

ANNUAL REPORT 2017



ICES
CIEM

International Council for
the Exploration of the Sea

Conseil International pour
l'Exploration de la Mer



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WELCOME

I am pleased to provide you with an insight into our activities in 2017.

ICES is a transatlantic and intergovernmental organization whose strength comes from a network of scientists and experts, supported by member countries that contribute to our work to secure the sustainable use of the seas.

Importantly, we work together with partners to link to areas of thematic and geographic importance, ensuring that our marine science is relevant globally, and is able to draw on expertise available beyond ICES member countries.

Among the highlights of
2017 was the Early
Career Scientist

An introduction from ICES General Secretary

Conference, organized jointly with the North Pacific Marine Science Organization (PICES). This event is held every five years to foster networks for young scientists and those early in their careers, and to attract new experts to our scientific networks. The topic of the symposium "Climate, Oceans and Society: Challenges & Opportunities" addressed several of the new issues that are broadening ICES work such as vulnerability of fish stocks to rising temperatures, climate change effects on fisheries, and assessments of pressures and impacts on a regional scale, from one side of the Atlantic to the other, including the Arctic.

Our flagship event, the Annual Science Conference (ASC) took place in September in Fort Lauderdale, Florida, and we were grateful for the American hospitality, as well as the extensive scientific discussions, and networking opportunities. Important outcomes from the conference this year include the establishment of new working groups that will tackle

current scientific issues related to marine litter as well as fisheries benthic impacts and trade-offs.

During 2017 we fostered our role as a provider of scientific advice to managers and kept busy responding to client requests for advice related to catch opportunities and environmental aspects. Quality assurance of ICES advice greatly depends on having access to, and an understanding of, data at a sufficient level of detail to provide robust assessments. We continue to work towards a scientific evaluation of input data and its uncertainty, as well as ensuring that our assessments are sufficiently documented and repeatable. We are investing in infrastructure to support this, including improvements to data portals for biological trawl surveys (DATRAS), acoustic surveys, and fisheries dependent information (Regional Database - RDB) as well as the continued development of repeatable assessments through the Transparent Assessment Framework (TAF).

I hope you enjoy reading this report and learning more about the work of our unique organization.



Anne Christine Brusendorff

Anne Christine Brusendorff,
ICES General Secretary

The essentials of our organization

ICES AT A GLANCE

The International Council for the Exploration of the Sea (ICES) is a global organization that develops science and advice to support the sustainable use of the oceans.

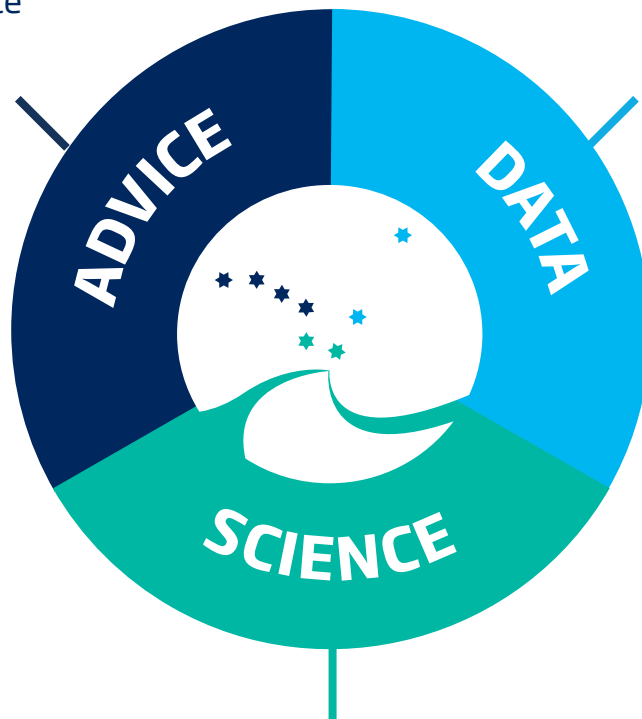
ICES is a network of more than 5,000 experts from over 700 institutes and organizations in 20 member countries and beyond. 1,500 experts participate in our activities annually.

