the environmental impact of fishing](#)
- 9.2.15 [Theme session O: Working toward an ecosystem approach to north atlantic marine aquaculture](#)
- 9.2.16 Theme session P: Electronic monitoring and movement analysis in fisheries: applications of emerging science
- 9.2.17 Theme session Q: Sustainability thresholds and ecosystem functioning: the selection, calculation, and use of reference points in fishery management (co-sponsored by PICES)
- 9.2.18 Theme session R: Towards a better understanding of human behaviour for improved fisheries science and management

9.3 Open Sessions reports

Open Session reports are linked to the titles listed below:

- 9.3.1 [Methodological advances to evaluate ecosystem impacts of human activities](#)
- 9.3.2 [Data's Den: Show us your best tools to process and present data](#)
- 9.3.3 [Do you know more about climate change issues than the wider European public?](#)
- 9.3.4 [How do we best incorporate social and economic analyses in management advice?](#)
- 9.3.5 [Public-private partnerships for the exploration of the sea](#)

9.4 ASC 2019

The 2019 Annual Science Conference will be held at Svenska Mässan, in Gothenburg, Sweden, Monday 9 to Thursday 12 September 2019.

A site visit took place in July 2018, with participation of Anna Davies from ICES secretariat, and representatives from the Swedish Institute Hav och Vatten, Emma Sernland and Pernilla Johansson. A contract for the venue is currently being finalised, with the final details of room occupancy being discussed at the moment.

The conference centre is located just outside Gothenburg city centre. It is a very large conference venue, where we will have use of one floor, of one tower, out of three.

Transport to Gothenburg is easy, with a small international airport, and excellent train and bus connections from larger international airports, Copenhagen and Stockholm. The conference venue is a 15–20 minute walk from Gothenburg central train station. There are many hotels in the vicinity of the conference venue, and in the city centre, at a range of budgets.

The opening ceremony will take place in the large auditorium (capacity + 1000), which can be adapted to suit our purpose. There is a large hall for the poster exhibit, with flexibility for side events, projection onto screens/white walls, and four theme session rooms (capacity 90–120) opposite one another.

Decisions on the social events, and locations for these are still pending. ICES and the hosts are considering to include lunches in the registration fee for the conference. This will allow 60 minute lunches, thereby prioritising time for theme and network sessions.

10 Symposia

The following symposia were co-sponsored by ICES in 2018 or are in planning for future years.

ICES co-sponsored symposia held in 2018:

- '4th ICES/PICES/IOC Symposium on Climate Change and Impacts on the World's Oceans', 4–8 June, Washington D.C. (symposium report made available – September 2018 SCICOM doc 44)

ICES co-sponsored symposia to be held in 2018:

- 'Conference on "Oceans Past VII", 22–26 October, Bremerhaven, Germany
- ICES/UNECE 'Management tools and standards in support of Sustainable Development Goal 14', to be held in a working meeting format, October 2018, Reykjavik, Iceland

ICES co-sponsored symposia to be held in 2019

- 'The International Year of the Salmon Symposium' (running title, Tromso, June 2019), hosted by NASCO
- 'Challenging the scientific legacy of Johan Hjort: Is it time for a new paradigm shift in marine research? symposium', June 2019, Bergen, Norway
- 'Shellfish - Resources and Invaders of the North' symposium, November 2019, Tromso, Norway

ICES co-sponsored symposia to be held in 2020

- Symposium on 'Marine Socio-Ecological Systems - MSEAS 2020: Navigating global change in the marine environment with socioecological knowledge', Yokohama, Japan
- An international symposium on 'The threat of plastic to Arctic and SubArctic marine ecosystems', April 2020, Reykjavik, Iceland

Pending symposia requests

- The World Fisheries Congress, October 2020, Adelaide, Australia
- 7th Zooplankton Symposium, 2021 (PICES venue)
- 5th ICES/PICES/IOC Symposium on Climate Change and Impacts on the World's Oceans', Bergen, Norway, 2021
- 4th PICES/ICES Early Career Scientist Conference, 2022 (looking for an ICES venue)

Annex 1: Full list of SCICOM Expert Groups

Expert Groups under Aquaculture Steering Group

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
1	Working Group on Pathology and Diseases of Marine Organisms	WGPDMO	Ryan Carnegie, USA	2016	2018	12	9
2	Working Group on Social and Economic Dimensions of Aquaculture	WGSEDA	Gesche Krause, Germany	2018	2020	9	7
3	Working Group on Application of Genetics in Fisheries and Aquaculture	WGAGFA	Jann Martinsohn, Italy	2018	2020	23	10
4	Working Group on Scenario Planning on Aquaculture	WGSPA	Ben Halpern, USA	2018	2021		
5	Working Group on Environmental Interactions of Aquaculture	WGEIA	Terje Svåsand, Norway	2018	2020		

Expert Groups under Ecosystem Processes and Dynamics Steering Group

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
1	Working Group on Biodiversity Science	WGBIODIV	W. Nikolaus Probst, Germany and Oscar Bos, the Netherlands	2016	2018	15	7
2	Working Group on Integrated Morphological and Molecular Taxonomy	WGIMT	Naiara Rodriguez-Ezpeleta, Spain, and Elaine Fileman, UK	2017	2019	19	11
3	Benthos Ecology Working Group	BEWG	Silvana Birchenough, UK	2018	2020	25	10

	EG name	EG Acronym	EG Chair	Year start	Year end	Number at- tending (2018)	Number of countries (2018)
4	Working Group on Small Pelagic Fishes, their Ecosystems and Climate Impact	WGSPEC	Priscilla Licandro, UK, and Athanassios Tsikliras, Greece	2016	2018		
5	Working Group on Phytoplankton and Microbial Ecology	WGPME	Alexandra Kraberg, Germany, and Marie Johansen, Sweden	2016	2018	15	9
6	Working Group on Crangon fisheries and life history	WGCRAN	Josien Steenbergen, the Netherlands	2016	2018		
7	Working Group on Zooplankton Ecology	WGZE	Sophie Pitois, UK, and Lidia Yebra, Spain	2018	2020	31	15
8	Working Group on Oceanic Hydrography	WGOH	Paula Fratantoni, USA, and César González-Pola, Spain	2018	2020	14	10
9	Working Group on the Biology and Life History of Crabs	WGCRAb	Martial Laurent, France	2017	2019		
10	Working Group on Resilience and Marine Ecosystem Services	WGRMES	Sebastian Villasante, Spain, and Gonzalo Macho Rivero, Spain	2018	2020		
11	ICES IOC Working Group on Harmful Algal Bloom Dynamics	WGHABD	Eileen Bresnan, UK	2018	2020	17	10
12	Working Group on Cephalopod Biology and Life History	WGCEPH	Graham Pierce, Spain, and Jean-Paul Robin, France	2017	2019		
13	ICES/PICES Working Group on Climate Change and Biologically-driven Ocean Carbon Sequestration	WGCCBOCS	Nianzhi Jiao, China, Louis Legendre, France, and Richard Rivkin, Canada	2016	2018		
14	Working Group on Fisheries-Induced Evolution	WGEVO	Bruno Ernande, France	2016	2018	9	7

	EG name	EG Acronym	EG Chair	Year start	Year end	Number at- tending (2018)	Number of countries (2018)
15	Working Group on Operational Oceanographic Products for Fisheries and the Environment	WGOOFE	Dominique Obaton, France, and Rodney Forster, UK	2016	2018		
16	Working Group on the Science to Support Conservation, Restoration and Management of Diadromous Species	WGDIAD	Johan Dannewitz, Sweden and Dennis Ensing, UK	2018	2020		
17	ICES-PICES Workshop on Political, Economic, Social, Technological, Legal and Environmental scenarios used in climate projection modelling	WKPESTLE	John Pinnegar, UK; Jörn Schmidt, Germany; Alan Haynie, USA; and Tyler Eddy, Canada	2018	2018		
18	A workshop entitled “Towards an European observatory of the invasive calanoid copepod <i>Pseudodiaptomus marinus</i>”	WKEUROBUS	Marco Uttieri, Italy	2018	2018	29	9
19	Working Group on data poor diadromous fish	WGDAM	Lari Veneranta, Finland, and Karen Wilson, USA	2016	2018		
20	Working Group with the Aim to Develop Assessment Models and Establish Biological Reference Points for Sea Trout (<i>Anadromous Salmo trutta</i>) Populations	WGTRUTTA	Johan Höjesjö, Sweden, and Alan Walker, UK	2017	2019		
21	Working Group on Seasonal-to-Decadal Prediction of Marine Ecosystems	WGS2D	Mark Payne, Denmark	2017	2019		
22	Scallop Assessment Working Group	WGScallop	Kevin Stokesbury, USA	2016	2018		

Expert Groups under Human Activities, Pressures and Impacts Steering Group

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
1	Working Group on Marine Benthos and Renewable Energy Developments	WGMBRED	Jennifer Dannheim, Germany, and Andrew B. Gill, UK	2016	2018	15	7
2	Working Group on Marine Renewable Energy	WGMRE	Finlay Bennet, UK	2017	2019	6	5
3	Working Group for Marine Planning and Coastal Zone Management	WGMP CZM	Matthew Gubbins, UK, and Andrea Morf, Sweden	2017	2019		
4	Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem	WGEXT	Ad Stolk, The Netherlands	2017	2019	17	13
5	Working Group on Biological Effect of Contaminants	WGBEC	Bjørn Einar Grøsvik, Norway, and Ketil Hylland, Norway	2016	2018	12	7
6	Marine Chemistry Working Group	MCWG	Koen Parmentier, Belgium	2016	2018		
7	Working Group on Marine Sediments in Relation to Pollution	WGMS	Craig Robinson, UK, and Maria Belzunce, Spain	2018	2020	16	8
8	Working Group on Economics	WGECON	Hazel Curtis	2018	2020	18	11
9	Working Group on Marine Litter	WGML	Thomas Maes, UK; Francois Galigni, France; and Andy Booth, Norway	2018	2020	17	9
10	ICES Working Group on Introduction and Transfers of Marine Organisms	WGITMO	Cynthia McKenzie, Canada	2017	2019	48	22