ICES PRODUCTS

- Annual recurrent advice on 200-250 fishing opportunities
- Special requests on broader ecosystem considerations, methodological standards, and threshold values
- Ecosystem and fisheries overviews, indicator development for healthy seas, evaluation of management plans
- Identification of research needs
- Technical advice and international peer review
- Data used in science and advisory products
- Science highlights within areas of societal importance
- [Training](#)
- [Publications](#)
- [Conferences and symposia](#)

Independent, evidence-based scientific advice on environmental issues and fisheries management

Hub for fisheries and environmental data and connection to data providers and end-users



Platform for cooperation in marine science

A network of 5,000 experts from nearly 60 countries

Our work also extends into the Arctic, the Mediterranean Sea, the Black Sea, and the North Pacific Ocean

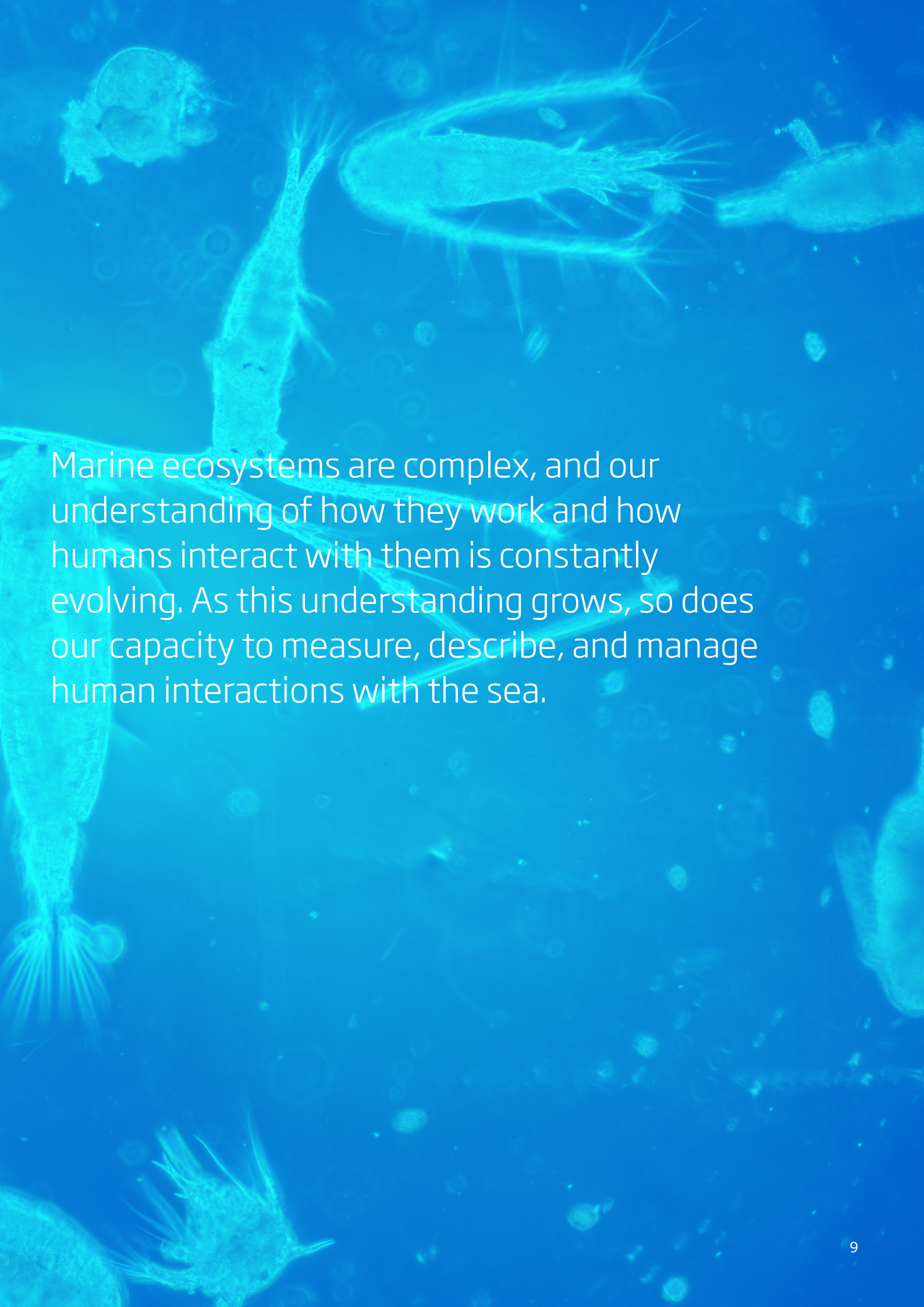


20 member countries: Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, United Kingdom, United States of America

A microscopic view of marine organisms, likely a water sample, showing various types of plankton and microorganisms. The background is a deep blue, and the organisms are illuminated, showing their intricate structures and movements. Some organisms have long, thin appendages, while others are more rounded or oval-shaped.

Understanding complexity

MARINE ECOSYSTEMS

A microscopic view of various marine organisms, including a large, elongated, segmented worm-like creature with many fine, hair-like appendages, and several smaller, more rounded organisms with similar appendages. The background is a deep blue, and the organisms are illuminated from above, creating a sense of depth and complexity.

Marine ecosystems are complex, and our understanding of how they work and how humans interact with them is constantly evolving. As this understanding grows, so does our capacity to measure, describe, and manage human interactions with the sea.

Understanding the structure, function, dynamics, and uses of marine ecosystems is an ongoing challenge. We are continuing to advance this understanding and report on ecosystems.

New **Ecosystem Overviews** for the Norwegian Sea and Icelandic Waters ecoregions were published. These were added to the [collection of overviews](#) published in 2016 for four other ecoregions. The overviews describe the respective ecosystems, the main human pressures, and how these pressures impact ecosystem components. The overviews are presented in the form of interactive online diagrams, which visualize the links between human activities, pressures, and state.

One of the smallest living ecosystem components, **zooplankton, was a new addition to the Operational Oceanographic Products and Services (OOPS)**. Available as a widget built into the interactive spatial facility map in our data portal, the service allows zooplankton abundances over the last 60 years to be viewed, mostly focusing on areas across the northeast Atlantic. The map hosts data from the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) and was prepared in collaboration with EU EMODnet Biology.

OOPs are being developed as we move towards making our ecosystem advice operational – defining and describing all steps of the process that culminate in the final advice. Through this we seek to link data to outputs, meeting the public expectations for a modern science and advisory organization and increasing the accessibility and profile of what we produce. The Ecosystem Overviews are also part of this drive.

Two Cooperative Research Reports (CRRs) on invasive species were published – [one on the sea squirt *D. vexillum*](#) and [another on invasive species in the North Atlantic and adjacent waters](#). The former aims to increase awareness of the sea squirts, with a focus on identification, natural history, current global distribution, potential impacts, and prospects for management and control where introductions occur. The latter brings together all observations of non-indigenous species reported by our [Working Group on Introductions and Transfers of Marine Organisms](#) between 2003 and 2007.

We also **released hazardous substances advice**, documenting current studies on pollutants and information concerning five groups of substances of emerging concern that are potential threats to the marine environment.

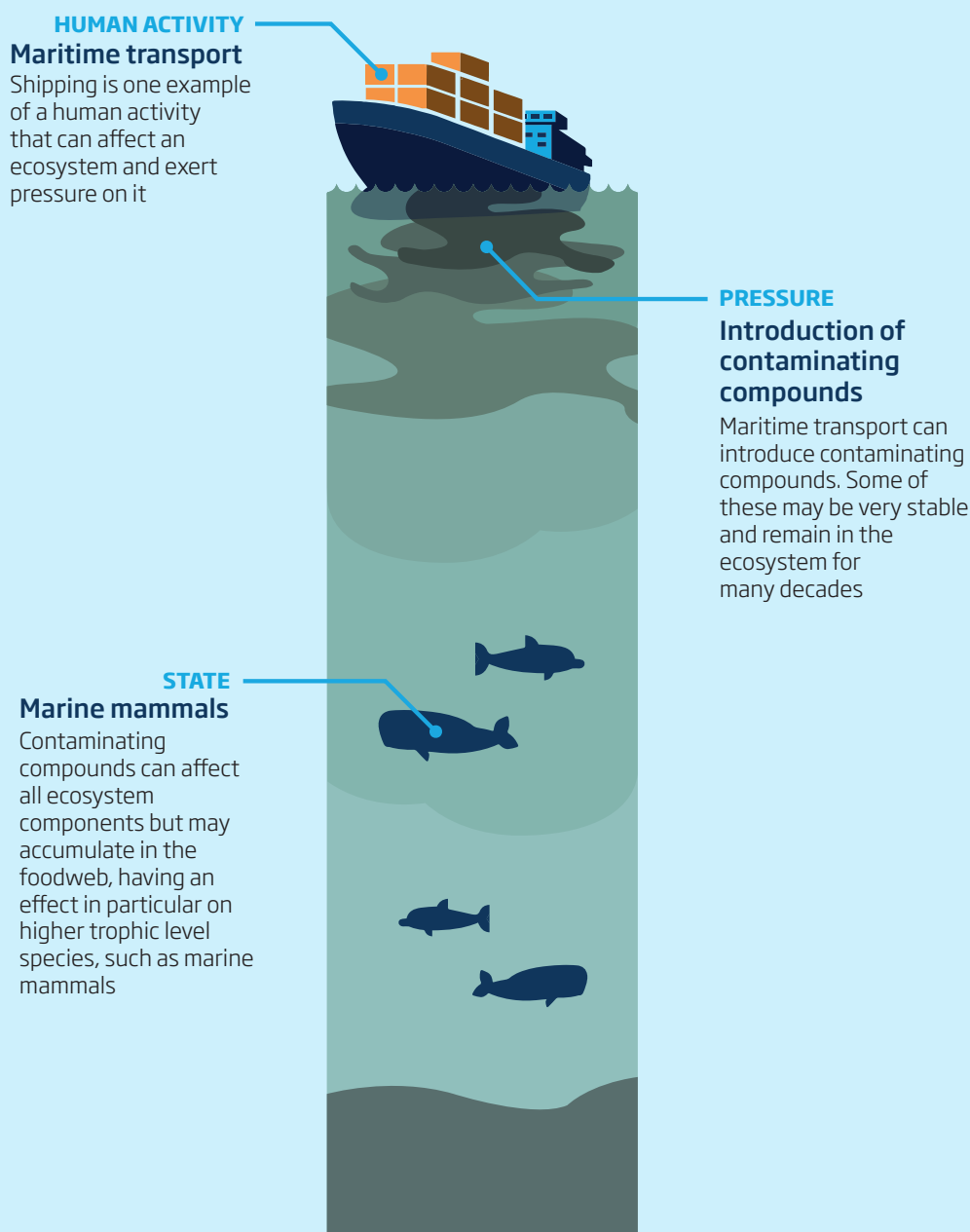
“The good thing about the Ecosystem Overviews is that having a scientific background is not necessary for understanding them, so everybody is able to get a broad overview about changes in the main human induced pressures and the ecosystem state. The overviews have also proven to be particularly useful to stakeholders, NGOs, and the general public.”