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
11	ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors	WGBOSV	Sarah Bailey, Canada	2016	2018	46	22
12	Stock Identification Methods Working Group	SIMWG	Lisa Kerr, USA	2017	2019	9	4
13	Working Group on the value of Coastal Habitats for Exploited Species	WGVHES	Josianne Støttrup, Denmark, Rochelle Seitz, USA, and Karen van de Wolfshaar, the Netherlands	2016	2018	20	9
14	Working Group on Spatial Fisheries Data	WGSFD	Niels Hintzen, the Netherlands, and Christian von Dorrien, Germany	2016	2018	22	14
15	Working Group on Marine Habitat Mapping	WGMHM	James Strong, UK	2018	2020	8	5
16	Methods Working Group	MGWG	Arni Magnusson, ICES	2017	2019		
17	Working Group on the History of Fish and Fisheries	WGHIST	Ruth Thurstan, Australia and Emily Klein, USA	2018	2020		
18	Working Group on Multispecies Assessment Methods	WGSAM	Sarah Gaichas, USA, and Alexander Kempf, Germany	2016	2018		
19	Working Group on Methods for Estimating Discard Survival	WGMEDS	Tom Catchpole, UK, and Sebastian Uhlmann, Belgium	2017	2019	22	12
20	Working Group on Fisheries Benthic Impact and Trade-offs	WGFBIT	Tobias van Kooten, Netherlands; Ole Ritzau Eigaard, Denmark; and Gert van Hoey, Belgium	2018	2020		
21	Workshop on Vulnerabilities and Risks to Culturally Significant Areas	WKVCSA	Andreas Kannen, Germany and Kira Gee, Germany	2018	2018	10	5

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
22	Workshop on Co-existence and Synergies in Marine Spatial Planning	WKCSMP	Kira Gee, Germany, and Eirik Mikkelsen, Norway	2018	2018	32	11
23	Workshop on Integrating Historical Data into modern stock assessment	WKIHSD	Massimiliano Cardinale, Sweden, and Giuseppe Scarcella, Italy	2019	2019		

Expert Groups under Integrated Ecosystem Assessments Steering Group

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
1	Working Group on Comparative Analyses between European Atlantic and Mediterranean marine ecosystems to move towards an Ecosystem-based Approach to Fisheries	WGCOMEDA	Marta Coll, Spain, Manuel Hidalgo, Spain, Hilmar Hinz, Spain and Christian Möllmann, Germany	2017	2019	12	6
2	Working Group on Ecosystem Assessment of Western European Shelf Seas	WGEAWESS	Steven Beggs, UK and Eider Andon-egi, Spain	2017	2019	20	5
3	ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea	WGIAB	Matilda Valman (HELCOM), Sweden, Laurene Pécuchet, Denmark, Saskia Otto, Germany and Martin Lindegren, Denmark	2016	2018	25	6
4	Working Group on the Integrated Assessments of the Barents Sea	WGIBAR	Elena Eriksen, Norway and Anatoly Filin, Russia	2017	2019	21	2

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
5	ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean	WGICA	John Bengtson (ICES), USA, Sei-Ichi Saitoh (PICES), Japan, and Hein Rune Skjoldal (PAME), Norway	2016	2018	17	6
6	Working Group on Integrating Ecological and Economic Models	WGIMM	Jörn Schmidt, Germany, J. Rasmus Nielsen, Denmark, and Eric Thunberg, USA	2015	?	NA	NA
7	Working Group on the Integrated Assessments of the Norwegian Sea	WGINOR	J. Óskarsson, Iceland, and Per Arneberg, Norway	2016	2018		
8	Working Group on Integrated Assessments of the North Sea	WGINOSE	Andy Kenny, UK and Erik Olsen, Norway	2017	2020	7	4
9	Working Group on Integrative, Physical-biological, and Ecosystem Modelling	WGIPEM	Morgane Travers-Trolet, France and Marie Maar, Denmark	2016	2018	29	11
10	Working Group on Large Marine Ecosystem Programme Best Practices	WGLMEBP	Hein Rune Skjoldal, Norway, and Rudolf Hermes, Thailand	2014	?	NA	NA
11	Working Group on Maritime Systems	WGMARS	Christine Röckmann, the Netherlands, Patricia M. Clay, USA	2016	2018	11	6
12	Working Group on Northwest Atlantic Regional Sea	WGNARS	Geret DePiper, USA and Robert Gregory, Canada	2017	2019	24	2
13	Working Group on SOCIAL indicators	WGSOCIAL	Lisa L. Colburn, USA, Amber Himes-Cornell, FAO, Marloes Kraan, the Netherlands	2018	2020	20	8

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
14	WKEAMA - PAME (Joint EA-EG) / ICES Workshop on the development of guidelines for Ecosystem Approach to management (EAM) in the Arctic	WKEAMA	Hein Rune Skjoldal, Norway, Libby Logerwell, USA	2018	2018	58	7
15	Workshop on operational EwE models to inform IEAs	WKEWIEA	Maria Angeles Torres, Spain, Maciej Tomczak, Sweden, Eider Andonegi, Spain	2018	2018		
16	Workshop on integrated trend analyses in support to integrated ecosystem assessment	WKINTRA	Saskia Otto, Germany, Benjamin Planque, Norway	2018	2018		
17	Workshop on methods to develop a swept-area based effort index	WKSABI	Kai Wieland, Denmark	2018	2018		
18	Workshop on translating science into advice	WKSCIENCE2ADVICE	Simon Jennings, ICES, and Eskild Kirkegaard, ICES	2018	2018		

Expert Groups under Ecosystem Observation Steering Group

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
1	International Bottom Trawl Survey Working Group	IBTSWG	Kai Wieland, Denmark & Corina Chaves, Portugal	2016	2018	18	10
2	Planning Group on Data Needs for Assessments and Advice	PGDATA	Joël Vigneau	2018	2020	14	10

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
3	Working Group on Acoustic and Egg Surveys for Sardine and Anchovy in ICES Areas VII, VIII and IX	WGACEGG	Maria Santos, Spain and Mathieu Doray, France	2017	2019		
4	Working Group on Atlantic Fish Larvae and Eggs Surveys	WGALES	Richard D.M. Nash, Norway and Maria Manuel Angelico, Portugal	2018	2020		
5	Working Group on Beam Trawl Surveys	WGBEAM	Holger Haslob, Germany	2017	2019		
6	Baltic International Fish Survey Working Group	WGBIFS	Olavi Kaljuste, Sweden	2018	2020	24	9
7	The Working Group on Biological Parameters	WGBIOP	Pierluigi Carbonara*, Italy, Cindy van Damme*, Netherlands and Julie Davies*, Denmark	2018	2020		
8	Working Group on Commercial Catches	WGCATCH	Nuno Prista, Sweden, and Ana Ribeiro Santos, United Kingdom	2017	2019		
9	Working Group 2 on North Sea Co and Plaice Egg Surveys in the North Sea	WGEGBS2	Matthias Kloppmann, Germany	2016	2018		
10	Working Group on Electrical Trawling	WGELECTRA	Adriaan Rijnsdorp, NL, Maarten Soetaert*, Belgium	2018	2020	18	6
11	Working Group on Fisheries Acoustics, Science and Technology	WGFAST	Richard O'Driscoll, NZ	2017	2019	92	16

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
12	ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB)	WGFTFB	Haraldur A. Einarsson, Iceland, and Pingguo He*, FAO	2017	2019	102	22
13	Working Group on International Deep Pelagic Ecosystem Surveys	WGIDEEPS	Kristjan Kristinsson, Iceland and Benjamin Planque, Norway	2017	2019		3
14	Working Group of International Pelagic Surveys	WGIPS	Matthias Schaber, Germany and Bram Couperus, Netherlands	2016	2018	28	9
15	Working Group on Improving use of Survey Data for Assessment and Advice	WGISDAA	Sven Kupschus, UK	2018	2020		
16	Working Group on Integrating Surveys for the Ecosystem Approach	WGISUR	Ralf van Hal, Netherlands	2018	2020		
17	Working Group on Mackerel and Horse Mackerel Egg Surveys	WGMEGS	Matthias Kloppmann, Germany and Gersom Costas, Spain	2018	2020	18	8
18	Working Group on Nephrops Surveys	WGNEPS	Kai Wieland, Denmark, Adrian Weetman, Scotland	2016	2018		
19	Working Group on Recreational Fisheries Surveys	WGRFS	Kieran Hyder, UK and Keno Ferter, Norway	2018	2020		
20	Workshop on Age Estimation Methods of Deep Water Species	WKAMDEEP2	Albert Ole Thomas, Norway, Kélig Mahé, France and Juan Gil Herrera, Spain	2018	2020		
21	Workshop on Age reading of Horse Mackerel, Mediterranean	WKARHOM3	Alba Jurado, Spain and Kélig Mahé, France	2018	2020		