Gudmundur Thordarson, Icelandic member of ICES Advisory Committee (ACOM)

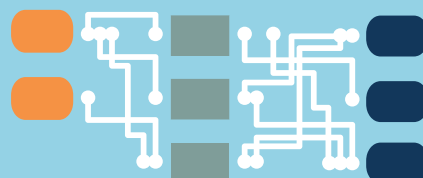
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Ecosystem Overviews

An ICES Ecosystem Overview provides a description of an ecosystem, identifies the main **human activities**, and links how the activities exert **pressure** and affect the **state** of the ecosystem components.




The Ecosystem Overviews are available on our website [and as interactive diagrams](#) which visualize the **activities**, **pressures**, and **states**.



An aerial photograph of a vast, frozen sea. The surface is covered with a dense field of ice floes, ranging from small, thin sheets to large, irregular chunks. The floes are separated by dark, open water, creating a complex, mosaic-like pattern. The lighting is soft, highlighting the textures of the ice and the calmness of the water.

Acknowledging influence

SEA AND SOCIETY



What happens in the oceans both affects and is affected by humans and their communities. Acknowledging this is important for ICES in two senses: building networks that enable cooperation and integrating social and economic sciences into our work.

Every five years, we join forces with our sister organization the North Pacific Marine Science Organization (PICES) to organize a conference for early career scientists. In 2017, the **Climate, Oceans and Society: Challenges & Opportunities** conference took place 30 May–2 June in Busan, Korea. The event drew 140 early career scientists from 30 countries to present and discuss topics such as patterns and processes in marine ecosystems, human effects on the marine environment, and climate effects on physical, chemical, and biological processes.

ICES–PICES cooperation extended to the 2017 Annual Science Conference (ASC) in Fort Lauderdale, Florida, where **two joint theme sessions were held**: one on climate change impacts on ecosystems, fisheries, and communities and one on marine bioinvasions – the latter also involving the Mediterranean Science Commission (CIESM).

The Arctic is a high-priority area for ICES. Cooperation with other organizations is

important for contributing to key areas, such as integrated observing systems and ecosystem assessments, maritime spatial planning, and environmental risk of shipping and oil and gas exploitation.

ICES was **granted observer status to the Arctic Council** at the Council’s 10th Ministerial meeting in Fairbanks, Alaska. The move builds on our existing cooperation with Arctic Council working groups, such as in the joint expert group between PICES, ICES, and PAME (the Council’s Protection of the Arctic Marine Environment group), co-chaired by Japan, Norway, and USA, which creates integrated environmental assessments for the Central Arctic Ocean.

The **socio-economic dimension formed an important part of a training course** in the fundamentals of the versatile modelling technique known as the Bayesian method. Students looked at ways of analysing different research questions, including those related to social-cultural systems.

“During the bioinvasions theme session it was clear that invasion trajectories and vectors are a common theme between ICES and PICES regions, and collaborative studies to investigate specific routes and vector risk would benefit from multi-region studies, particularly with regard to the Arctic. Non-indigenous species’ adaptability between invaded locations can be used to detect ecosystem level changes and help characterize impacts.”

*Cynthia McKenzie, Convener of Theme Session B at the 2017 ASC
and Chair of ICES Working Group on Introductions and Transfers of Marine Organisms*

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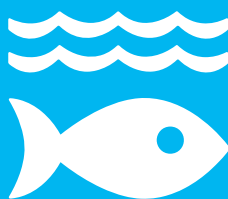
UN Sustainable Development Goals

ICES pledged two commitments to the United Nations Ocean Conference in support of Sustainable Development Goal (SDG) 14.

1 Developing the science basis to assist ecosystem-based management.

2 Enhancing marine science training and capacity building.

14 LIFE BELOW WATER




The role of the **UN Sustainable Development Goals** is to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years.

The background of the slide is a close-up photograph of a fishing net, showing the intricate mesh and several large, light-colored floats. The entire image is covered with a semi-transparent orange filter. The text is overlaid on this background.

Securing sustainability

FISHERIES AND AQUACULTURE



Scientific evidence and advice helps to secure sufficient and sustainable fish production from capture fisheries and aquaculture.

Advice **for 194 different fish and shellfish stocks, most of which was recurring advice on fishing opportunities**, was issued in 2017.

Alongside this, **24 special requests** were addressed on various issues, from recovery plan evaluation to trade-offs between seabed impact of fishing and catches and landings.

One such piece of advice was delivered in March, which found that the **distributions of 16 out of 21 species of fish analysed across the northeast Atlantic since 1985 had shifted**. Of these, eight exhibited distribution changes that crossed quota management and allocation boundaries. Environmental conditions such as sea temperature, in addition to changes in the distribution and intensity of fishing effort, were found to be strong drivers for these patterns.

Fisheries Overviews were released for the Greater North Sea and the Baltic Sea ecoregions, intended for those with an interest in fisheries management. They summarize catches over time, national fleets in operation, composition of the catches, and gears and methods used. They also highlight stock management and the current status of stocks, including information relative to maximum sustainable yield (MSY) and the precautionary approach. Ecosystem impacts, species interactions, and mixed fisheries are also described.

Aquaculture, one of our strategic areas, has received fresh impetus with the creation of **a new Aquaculture Steering Group** to guide and support expert groups.

An acoustic trawl survey data portal went live on our website, supported by the EU Horizon 2020 AtlantOS project. The portal aims at standardizing and quality controlling acoustic and biotic data collected on national acoustic trawl surveys in the northeast Atlantic and Baltic Sea, and acting as a common hub in which data from all our survey groups are available.

The portal is the result of cooperation across the whole ICES area, including work by survey groups such as those on international pelagic surveys, Baltic international fish surveys, Baltic fisheries assessments, and southern horse mackerel, anchovy, and sardine.

Also on the data front, a **catalogue containing all the historical metadata** used by the Working Group on the History of Fish and Fisheries was set up. The catalogue provides long-term fisheries data, such as those on landings and fishing effort, collated throughout the North Atlantic and beyond, together with a description and contact information for those interested in making use of the data.

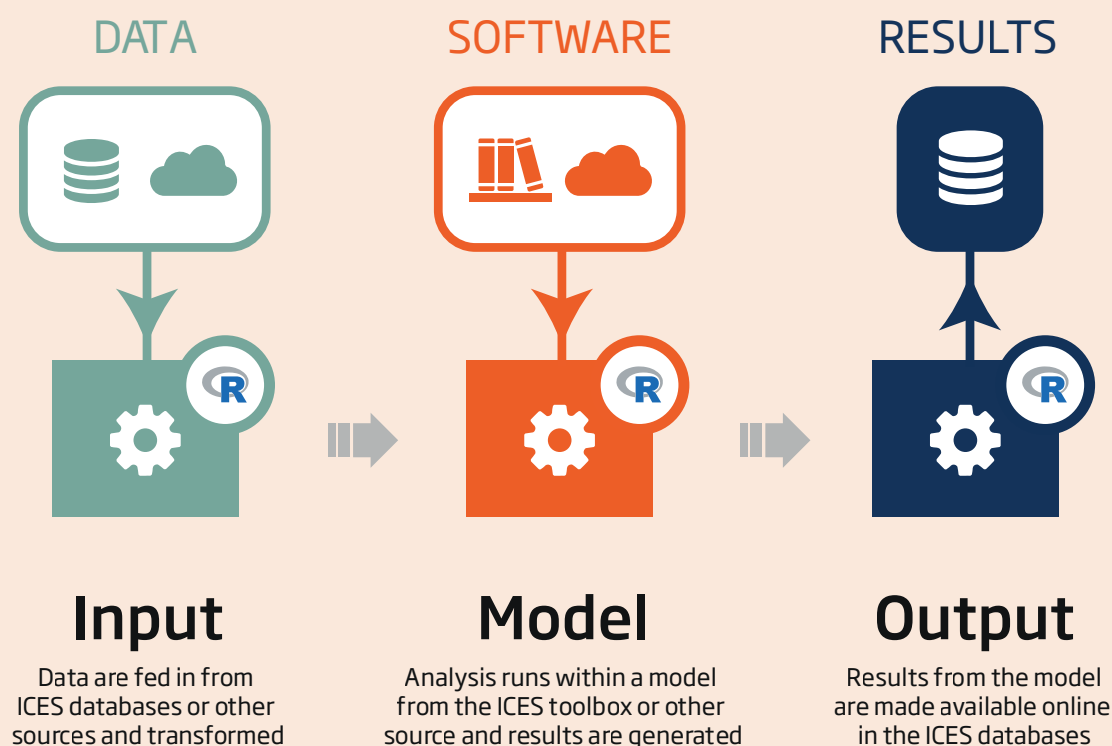
"More seafood now comes from aquaculture than wild harvest. With some notable exceptions, most ICES countries import the vast majority of their seafood from other regions and have small aquaculture industries. These countries share a strong environmental ethic, knowledge based economies, high standards of living and labour costs, comfort with technology, and robust scientific resources. The aquaculture expert groups will focus on building the scientific basis and tools needed for sustainable aquaculture production within this context."