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
	Horse Mackerel and Blue Jack Mackerel						
22	Workshop on Age estimation of Mackerel (Scomber scombrus)	WKARMAC2	Jens Ulleweit*, Germany and Maria Rosario Navarro*, Spain	2018	2020		
23	Workshop for Advancing Sexual Maturity Staging in Fish	WKASMSF	Maria Cristina Follesa, Italy, and Cindy van Damme, The Netherlands	2018	2018	13	7
24	The second Workshop on Optimization of Biological Sampling	WKBIOPTIM2	Ana Cláudia Fernandes*, Portugal and Maria Teresa Facchini*, Italy	2018	2018		
25	Workshop on DATRAS surveys- Bay of Biscay and Iberian Coast	WKDATR-BoB	Corina Chaves, Portugal and Vaishav Soni, ICES	2018	2018	5	3
26	Workshop on DATRAS surveys- Greater North Sea Celtic Sea	WKDATR-NSCS	David Stokes, Ireland and Vaishav Soni, ICES	2018	2018	8	
27	Workshop on evaluating survey information Celtic Sea gadoids	WKESIG	David Stokes*, Ireland	2018	2018		
28	Workshop on Egg staging, Fecundity and Atresia in Horse mackerel and Mackerel	WKFATHOM	Maria Korta, Spain, and Matthias Kloppmann, Germany	2018	2018		
29	Workshop on Mackerel biological parameter Quality Indicators	WKMACQI	Cindy van Damme, the Netherlands	2018	2017/2018	7	4
30	Workshop on Uses of Machine Learning in Marine Science	WKMLEARN	Ketil Malde*, Norway and Shaheen Syed*, Netherlands/UK	2018	2018	29	11
31	Workshop on Methods for Stakeholder Involvement in Gear Development	WKMSIGD	Jordan Feekings*, Denmark, and Daniel Valentinsson*, Sweden	2018	2018		10

	EG name	EG Acronym	EG Chair	Year start	Year end	Number attending (2018)	Number of countries (2018)
32	Workshop on Nephrops burrow counting	WKNEPS	Adrian Weetman, UK and Jennifer Doyle, Ireland	2018	2018		
33	Joint WGBYC/WGCATCH Workshop on sampling of by-catch and PET species	WKPETSAMP	Bram Couperus*, the Netherlands, and Katja Ringdahl*, Sweden	2018	2018		
34	Workshop on Technical Development to Support Fisheries Data Collection 2	WKSEATEC2	David Stokes, Ireland; Marcellus Rôdiger, Germany	2018	2018		
35	Workshop on Elasmobranchs maturity	WKSEL3	Maria Cristina Follesa, Italy and Pierluigi Cabonara, Italy	2018	2018		
36	Workshop on age validation studies of small pelagic species	WKVALPEL	Javier Rey*, Spain, Kelig Mahé*, France and Pierluigi Carbonara*, Italy	2018	2018		

Annex 2: Draft science plan

The Science Plan will guide the conduct and delivery of science in support of the vision and mission of ICES, as described in the draft Strategic Plan. The Science Plan describes the scientific priorities and goals of ICES, their rationale, how they contribute to ICES vision and mission, and the science and other tasks to be undertaken to meet them. The Science Plan will be a public document with an audience comprising the marine science community in ICES countries and beyond.

A separate implementation plan describes how the Science Plan will be implemented and how progress with implementation will be monitored and reported. It also defines how people and groups within ICES will contribute to implementation, the tasks they will undertake and how progress will be measured and reported. Collectively, the science plan and implementation plan guide the conduct and delivery of science in support of the vision and mission of ICES. The intended audience for the implementation plan are the people and groups in ICES who are involved in implementing, monitoring and reporting on implementation of the science plan, principally the members of the Science Committee and associated groups and the ICES Secretariat.

Progress with implementation of the science plan will be reviewed and reported annually to our governing body, the ICES Council. As well as guiding future implementation of the science plan, information gleaned from annual reviews will be used to shape our future marine science priorities and to ensure we are effectively meeting societal needs for impartial evidence on the state and sustainable use of our seas and oceans.

As described in our 2017 report to Council the science plan was developed through an inclusive and consultative process that drew on expertise throughout the ICES network and constituent bodies, science priorities identified by member countries and a review of national and international policy drivers and science opportunities for ICES. The science priorities and associated topics in the science plan received final review and sign-off by the Science Committee on 5 October 2018. The texts of the draft plan, but not the scientific priorities, are subject to ongoing review, with sign-off expected on the Science Committee forum after feedback from the Council meeting and finalisation of the strategic plan.

Draft Science Plan (7 Oct 2018)

Marine ecosystem and sustainability science for the 2020s and beyond

Science Plan of the International Council for the Exploration of the Sea

Who we are:

The International Council for the Exploration of the Sea (ICES) is an intergovernmental organization dedicated to advancing and shaping marine science to support sustainable use of our seas and oceans. The ICES international network comprises more than 5,000 scientists from over 690 marine institutes in 20 member countries and beyond.

ICES Vision:

To be a world-leading marine science organization, effectively meeting societal needs for impartial evidence on the state and sustainable use of our seas and oceans.

ICES Mission:

To advance and share scientific understanding of marine ecosystems and the services they provide, and to employ this knowledge to generate state-of-the-art advice on meeting conservation, management and sustainability goals.

[opening text]

Our science plan “Marine ecosystem and sustainability science for the 2020s and beyond” describes ICES scientific priorities and objectives and a pathway to achieve them. By successfully implementing our science plan we will generate ecosystem and sustainability science with a high and beneficial impact on society. Our science will advance understanding of marine ecosystems, improve assessments of the effects of human activities, improve observations of the seas and oceans and provide evidence and solutions to support conservation and management. Supporting tasks will increase the visibility and impact of this science, provide a rewarding and efficient working environment, engage new scientists, increase training and networking opportunities, and strengthen collaboration with regional and global partners. By achieving our scientific objectives and completing the supporting tasks the ICES community will create a world-leading marine science organization, effectively meeting societal needs for impartial evidence on the state and sustainable use of our seas and oceans.

This plan was developed through an inclusive and consultative process that drew on expertise throughout the ICES network and constituent bodies, science priorities identified by member countries and a review of national and international policy drivers and science opportunities for ICES. The audience for this plan is the marine science community, in ICES countries and beyond. Many people in the audience have also helped to create this plan! We hope the plan will both resonate with and support managers, industry, funding agencies, governments, and inter-governmental and non-governmental organisations committed to advancing marine science, conservation and management.

To deliver “Marine ecosystem and sustainability science for the 2020s and beyond”, the ICES community will work in seven priority areas of marine science, each with related objectives and purpose.

1. Understanding ecosystems

Advance and shape understanding of the structure, function and dynamics of marine ecosystems — to develop and vitalize marine science and underpin its applications

2. Impacts of human activities

Measure and project the effects of human activities on ecosystems and ecosystem services — to elucidate present and future states of natural and social systems

3. Observation and exploration

Monitor and explore the seas and oceans — to track changes in the environment and ecosystems and to identify resources for sustainable use and protection

4. Emerging techniques and technologies

Develop, evaluate and harness new techniques and technologies — to advance knowledge of marine systems, inform management and increase scope and efficiency of monitoring

5. Seafood production

Generate evidence and advice for management of wild-capture fisheries and aquaculture — to help sustain safe and sufficient seafood supplies

6. Conservation and management science

Develop tools, knowledge and evidence for conservation and management — to provide more and better options to help managers set and meet objectives

7. Sea and society

Evaluate contributions of the sea to livelihoods, cultural identities and recreation — to inform ecosystem status assessments, policy development and management

Supporting tasks will add to the scope, scale and impact of our scientific output in each of the seven priority areas. Across all areas of our science we will increase the visibility of, and access to, our science, data and advice and recognise, promote and use the science outputs. ICES values the disciplines, perspectives and expertise brought to our network by member country institutions, partners, clients and stakeholders. We will regularly and actively solicit their inputs to the development of our science at the Annual Science Conference, through other sponsored conferences and discipline and topic-specific workshops and meetings.

For all people engaging with ICES science we will seek to provide an efficient, collaborative, respectful and rewarding working environment, as well as the resources and infrastructure needed by ICES groups to develop and share knowledge and expertise. We will ensure expert groups have flexibility to innovate and explore new topics and encourage and support cross-cutting science activity. To secure our future as a world-class marine science organisation we will provide more and better networking and training opportunities and encourage engagement of a new and emerging generation of scientists with expert groups.

We will work closely with regional and global partners. Relationships with partners extend the reach of our science into the Mediterranean, Black Sea, Arctic, North Pacific Ocean and globally. Partnerships bring mutual benefits, by strengthening the contribution of regional expertise to larger-scale and global processes and contributing to shaping and delivering marine science and advice beyond the ICES region. We will exchange knowledge and expertise with regional and global partners through collaborative projects, networks and

training: to shape and advance marine science and advice. We will also engage with partners to meet joint scientific goals; by developing joint expert groups, co-sponsoring conferences and conference sessions and contributing to overviews and assessments of the state and uses of the marine environment.

[Box]

Science Plan outcomes

- Marine science with a high and beneficial impact on society
- Engaged and productive scientists from the natural and social sciences
- Increased visibility of, and access to, our science, data and advice
- Stronger and more dynamic links between science and advice
- A secure position as a world-class marine science organisation

Implementation

The scientific objectives and tasks in this science plan are to be accomplished in the period 2019-2024. But these accomplishments will also prepare us to address emerging scientific challenges in the late 2020s and beyond. Implementation of the plan will be assessed by measuring and reviewing outcomes. These include the impacts of our science and advice on conservation, management and sustainability goals, the extent of engagement with ICES and the uses of our science, data and advice. Progress with implementation will be reported to and reviewed by our governing body, the ICES Council. Information gleaned from their reviews will be used to shape our future marine science objectives and tasks and to ensure we are contributing effectively to the ICES mission. Responsibilities for implementation of the science plan are described in an implementation plan. The intended audience for the implementation plan is narrower than for the science plan and includes the people and groups in ICES who are involved in implementing, monitoring and reporting on delivery of the science plan.

1. Understanding ecosystems

Advance and shape understanding of the structure, function and dynamics of marine ecosystems — to develop and vitalize marine science and underpin its applications

Marine sustainability science is predicated on an underlying understanding of the structure, function and dynamics of marine ecosystems and their interactions with the physical and chemical environment. As this understanding evolves and increases, so does our capacity to report on the status of the marine environment and measure, describe and manage human interactions with the sea.