Mike Rust, Chair of Aquaculture Steering Group

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TRANSPARENT ASSESSMENT FRAMEWORK

The Transparent Assessment Framework (TAF) is a framework to organize collected data, methods, and results used in ICES assessments, allowing for easy referencing and re-runs. This provides transparency and access to standardized data.

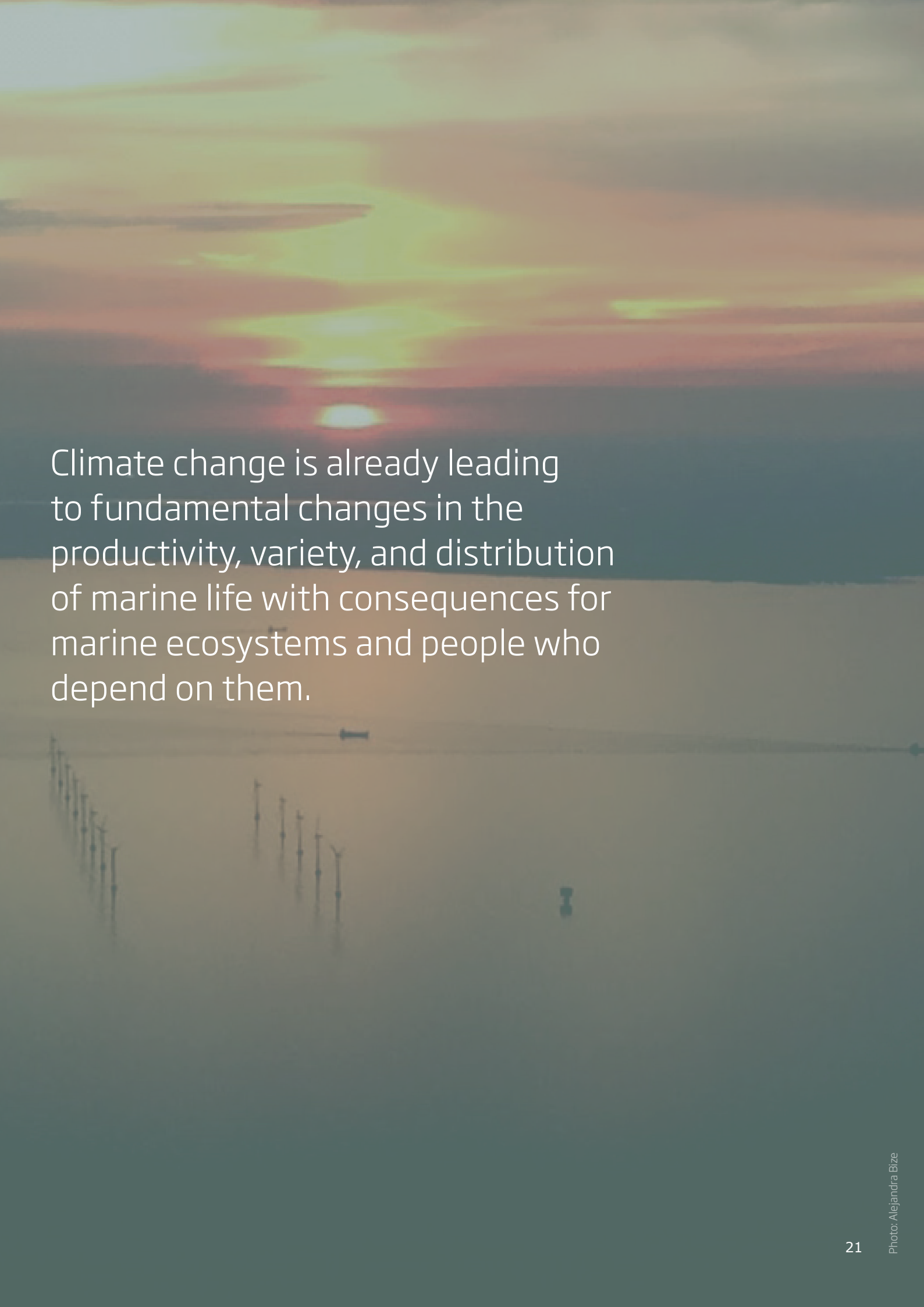


The Transparent Assessment Framework (TAF) is an online archive of final assessments for each year, for all stock categories. All data inputs and outputs are linked to existing or upcoming ICES data services.



Change and impact

OCEAN CLIMATE

A photograph of a sunset over a body of water. The sun is low on the horizon, creating a bright orange and yellow glow that spreads across the sky. The water is calm, reflecting the colors of the sky. In the foreground, several wind turbines are visible, their silhouettes standing against the lighter water. The overall mood is serene and contemplative.

Climate change is already leading to fundamental changes in the productivity, variety, and distribution of marine life with consequences for marine ecosystems and people who depend on them.

ICES is working to better understand and advise on climate impacts on marine systems, from physical processes to consequences for fishing and marine industries.