Tasks:

Assess and report on trends in ocean climate
Improve understanding of the oceanography of semi-enclosed and shelf seas and the wider north Atlantic ocean
Describe links between the physical and biological environment and their influence on production, biogeochemical cycles and other ecosystem functions, and their consequences for the stability and resilience of ecosystems and the services they provide
Describe connectivity within and among ecosystems, of many species and life stages at a range of spatial scales, and assess the ecological consequences
Develop methods to map and predict the distribution of seabed and pelagic habitats and biodiversity and their sensitivity to disturbance
Develop and apply molecular, taxonomic and other methods to describe and identify species
Describe life histories and their links to the environment and responses to environmental change, including phenotypic and genetic adaptation
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
Conduct comparative analyses of the structure, function and dynamics of ecosystems in ICES regions and beyond

2. Impacts of human activities

Measure and project the effects of human activities on ecosystems and ecosystem services — to elucidate present and future states of natural and social systems

The seas provide many benefits for people but human activities pose risks as well as providing opportunities. Pressures 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 affect ecosystems and the environment. Understanding these pressures and their impacts will provide evidence to advise on the trade-offs between benefits and risks.

Tasks:

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.
Explore how pressures on the marine environment act, independently and collectively, to modify the variety, quantity and distribution of marine life and structure, function and dynamics of food webs and marine ecosystems (including cumulative pressures and their cumulative impacts)
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.
Describe the exposure of habitats to pressures, their vulnerability and resilience, and develop and test indicators of pressure, state and function
Develop methods and models for assessing and projecting ecological impacts of diffuse pressures (climate change, pollution, litter and acidification) spanning different levels of biological organisation and at a range of time and space scales
Model the transport of pollutants, including litter, 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)
Assess and project implications of human activities for management systems and marine industries and advise on options for mitigation and adaption

3. Observation and exploration

Monitor and explore the seas and oceans — to track changes in the environment and ecosystems and to identify resources for sustainable use and protection

Both science and advice rely on observations of physical, chemical and biological properties of the environment and ecosystems. Monitoring provides essential inputs to status assessments, including fisheries and ecosystem overviews, as well as feedback on the effects of conservation and management measures. Since large areas of the marine environment have not been observed, exploration provides essential information on the distribution of biological resources for sustainable use and protection.

Tasks:

Develop and co-ordinate, integrated, quality assured and cost-effective monitoring programmes
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
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 our science and advisory needs
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 seabed habitats
Develop more effective mechanisms to ensure that monitoring and surveillance data (e.g. VMS, AIS) can be reused or reprocessed to support ICES needs
Identify, design and use opportunities for public participation in observation and exploration through citizen-science and opportunities for marine industries and other stakeholders to contribute to research design, data gathering and interpretation

4. Emerging techniques and technologies

Develop, evaluate and harness new techniques and technologies — to advance knowledge of marine systems, inform management and increase the scope and efficiency of monitoring

New techniques and technologies continue to transform our capacity to understand and monitor biota, marine ecosystems, human activities and pressures, to analyse data and to conduct assessments. Some emerging technologies may be so disruptive that they fundamentally challenge the accuracy and cost-effectiveness of existing approaches. It is essential to develop, identify and review emerging techniques and technologies and to support up-take when they advance capacity to improve the rigour, scope and impact of science and advice.

Tasks:

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
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
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 to assess their strengths and weaknesses
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 methods) as well as sensors for chemical and physical sampling
Track the emergence of new technologies in marine industries and assess how these technologies affect the interactions between those industries and the marine environment

5. Seafood production

Generate evidence and advice for management of wild-capture fisheries and aquaculture — to help sustain safe and sufficient seafood supplies

Production of seafood and associated by-products supports livelihoods and businesses and makes an important contribution to human nutrition and health. Securing a sufficient and sustainable supply of safe seafood from wild-capture fisheries and aquaculture is an ongoing challenge for society and effective development and management of these industries relies on scientific evidence.

Tasks:

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
Increase understanding of stock structures, migrations, life histories, natural mortality, climate and food web impacts on marine and diadromous species as well as multi-species interactions and the consequences of stock recovery to strengthen the inputs and evidence base for assessment and advice
Further understanding and operationalisation of ecosystem-based fishery management and MSY concepts and their application in mixed, multispecies and emerging (e.g. mesopelagic) fisheries
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
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
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
Develop aquaculture overviews to describe the distribution, ecosystem interactions, benefits and impacts of aquaculture production
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

6. Conservation and management science

Develop tools, knowledge and evidence for conservation and management — to provide more and better options to help managers set and meet objectives

Conservation and management measures are taken to meet the objectives of management bodies that are tasked to balance demands for use and protection of the sea. To guide and support effective conservation and management these bodies require evidence and advice based on current policies and management regimes, but also seek inputs on the performance of management, the status of the managed environment and information to develop future approaches and policies.

Tasks:

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.

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

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

Provide evidence to inform policy developers as they seek to set objectives and to address and reconcile use and conservation of the sea

Develop and publish integrated ecosystem assessments and ecosystem overviews to describe and report on regional status and use of the sea.

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

7. Sea and society

Evaluate contributions of the sea to livelihoods, cultural identities and recreation — to inform ecosystem status assessments, policy development and management

People and their communities, societies and cultures benefit directly from seas and oceans because people engage in aquaculture, fishing, shipping and other marine industries, or use the sea for recreation. All other humans benefit indirectly from services provided by the seas and oceans, given their role in global biogeochemical cycles and the climate system. We seek to achieve a step change in understanding and reporting of human interactions with the sea, to inform policy development, conservation and management.

Tasks:

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
Trial and improve social and economic indicators for use in fisheries and ecosystem overviews and the emerging aquaculture overviews
Investigate the social and economic risks and opportunities provided by alternate uses of the sea.
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
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
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
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

Annex 3: Implementation of the ICES science plan (draft)

Implementation plan for “Marine ecosystem and sustainability science for the 2020s and beyond”: the science plan of the International Council for the Exploration of the Sea

Introduction

This implementation plan describes how the ICES science plan “Marine ecosystem and sustainability science for the 2020s and beyond” will be implemented and how progress with implementation will be measured and reported. It also defines how people and groups within ICES will contribute to implementation and the tasks they will undertake. Collectively, the science plan and implementation plan guide the conduct and delivery of science in support of the vision and mission of ICES.

The intended audience for this implementation plan are the people and groups in ICES who are involved in implementing, monitoring and reporting on implementation of the science plan, principally the members of the Science Committee, other ICES groups referred to in this plan, and the ICES Secretariat.

Progress with implementation of the science plan will be reviewed and reported annually to our governing body, the ICES Council. As well as guiding future implementation of the science plan, information gleaned from annual reviews will be used to shape our future marine science priorities and to ensure we are effectively meeting societal needs for impartial evidence on the state and sustainable use of our seas and oceans.

Links between implementation plan and science plan

The science plan describes seven areas of marine science which will be the focus of ICES work from 2019-2024, each with related objectives and purpose. It also describes supporting tasks to add to the scope, scale and impact of our scientific output in each of the seven areas. The science elements of the plan will advance understanding of marine ecosystems, improve assessments of the effects of human activities, improve observations of the seas and oceans and provide evidence and solutions to support conservation and management. Supporting tasks will increase the visibility and impact of this science, provide a rewarding and efficient working environment, engage new scientists, increase training and networking opportunities, and strengthen collaboration with regional and global partners. By achieving our scientific objectives and completing the supporting tasks the ICES community will help to realise its vision and mission.

To meet the scientific objectives and to accomplish the tasks in this science plan, as well as to manage, monitor and report on progress with implementing the plan, this implementation plan guides the work needed to meet seven objectives.

- A. To catalyse, shape, facilitate and promote marine science which has a high and beneficial impact on society and addresses all priorities identified in the science plan
- B. To ensure expert groups have flexibility to innovate and explore new topics and encourage and support cross-cutting science activity
- C. To increase the visibility of, and access to, our science, data and advice and recognise, promote and use the science outputs from expert groups
- D. To provide an efficient, collaborative, respectful and rewarding working environment for all scientists, as well as the resources and infrastructure needed by ICES groups to develop and share knowledge and expertise
- E. To provide more and better networking and training opportunities and encourage engagement of a new and emerging generation of scientists with ICES and expert groups

F. To exchange knowledge and expertise with regional and global partners through collaborative projects, networks and training; to shape and advance marine science and advice and meet joint scientific goals

G. To monitor and report on progress towards meeting the goals of the science plan

Actions in support of these seven objectives are widely distributed throughout the ICES community. Box 1 indicates the contributing roles of different groups in the ICES system and Table 1 indicates responsibilities for specific actions. For actions to be taken by the ICES Secretariat, the actions in this table are also transposed to their joint work plan.

Assessing progress

Progress with implementation will be assessed by our governing body, the ICES Council. They will make their assessment of progress with implementation based on annual reviews of progress provided by the Science Committee. Information gleaned from these annual reviews and from innovation within the ICES network more widely will be also be used to develop our future work and marine science priorities and to ensure we are effectively advancing and shaping marine science and meeting societal needs for impartial evidence on the state and sustainable use of our seas and oceans.

Progress reports to ICES Council will summarise progress using metrics and reports described in this implementation plan (Table 1), provide reports from the steering groups and operational groups contributing to implementation and summarise activity and output from the expert group network and at the Annual Science Conference and symposia. We will also develop some impact studies, to illustrate progress with uptake of science into advice and its impacts.

The Science Committee will also continue to conduct internal reviews of marine science topics on an annual basis, to identify and shape emerging areas of science and to ensure it remains fully prepared for future science planning exercises.

[Box 1]

Groups contributing to implementation

Seven types of group, the Science Committee, the Advisory Committee and the ICES Secretariat will contribute to implementation of the science plan. Other temporary groups are also formed to develop content for conferences and symposia and to address other transient actions. Further information on these groups and their operations are provided in the “Guidelines for ICES groups” [add link]

Expert groups. Expert groups are groups of scientists who collaborate during scheduled meetings, and often intersessionally, to advance understanding of marine systems by tackling fundamental and applied scientific questions and developing analyses that underpin state-of-the-art advice on meeting conservation, management and sustainability goals. The questions they address are defined by terms of reference that are reviewed and signed off by the science and advisory committees. Reports on their work are published annually.

Steering groups. Steering groups addresses broad and enduring areas of science and advice and 'parent' a number of expert groups. They are responsible for guiding and supporting expert groups and helping to ensure their work is effectively co-ordinated, conducted and reported.

Data and Information Group. The data and information group advises on all aspects of data management, including data policy, data strategy, data quality, technical issues, and user-oriented guidance. Their work is closely coordinated with the ICES Data Centre and helps to ensure that expert groups have access to the data that is essential to their work.

Science Impact and Publication Group. The science impact and publication group coordinates and supports the publication and dissemination of research conducted under the auspices of ICES. The group is responsible for guiding, monitoring and sharing ICES publication output and increasing the reach and impact of ICES publications.

Training Group. The training group develops the structure and content of the ICES training programme and then guides and supports the provision of training.

Strategic Initiatives. Strategic initiatives develop and co-ordinate cross-cutting science that impacts and interacts with the science of many expert groups. They also focus on building science collaborations outside ICES member countries.

Science Committee. The science committee is the main scientific body in ICES and is ultimately responsible for implementing and monitoring the progress of the science plan with the support of the ICES network. Through effective planning of the work of ICES groups the science committee strives to ensure there are effective working relationships between all parties contributing to implementation of the science plan.

Advisory Committee. The advisory committee is responsible for providing scientific advice to competent authorities in support of the sustainable management of marine resources and ecosystems throughout the North Atlantic Ocean and for guiding the development of science in support of advice. The advisory committee must access and evaluate the best available science to meet client needs for impartial evidence on the state and sustainable use of our seas and oceans.

ICES Secretariat. The ICES Secretariat provides secretarial, administrative, logistical, scientific, and data handling support to the preceding groups and the ICES community in general. This facilitates effective planning of meetings, reporting and external communication. Sections covering science support, data and information, publications and communications, and advisory support will all contribute to implementation of the science plan.

[end of text box]

Table 1. Fulfilling the commitments in the ICES science plan: tasks, responsibilities, metrics of progress and targets. Metrics are shown for tasks undertaken by the Science Committee and related groups, tasks shown in red are already underway within the ICES joint work plan [but note some edits suggested for specificity/compatibility].

Objective	How	Tasks (and code)	Responsible	Metrics (targets, if quantitative)
A. To catalyse, shape, facilitate and promote marine science which has a high and beneficial impact on society and addresses all priorities identified in the science plan	Establish terms of reference (ToR) and new expert groups as appropriate: to address all science priorities identified in the science plan. Ensure effective and ongoing review of expert group activity and outputs.	A1. Work with the expert group chairs to ensure their ToR, individually and collectively, address the priorities identified in the science plan	SCICOM (lead) Steering group chairs Expert group chairs Secretariat	Proportion of science priorities mapped to ToR (100%) Successful completion of ToR from evaluation of expert group reports (100%)
		A2. Identify needs for new expert groups and rationalisation of existing groups	SCICOM (lead) Steering group chairs Expert group chairs Secretariat	Proportion science priorities mapped to ToR (100%) Expert groups with overlapping remit (0%)
		A3. Ensure that the work of expert groups is well co-ordinated to increase interaction and synergy and avoid inefficiencies and repetition of work	Steering group chairs (lead) Expert group chairs SCICOM	Interaction of expert and steering group chairs during preparation of resolutions (100% of resolutions) Overlapping and uncoordinated ToR (0%)

Objective	How	Tasks (and code)	Responsible	Metrics (targets, if quantitative)
	Strengthen our expert groups, creating stronger and more dynamic links between science and advice, attracting and engaging a wider range of scientists from the natural and social sciences and supporting and capturing innovation	A4. Effective review of expert group descriptions, ToR and expert group outputs for science content and clarity of presentation	Steering group chairs (lead) SCICOM Expert group chairs Secretariat	Review of ToR, group descriptions and reports before publication (100% reviewed)
		A5. Publish the ICES science plan in an attractive and accessible format for physical circulation at ICES events and for web viewing	Secretariat (lead) SCICOM	Plan published, circulated and on website (complete)
		A6. Opening link to science content on front page of ICES website	Secretariat (lead)	Presence of working link (complete)
		A7. Identify and promote science priorities, nationally and internationally (ICES work plan 1.1.x)	SCICOM	Number of talks and size and diversity of audiences Downloads and views of science plan Narratives defining influence of ICES science on international science agenda Uptake of science described in the science plan into ICES advice

Objective	How	Tasks (and code)	Responsible	Metrics (targets, if quantitative)
		A8. Encourage [suggest now changing this to “support”] diversification of ICES research topics by co-organizing science symposia with strategic partners (ICES work plan 1.1.x)	Secretariat (lead) SCICOM	Number and scope of symposia on topics linked to science priorities
		A9. Contact in cooperation with ICES Member Countries relevant public and non-profit institutes, academia currently not actively involved in ICES with the aim of including them in ICES community. Plan to be presented to Council based on suggestion from SCICOM and the Secretariat. Identify funding schemes in Member Countries to highlight different models of participation (especially for academia) (ICES work plan 1.1.x)	Secretariat	TBD
B. To ensure expert groups have flexibility to innovate and explore new topics and encourage and support cross-cutting science activity	Capturing and highlighting innovation by the expert groups and working quickly to review and respond to this innovation	B1. Annual review of all expert group outputs and recommendations	SCICOM (co-lead) Steering group chairs (co-lead) Secretariat	Expert group outputs reviewed annually (100%) Expert group recommendations reviewed and innovation identified and acted upon through changes and additions to terms of reference or supportive actions: annually for all expert groups (100%)

Objective	How	Tasks (and code)	Responsible	Metrics (targets, if quantitative)
		B2. Regular review of science priorities to meet current and emerging advisory needs, with distribution of highest priority work to expert group network	ACOM (lead) SCICOM	Annual review and allocation of tasks (complete)
C. To increase the visibility of, and access to, our science, data and advice and recognise, promote and use the science outputs from expert groups	Provide outlets for publishing the science catalysed by this plan, measuring its impact and sharing it via a range of media channels, within our existing network and beyond Develop services and tools to enable visualisation and easy access to data to meet the needs of users in our groups	C1. Identify authors (group members) and editors (chairs) on the cover of ICES expert group reports and state citation and DOI on cover of all expert group final reports. [and place in a series with ISSN]	Secretariat	Expert group reports published with author and citation information (100%)
		C2. Increase ICES impact through communication and publication (ICES work plan 3.7.x) [edit to the specific 'of science highlights']	Secretariat (lead) SCICOM	Number of highlights published by science priority area [can anything like downloads, altimetric etc be done on these- really have no idea of uptake]
		C3. Project ICES work in new engaging/branded/relevant formats (infographics that communicate ICES products effectively) (ICES work plan 3.7.x)	Secretariat	[can anything like downloads, altimetric, etc. be done on these- really have no idea of uptake]
		C4. Continue editing/formatting/checking, cataloguing and digitalizing of in-house publications (ICES work plan 3.8.x)	Secretariat	[need to establish specifics here, timeframes, what has priority]

Objective	How	Tasks (and code)	Responsible	Metrics (targets, if quantitative)
		C5. Roll out Digital Object Identifiers (DOI's) for data outputs and ICES publications for better citation and traceability (ICES work plan 2.4)	Secretariat	Proportion of expert groups published with DOI (100%)
		C6. Bibliographic analysis of ICES publication output and impact (ICES work plan 2.4.x)	Science impact and publication group (lead) Secretariat	ICES-linked peer review papers data-based since 2010 (100%) Annual citation analysis (completed) Searchable web interface for presentation of peer-review outputs and ICES links (completed)
		C7. Annual analyses of ICES science impact for reporting to SCICOM ASC meeting and Council October meeting (ICES work plan 2.4.x)	Science impact and publication group (lead) Secretariat	Case studies
		C8. Develop data management frameworks supporting client and network needs (ICES work plan 2.7.x) [edit to 'and implement?'] [need to get some more specificity]	Data and Information group (lead) Secretariat	TBD

Objective	How	Tasks (and code)	Responsible	Metrics (targets, if quantitative)
D. To provide an efficient, collaborative, respectful and rewarding working environment for all scientists, as well as the resources and infrastructure needed by groups to develop and share knowledge and expertise	Provide effective support and appropriate facilities for meetings.	D1. Sign-off and implement ICES code of conduct, conflict of interest policy and standard of conduct policy	ICES Council (lead) SCICOM	Code of conduct and related documents signed off, included in guidelines for ICES groups and introduced at WGCHAIRS meeting
	Institute and raise awareness of ICES codes regarding work practices and expected behaviours in expert groups.	D2. Update and make available revised "Guidance for EG Chairs" [change to "Guidelines for ICES groups"] (ICES work plan 1.2.x)	SCICOM (lead) Secretariat	SCICOM consultation, review, publication and promotion of guidelines at WGCHAIRS and on WGCHAIRS Forum (2 updates per year)
	Give effective guidance on running expert groups, support chairs with implementation and ensure all scientists in the network know how and where to get support.	D3. Secretariat to support and facilitate work of Council/Bureau/Finance Committee/ACOM/SCICOM/Steering groups and the Expert and Operational Working groups throughout the year, the arrangements of the Annual Science Conference, Symposia, and Early Career Scientist Conference, as well as the communication and dissemination about these activities.(ICES work plan 1.2.x) [This is broad and vague to track- replace?]	Secretariat	TBD
E. To provide more and better networking opportunities and encourage engagement of	Ensure that the scientific programme at the ASC and symposia provides opportunities for everyone, from students and early career scientists through	E1. Develop topical and engaging ASC programme (ICES work plan 3.1)	SCICOM (lead) Secretariat	ASC attendance and feedback