ICES-PICES Strategic Initiative on Climate Change Impacts on Marine Ecosystems (SICCME) continued its efforts across the northern hemisphere to understand, estimate, and predict the impacts of climate change on marine ecosystems. **The Workshop on Regional Climate Change Vulnerability Assessment for the Large Marine Ecosystem in the Northern Hemisphere**, organized by SICCME, compared different climate vulnerability assessment approaches for fisheries and aquaculture and discussed opportunities for comparative studies looking at the relative vulnerability of species in a number of Large Marine Ecosystems (LMEs).

One key piece of advice released in 2017 was on the **impacts of climate change on Atlantic salmon stock dynamics**. Issued in response to a request from the North Atlantic Salmon Conservation

Organization (NASCO), the advice found that climate change has the potential to impact biological and environmental factors such as distribution, productivity, migration patterns, genetic variation, and prey competition.

The Working Group on Seasonal-to-Decadal Prediction of Marine Ecosystems held its inaugural meeting. The group takes up the challenge of translating forecasts of the physical environment to the biological environment. This will involve identifying biological variables such as spatial distributions and growth, and using them to create ecological forecast products that can be used in advice.

ICES Report on Ocean Climate (IROC) was published, providing information on the state of the North Atlantic and Nordic seas. The IROC presents measurements of temperature, salinity, sea level pressure, air temperature, and ice cover from the ocean surface, its upper thousand metres, and its depths.