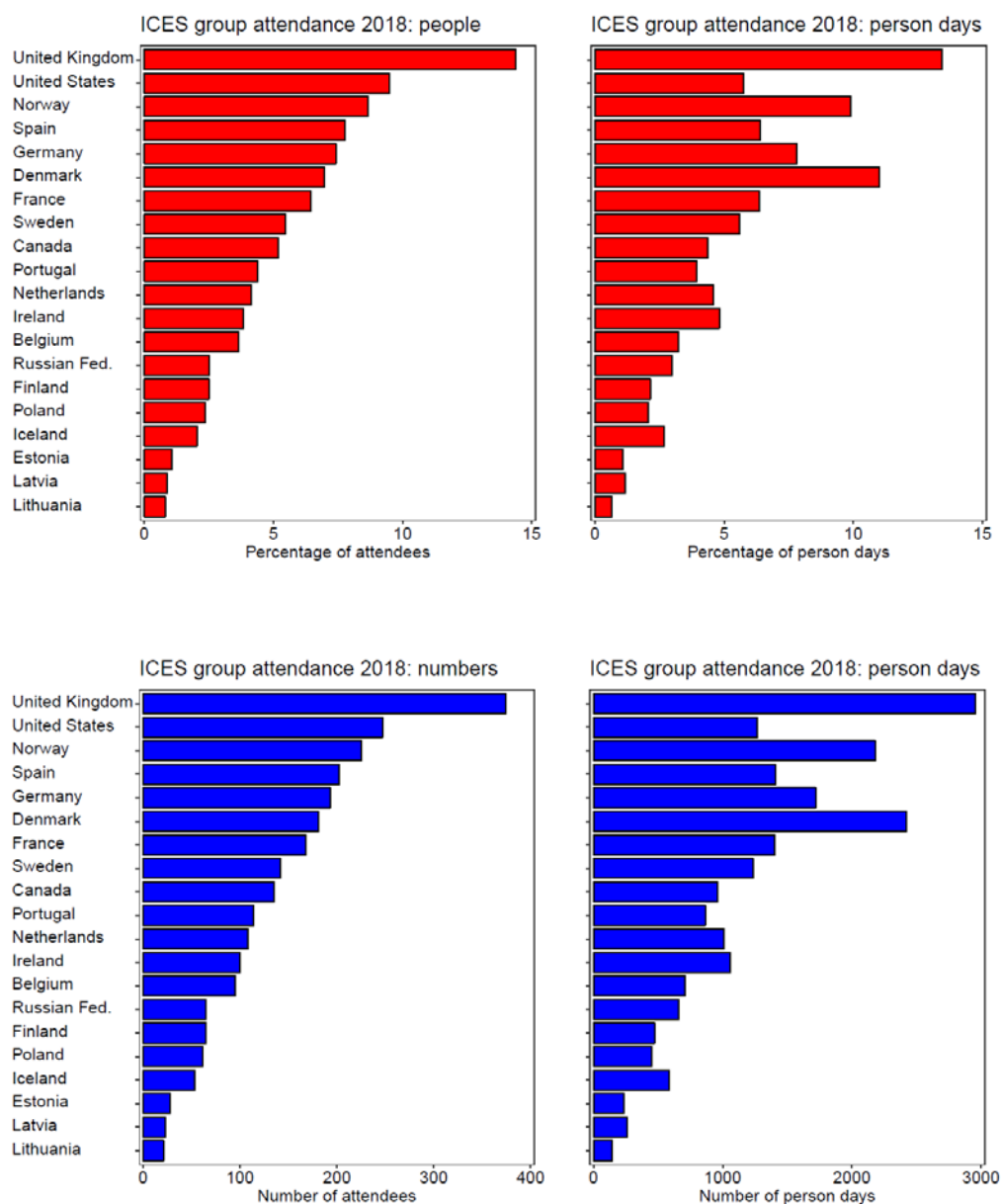
Objective	How	Tasks (and code)	Responsible	Metrics (targets, if quantitative)
a new and emerging generation of scientists with ICES and expert groups	established leaders of large research institutes, to engage and contribute.	E2. Support the Science Committee to deliver a relevant, inclusive and modern annual conference programme (ICES work plan 3.1.x)	Secretariat (lead) SCICOM	Conference attendance and feedback
	Develop and implement a training strategy	E3. Evaluate and develop a strategy for the ICES Training Programme, including assessment of training needs, online training courses, considerations of alternative training initiatives (courses arranged by Ph.D/Post.doc), and exploring options for accreditation of the training course (ICES work plan 1.3.x)	Training group (lead) Secretariat SCICOM	Completion
		E4. Implement strategy for ICES Training Programme	Secretariat (lead) Training group SCICOM	Attendee feedback [any metric of engagement of trainees in expert groups etc]
		E5. Secretariat to support and facilitate work of Council/Bureau/Finance Committee/ACOM/SCICOM/Steering groups and the Expert and Operational Working groups throughout the year, the arrangements of the Annual Science Conference, Symposia, and Early Career Scientist Conference, as well as the communication and dissemination about these activities (ICES work plan 1.2.x) [This is broad and vague to track- replace?]	Secretariat	ASC and conference attendance and feedback

Objective	How	Tasks (and code)	Responsible	Metrics (targets, if quantitative)
F. To exchange knowledge and expertise with regional and global partners through collaborative projects, networks and training: to shape and advance marine science and advice and meet joint scientific goals	Strengthening our relationships with existing strategic partners through joint missions and activities. Developing new partnerships to increase reach and impact of science and support capacity building (training issues addressed under 'training')	F1. Work with partners to identify needs and opportunities for joint expert groups conducting work of mutual and added benefit and initiate these expert groups	SCICOM (lead) Strategic initiatives Steering group chairs Secretariat	Joint expert groups with key partners established and operational and addressing science priorities (at least one with each partner)
		F2. Contact in cooperation with ICES Member Countries relevant public and non-profit institutes, academia currently not actively involved in ICES with the aim of including them in ICES community. Plan to be presented to Council based on suggestion from SCICOM and the Secretariat. Identify funding schemes in Member Countries to highlight different models of participation (especially for academia) (ICES work plan 1.1.x)	Secretariat (lead) SCICOM	New partners identified and engaged with ICES
	By developing joint expert groups, co-sponsoring conferences and conference sessions and contributing to overviews and assessments of the state and uses of the marine environment	F3. Develop and co-sponsor conferences with partners and ensure partners have a visible role at the annual science conference	Secretariat (co-lead) SCICOM (co-lead) Strategic initiatives	Number of sessions and conferences with partners (at least one with each partner during this science plan implementation period)
		F4. Develop integrated ecosystem assessments and ecosystem overviews for new regions with partners	Integrated ecosystem assessment SG (lead) Secretariat	Can we define specific regions in this target

What	How	Tasks	Responsible	Metrics (targets, if quantitative)
	Develop and co-ordinate cross cutting science activities related to climate change and the sea and society	F5. Strategic initiatives to establish and implement cross-cutting plans	Strategic initiatives (lead) Steering group chairs SCICOM	Proportion of relevant expert groups actively engaged in cross-cutting activities (100% by topic)
G. To monitor and report on progress towards meeting the goals of the science plan	Monitor implementation of the science plan and report on progress, innovation and science highlights through reports to Council, web communications and publications	G1. Regularly and actively solicit inputs from member country institutions, partners, clients and stakeholders on the development of our science	SCICOM (lead) Secretariat	Annual review of science priorities (completed and reported)
		G2. Annually report to ICES Council on implementation of the science plan and summarise activity and output from the expert group network and at the Annual Science Conference and symposia	SCICOM (lead) Secretariat	Annual report and presentation to Council (completed)
		G3. Identify and shape emerging areas of science and maintain preparedness for future science planning	SCICOM	Annual review of science priorities (completed and reported)

Annex 4: Attendance at ICES groups

The numbers and percentages of scientists attending ICES groups by nationality and the number and percentages of person days of attendance by nationality are summarised in the following figures. In total, for the year to 11 October 2018, there were 2600 scientists joining ICES groups (all types of group) accounting for just over 22000 person days of activity.



Annex 5: Peer-reviewed publications 2017–2018

These are peer reviewed papers identified before 20 September 2018 and acknowledging inputs from parts of the ICES community. Please inform the ICES Editor if you are familiar with peer review publications that you know to be facilitated by ICES groups but have not yet been included.

2018

Aps, R., Herkul, K., Kotta, J., Cormier, R., Kostamo, K., Laamanen, L., Lappalainen, J., *et al.* Marine environmental vulnerability and cumulative risk profiles to support ecosystem-based adaptive maritime spatial planning. *ICES Journal of Marine Science*, <https://doi.org/10.1093/icesjms/fsy1>. Link: ICES Working Group for Marine Planning and Coastal Zone Management (WGMPCZM)

Ciavatta S., Brewin R. J. W., Skákala J., Polimene L., de Mora L., Artioli Y., and Allen J. I. 2018. Assimilation of Ocean-Color Plankton Functional Types to Improve Marine Ecosystem Simulations. *Journal of Geophysical Research: Oceans*, 123: 834-854. <https://doi.org/10.1002/2017JC013490>. Link: ICES Data Centre (the in situ data for validation were downloaded from the ICES database <http://ices.dk/marine-data>)

Lee, S., Hofmeister, R., and Hense, I. 2018. The role of life cycle processes on phytoplankton spring bloom composition: a modelling study applied to the Gulf of Finland. *Journal of Marine Systems*, 178: 75-85. <https://doi.org/10.1016/j.jmarsys.2017.10.010>. Link: ICES Data Centre

Maar, M., Butenschön, M., Daewel, U., Eggert, A., Fan, W., Hjøllø, S. S., Hufnagl, M. *et al.* 2018. Responses of summer phytoplankton biomass to changes in top-down forcing: Insights from comparative modelling. *Ecological Modelling*, 376: 54-67. <https://doi.org/10.1016/j.ecolmodel.2018.03.003>. Link: ICES Working Group on Integrative, Physical-biological, and Ecosystem Modelling (WGIPEM)

Ojaveer H, Galil BS, Carlton JT, Alleway H, Gouletquer P, Lehtiniemi M, *et al.* (2018) Historical baselines in marine bioinvasions: Implications for policy and management. *PLoS ONE* 13(8): e0202383. <https://doi.org/10.1371/journal.pone.0202383>. Link: ICES Working Group on Introductions and Transfers of Marine Organisms (WGITMO)

Peck, M. A., Arvanitidis, C. Butenschön, M., Canu, D. M., Chatzinikolaou, E., Cucco, A., Domenici, P., *et al.* 2018. Projecting changes in the distribution and productivity of living marine resources: A critical review of the suite of modelling approaches used in the large European project VECTORS. *Estuarine, Coastal and Shelf Science*, 201: 40-55. <https://doi.org/10.1016/j.ecss.2016.05.019>. Link: ICES Working Group on Integrated Physical-biological and Ecosystem Modelling (WGIPEM) and ICES PICES Strategic Initiative on Climate Change Impacts on Marine Ecosystems (SICCMIE)

Rey, A., Basurko, O. C., and Rodríguez-Ezpeleta, N. 2018. The challenges and promises of genetic approaches for ballast water management. *Journal of Sea Research*, 133: 134-145. <https://doi.org/10.1016/j.seares.2017.06.001>. Link: ICES Working Group on Ballast and Other Ship Vectors (WGBOSV) and ICES Working Group on Introduction and Transfers of Marine Organisms (WGITMO)

2017

Ahmed, N., Bunting, S. W., Glaser, M., Flaherty, M. S. and Diana, J. S. 2017. Can greening of aquaculture sequester blue carbon? *Ambio*, 46: 468-477. <https://doi.org/10.1007/s13280-016-0849-7>. Link: ICES PICES IOC 3rd International

Symposium on the Effects of Climate Change on the World's Oceans, Santos, Brazil during 23–27 March 2015

Alonso-Fernandez, A. Otero, J., Banon, R., Campelos, J. M., Santos, J. and Mucientes, G. 2017. Sex ratio variation in an exploited population of common octopus: ontogenic shifts and spatio-temporal dynamics. *Hydrobiologia*, 794: 1-16. <https://doi.org/10.1007/s10750-016-3065-3>. Link: ICES Science Fund 2014

Ansong, J., Gissi, E., and Calado, H. 2017. An approach to ecosystem-based management in maritime spatial planning process. *Ocean & Coastal Management*, 141: 65-81. <https://doi.org/10.1016/j.ocecoaman.2017.03.005>. Link: Working Group for Marine Planning and Coastal Zone Management (WGMPCZM)

Ballesteros, M., Chapela, R., Ramírez-Monsalve, P., Raakjaer, J., Hegland, T. J., Nielsen, K. N., *et al.* 2017. Do not shoot the messenger: ICES advice for an ecosystem approach to fisheries management in the European Union. *ICES Journal of Marine Science*, fsx181-fsx181. <https://doi.org/10.1093/icesjms/fsx181>

Berdalet, E., Kudela, R., Urban, E., Enevoldsen, H., Banas, N. S., Bresnan, E., Burford, M., *et al.* 2017. GlobalHAB A New Program to Promote International Research, Observations, and Modeling of Harmful Algal Blooms in Aquatic Systems. *Oceanography*, 30: 70-81. <https://doi.org/10.5670/oceanog.2017.111> Link: ICES-IOC Working Group on Harmful Algal Bloom Dynamics (WGHABD)

Da-Rocha, J. M., and Sempere, J. 2017. ITQs, Firm Dynamics and Wealth Distribution: Does Full Tradability Increase Inequality? *Environmental and Resource Economics*, 68: 249-273. <https://doi.org/10.1007/s10640-016-0017-3> Link: 2013 ICES Annual Science Conference

Deruytter D., Baert J. M., Nevejan N., De Schamphelaere K. A.C.; and Janssen, C. R. 2017. Mixture toxicity in the marine environment: Model development and evidence for synergism at environmental concentrations. *Environmental Toxicology and Chemistry*, 36: 3471-3479. <https://doi.org/10.1002/etc.3913>. Link: ICES Data Centre

Di Capua, I., Maffucci, F., Pannone, R., Mazzocchi, M. G., Biffali, E., and Amato, A. 2017. Molecular phylogeny of Oncaeidae (Copepoda) using nuclear ribosomal internal transcribed spacer (ITS rDNA). *Plos One*, 12: <https://doi.org/10.1371/journal.pone.0175662>. Link: ICES Working Group on Integrated Morphological and Molecular Taxonomy (WGIMT)

Dukhovskoy, D. S., Bourassa, M. A., Petersen, G. N., and Steffen, J. 2017. Comparison of the ocean surface vector winds from atmospheric reanalysis and scatterometer-based wind products over the Nordic Seas and the northern North Atlantic and their application for ocean modeling. *Journal of Geophysical Research-Oceans*, 122: 1943-1973. <https://doi.org/10.1002/2016JC012453>. Link: ICES dataset on Ocean Hydrography (www.ocean.ices.dk)

Fortibuoni, T., Libralato, S., Arneri, E., Giovanardi, O., Solidoro, C., and Raicevich, S. 2017. Fish and fishery historical data since the 19th century in the Adriatic Sea, Mediterranean. *Scientific Data*, 4: 170104. <https://doi.org/10.1038/sdata.2017.104>. Link: ICES Working Group on the History of Fish and Fisheries (WGHIST)

Froese, R., Demirel, N., Coro, G., Kleisner, K. M., and Winker, H. 2017. Estimating fisheries reference points from catch and resilience. *Fish and Fisheries*, 18: 506-526. <https://doi.org/10.1111/faf.12190>. Link ICES Workshop on the Development of Quanti-

tative Assessment Methodologies based on LIFE-history traits, exploitation characteristics, and other relevant parameters for data-limited stocks (WKLIFE IV and WKLIFE V)

Gaichas, S. K., Fogarty, M., Fay, G., Gamble, R., Lucey, S., and Smith, L. 2017. Combining stock, multispecies, and ecosystem level fishery objectives within an operational management procedure: simulations to start the conversation. *ICES Journal of Marine Science*, 74: 552-565. <https://doi.org/10.1093/icesjms/fsw119>. Link: ICES MYFISH Symposium "Targets and Limits for Long-Term Fisheries Management."

Gastauer, S., Scoulling, B., and Parsons, M. 2017. Estimates of variability of goldband snapper target strength and biomass in three fishing regions within the Northern Demersal Scalefish Fishery (Western Australia). *Fisheries Research*, 193: 250-262. 10.1016/j.fishres.2017.05.001. Link: ICES Working Group on Fisheries Acoustics, Science and Technology (WGFAST)

González-Irusta, J. M. and Wright, P. J. 2017. Spawning grounds of whiting (*Merlangius merlangus*). *Fisheries Research*, 195: 141-151. <https://doi.org/10.1016/j.fishres.2017.07.005>. Link: ICES 1st quarter NS IBTS

Hiddink, J. G., Jennings, S., Sciberras, M., Szostek, C. L., Hughes, K. M., Ellis, N., Rijnsdorp, A. D., *et al.* 2017. Global analysis of depletion and recovery of seabed biota after bottom trawling disturbance. *Proceedings of the National Academy of Sciences of the United States of America*, 114: 8301-8306. <https://doi.org/10.1073/pnas.1618858114> Link: ICES Workshop on guidance on how pressure maps of fishing intensity contribute to an assessment of the state of seabed habitats (WKFBI, 2016) and ICES Workshop to evaluate regional benthic pressure and impact indicator(s) from bottom fishing (WKBENTH, 2017) and ICES Workshop to evaluate tradeoffs between the impact on seafloor habitats and provisions of catch/value (WKTRADE, 2017),

Hylland, K., Burgeot, T., Martinez-Gomez, C., Lang, T., Robinson, C. D., Svavarsson, J., Thain, J. E., *et al.* J. 2017. How can we quantify impacts of contaminants in marine ecosystems? The ICON project. *Marine Environmental Research*, 124: 2-10. <https://doi.org/10.1016/j.marenvres.2015.11.006>. Link: Working Group on the Biological Effects of Contaminants (WGBEC) and ICES/OSPAR Workshop on Integrated Monitoring of Contaminants and their Effects in Coastal and Open sea Areas (WKIMON) and ICES/OSPAR Study Group on Integrated Monitoring of Contaminants and Biological Effects (SGIMC)

Hylland, K., Skei, B. B., Brunborg, G., Lang, T., Gubbins, M. J., le Goff, J., Burgeot, T. 2017. DNA damage in dab (*Limanda limanda*) and haddock (*Melanogrammus aeglefinus*) from European seas. *Marine Environmental Research*, 124: 54-60. <https://doi.org/10.1016/j.marenvres.2016.01.001>. Link: Working Group on the Biological Effects of Contaminants (WGBEC) and ICES/OSPAR Workshop on Integrated Monitoring of Contaminants and their Effects in Coastal and Open sea Areas (WKIMON) and ICES/OSPAR Study Group on Integrated Monitoring of Contaminants and Biological Effects (SGIMC)

Hylland, K., Robinson, C. D., Burgeot, T., Martinez-Gomez, C., Lang, T., Svavarsson, J., Thain, J. E., *et al.* 2017. Integrated chemical and biological assessment of contaminant impacts in selected European coastal and offshore marine areas. *Marine Environmental Research*, 124: 130-138. <https://doi.org/10.1016/j.marenvres.2016.05.014> Link: Working Group on the Biological Effects of Contaminants (WGBEC) and ICES/OSPAR Workshop on Integrated Monitoring of Contaminants and their Effects in Coastal and Open

sea Areas (WKIMON) and ICES/OSPAR Study Group on Integrated Monitoring of Contaminants and Biological Effects (SGIMC)

Jayasinghe, R., Amarasinghe, U. S., and Newton, A. 2017. Evaluation of status of commercial fish stocks in European marine subareas using mean trophic levels of fish landings and spawning stock biomass. *Ocean & Coastal Management*, 143: 154-163. <https://doi.org/10.1016/j.ocecoaman.2016.07.002>. Link: ICES advisory sheets 2014

Kerr, L. A., Hintzen, N. T., Cadrin, S. X., Clausen, L. W., Dickey-Collas, M., Goethel, D. R., Hatfield, E. M. C., *et al.* 2017. Lessons learned from practical approaches to reconcile mismatches between biological population structure and stock units of marine fish. *ICES Journal of Marine Science*, 74: 1708-1722. <https://doi.org/10.1093/icesjms/fsw188>. Link: ICES Workshop on Implications of Stock Structure (WKISS)

Lillebo, A. I., Pita, C., Rodrigues, J. G., Ramos, S., and Villasante, S. 2017. How can marine ecosystem services support the Blue Growth agenda? *Marine Policy*, 81: 132-142. <https://doi.org/10.1016/j.marpol.2017.03.008>. Link: ICES Working Group on Resilience and Marine Ecosystem Services (WGRMES)

Lowerre-Barbieri, S., DeCelles, G., Pepin, P., Catalan, I. A., Muhling, B., Erisman, B., Cadrin, S., *et al.* 2017. Reproductive resilience: a paradigm shift in understanding spawner-recruit systems in exploited marine fish. *Fish and Fisheries*, 18: 285-312. <https://doi.org/10.1111/faf.12180>. Link: ICES Workshop on the Development of Quantitative Assessment Methodologies based on Life-history traits, exploitation characteristics and other relevant parameters for the ICES Data-limited Stocks 5 (WKLIFE 2015)

Marshak, A. R., Link, J. S., Shuford, R., Monaco, M. E., Johannesen, E., Bianchi, G., Anderson, M. R., *et al.* 2017. International perceptions of an integrated, multi-sectoral, ecosystem approach to management. *ICES Journal of Marine Science*, 74: 414-420. <https://doi.org/10.1093/icesjms/fsw214>. Link: Atlantic Ocean Research Alliance AORA-CSA workshop: Making the ecosystem approach operational, ICES Workshop on Regional Seas Commissions and Integrated Ecosystem Assessment Scoping (WKRISCO),

Matteo, F., and Wood, S. N. 2017. A generalized Fellner-Schall method for smoothing parameter optimization with application to Tweedie location, scale and shape models. *Biometrics*, 73: 1071-1081. <https://doi.org/10.1111/biom.12666>. Link: ICES Data Centre (mackerel data from ICES Atlantic *Anguilla* surveys, <http://eggsandlarva.ices.dk>.)

Methling, C., Skov, P. V., and Madsen, N. 2017. Reflex impairment, physiological stress, and discard mortality of European plaice *Pleuronectes platessa* in an otter trawl fishery. *Ices Journal of Marine Science*, 74: 1660-1671. <https://doi.org/10.1093/icesjms/fsx004>. Link: ICES Workshop on methods for estimating discard survival (WKMEDS)

Ojaveer, H., Lankov, A., Teder, M., Simm, M., and Klais, R. 2017. Feeding patterns of dominating small pelagic fish in the Gulf of Riga, Baltic Sea. *Hydrobiologia*, 792: 331-344. <https://doi.org/10.1007/s10750-016-3071-5>. Link: ICES Workshop on Spatial Analyses for the Baltic Sea (WKSPATIAL)

Ojaveer, H., Olenin, S., Narscius, A., Florin, A. B., Ezhova, E., Gollasch, S., Jensen, K. R., *et al.* 2017. Dynamics of biological invasions and pathways over time: a case study of a temperate coastal sea. *Biological Invasions*, 19: 799-813. <https://doi.org/10.1007/s10530-016-1316-x> Link: ICES Working Group on Introductions and Transfers of Marine Organisms (WGITMO)

Oziel, L., Neukermans, G., Ardyna, M., Lancelot, C., Tison, J. L., Wassmann, P., Sirven, J., *et al.* 2017. Role for Atlantic inflows and sea ice loss on shifting phytoplankton

blooms in the Barents Sea. *Journal of Geophysical Research-Oceans*, 122: 5121-5139. <https://doi.org/10.1002/2016JC012582>. Link: ICES Working Group on Oceanic Hydrography (WGOH)

Ramos, J., Caetano, M., Himes-Cornell, A., dos Santos, M. N. 2017. Stakeholders' conceptualization of offshore aquaculture and small-scale fisheries interactions using a Bayesian approach. *Ocean & Coastal Management*, 138: 70-82. <https://doi.org/10.1016/j.ocecoaman.2017.01.008>. Link: ICES ASC 2014

Rindorf, A. Dichmont, C. M., Levin, P. S., Mace, P., Pascoe, S., Prellezo, R., Punt, A. E., *et al.* 2017. Food for thought: pretty good multispecies yield. *ICES Journal of Marine Science*, 74: 475-486. <https://doi.org/10.1093/icesjms/fsw071> Link: ICES/MYFISH symposium Targets and Limits for Long-term Fisheries Management 2015

Rindorf, A., Cardinale, M., Shephard, S., De Oliveira, J. A. A., Hjørleifsson, E., Kempf, A., Luzencyk, A., *et al.* 2017. Fishing for MSY: using "pretty good yield" ranges without impairing recruitment. *ICES Journal of Marine Science*, 74: 525-534. <https://doi.org/10.1093/icesjms/fsw111> Link: Joint ICES-MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3)

Rindorf, A., Mumford, J., Baranowski, P., Clausen, L. W., García, D., Hintzen, N. T., Kempf, A., *et al.* 2017. Moving beyond the MSY concept to reflect multidimensional fisheries management objectives. *Marine Policy*, 85: 33-41. <https://doi.org/10.1016/j.marpol.2017.08.012> Link: The authors thank ICES for providing invaluable assistance in the process

Samhuri, J. F., Andrews, K. S., Fay, G., Harvey, C. J., Hazen, E. L., Hennessey, S. M., Holsman, K., *et al.* 2017. Defining ecosystem thresholds for human activities and environmental pressures in the California Current. *Ecosphere*, 8: e01860-n/a. <https://doi.org/10.1002/ecs2.1860> Link: ICES Advisory Programme Professional Officer Scott Large

Sánchez-Leal, R. F., Bellanco, M. J., Fernández-Salas, L. M., García-Lafuente, J., Gasser-Rubinat, M., González-Pola, C., Hernández-Molina, F. J., *et al.* 2017. The Mediterranean Overflow in the Gulf of Cadiz: A rugged journey. *Science Advances*, 3: eaao0609. <https://doi.org/10.1126/sciadv.aao0609> Link: ICES Data Centre

Trifonova, N., Maxwell, D., Pinnegar, J., Kenny, A., and Tucker, A. 2017. Predicting ecosystem responses to changes in fisheries catch, temperature, and primary productivity with a dynamic Bayesian network model. *ICES Journal of Marine Science*, 74: 1334-1343. <https://doi.org/10.1093/icesjms/fsw231> Link: ICES North Sea Integrated Assessment Working Group (WGINOSE)

Ulrich, C., Vermard, Y., Dolder, P. J., Brunel, T., Jardim, E., Holmes, S. J., Kempf, A., *et al.* 2017. Achieving maximum sustainable yield in mixed fisheries: a management approach for the North Sea demersal fisheries. *ICES Journal of Marine Science*, 74: 566-575. <https://doi.org/10.1093/icesjms/fsw126> Link: ICES Working Group on Mixed Fisheries Advice (WGMIXFISH)

Uusi-Heikkilä, S., Savilampi, T., Leder, E., Arlinghaus, R., and Primmer, C. R. 2017. Rapid, broad-scale gene expression evolution in experimentally harvested fish populations. *Molecular Ecology*, 26: 3954-3967. <https://doi.org/10.1111/mec.14179> Link: ICES Science Fund

van der Reijden, K. J., Molenaar, P., Chen, C., Uhlmann, S. S., Goudswaard, P. C., and van Marlen, B. 2017. Survival of undersized plaice (*Pleuronectes platessa*), sole (*Solea*

solea), and dab (*Limanda limanda*) in North Sea pulse-trawl fisheries. *Ices Journal of Marine Science*, 74: 1672-1680. <https://doi.org/10.1093/icesjms/fsx019> Link: ICES Workshop on Methods for Estimating Discard Survival (WKMEDS)

Vieira, N., and Brito, C. 2017. Brazilian manatees (re)discovered: Early modern accounts reflecting the overexploitation of aquatic resources and the emergence of conservation concerns. *International Journal of Maritime History*, 29: 513-528. <https://doi.org/10.1177/0843871417713683> Link: Oceans Past V 2015

Wilding, T. A., Gill, A. B., Boon, A., Sheehan, E., Dauvin, J. C., Pezy, J. P., O'Beirn, F., *et al.* 2017. Turning off the DRIP ('Data-rich, information-poor') - rationalising monitoring with a focus on marine renewable energy developments and the benthos. *Renewable & Sustainable Energy Reviews*, 74: 848-859. <https://doi.org/10.1016/j.rser.2017.03.013> Link: ICES Working Group on Marine Benthos and Renewable Energy Developments (WGMRED)