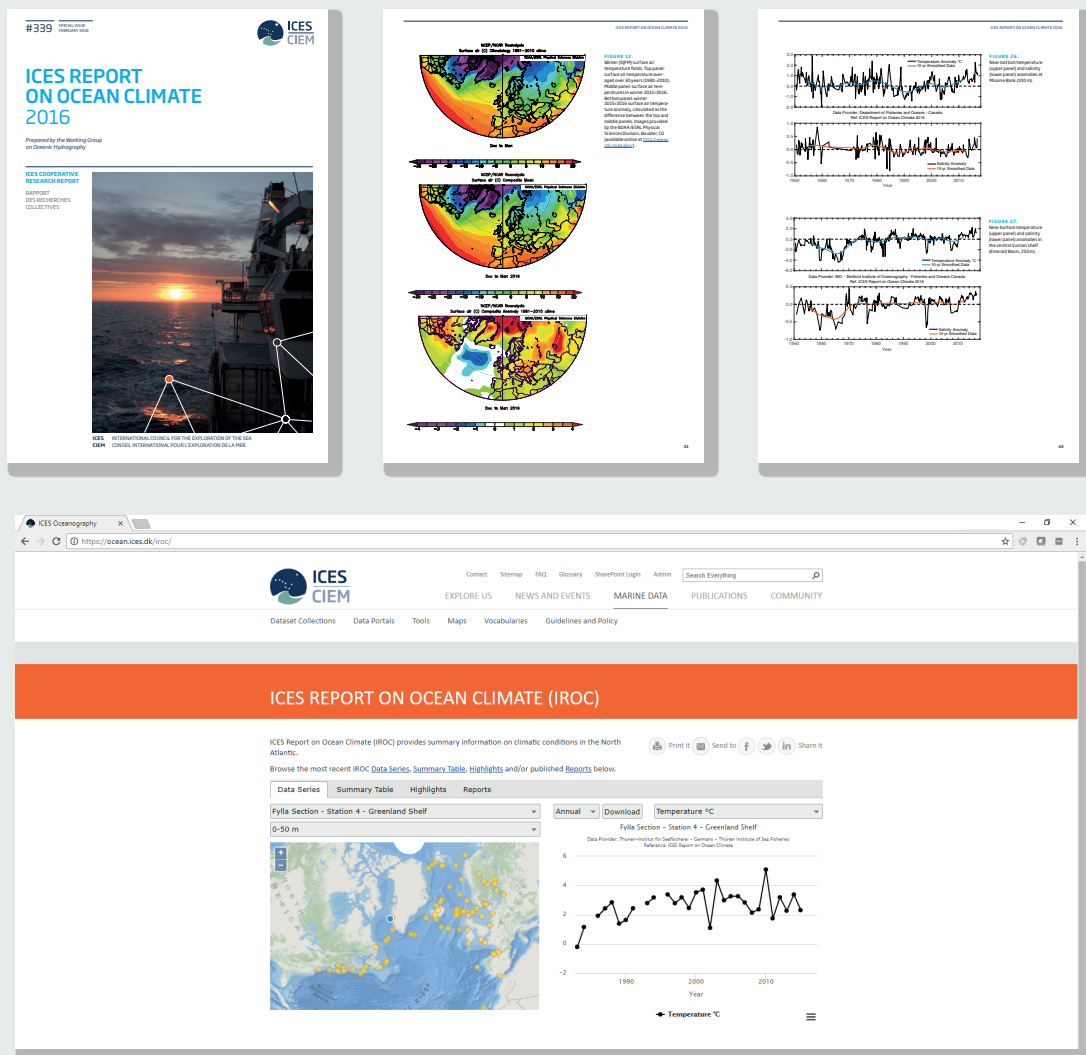
"The advice found that reductions in abundance of salmon could potentially lead to some local extirpations occurring when stream temperatures increase, especially in the southern part of the range. However rising stream temperatures can also increase juvenile growth and productivity or facilitate population expansion into habitats that until recently were below the minimal temperature requirements for salmon in the northern parts of the range."

Dennis Ensing, Co-chair of a workshop set up to address the advice request from NASCO

CASE

ICES Report on Ocean Climate

The ICES Report on Ocean Climate (IROC) is published annually and the data are available through our [IROC web tool](#).




Long time-series of ocean properties are rare in the surface ocean and even rarer in the deep ocean. The North Atlantic region is unusual in having a relatively large number of locations at which oceanographic data have been collected repeatedly for many years or decades; the records go back more than a century.

These valuable data are collated in ICES Report on Ocean Climate (IROC) to provide the very latest information from ICES areas of the North Atlantic and Nordic seas. At locations where the ocean is regularly measured, sea temperature and salinity status are described for 2016. Observed trends over the past decade, and longer where possible, are also included.

Risks from human activities

BIODIVERSITY AND HABITATS

A close-up photograph of a flatfish, likely a plaice, resting on a sandy seabed. The fish is white with a prominent dark eye and is partially buried in the sand. The background is a soft-focus view of the ocean floor.

Our seas and oceans
provide us with many
benefits, but human
activities can pose
risks to biodiversity
and habitats.

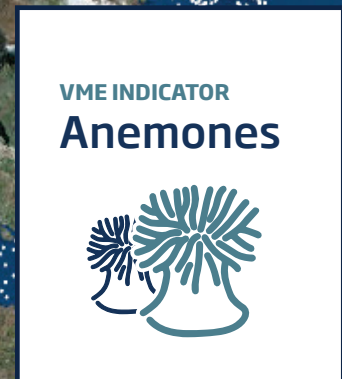
Improving our understanding of the trade-offs between the benefits and risks of human activities is central to the ICES mission.

The seabed was the subject of one special advice request addressed this year. The work, issued for the European Commission's Directorate-General for Environment (DG ENV), **looked at the relationship between the impact of fishing on the seabed relative to what is caught and landed at port.**

Three sets of indicators were proposed: a fishery's effort footprint (pressure), the impact of fishing gear on the seabed, and the value and weight of fish landed. The first two were compared with the latter to assess trade-offs between conservation and exploitation. This will help to ensure sustainability, one of the underlying principles of EU's Marine Strategy Framework Directive (MSFD) and Common Fisheries Policy (CFP).

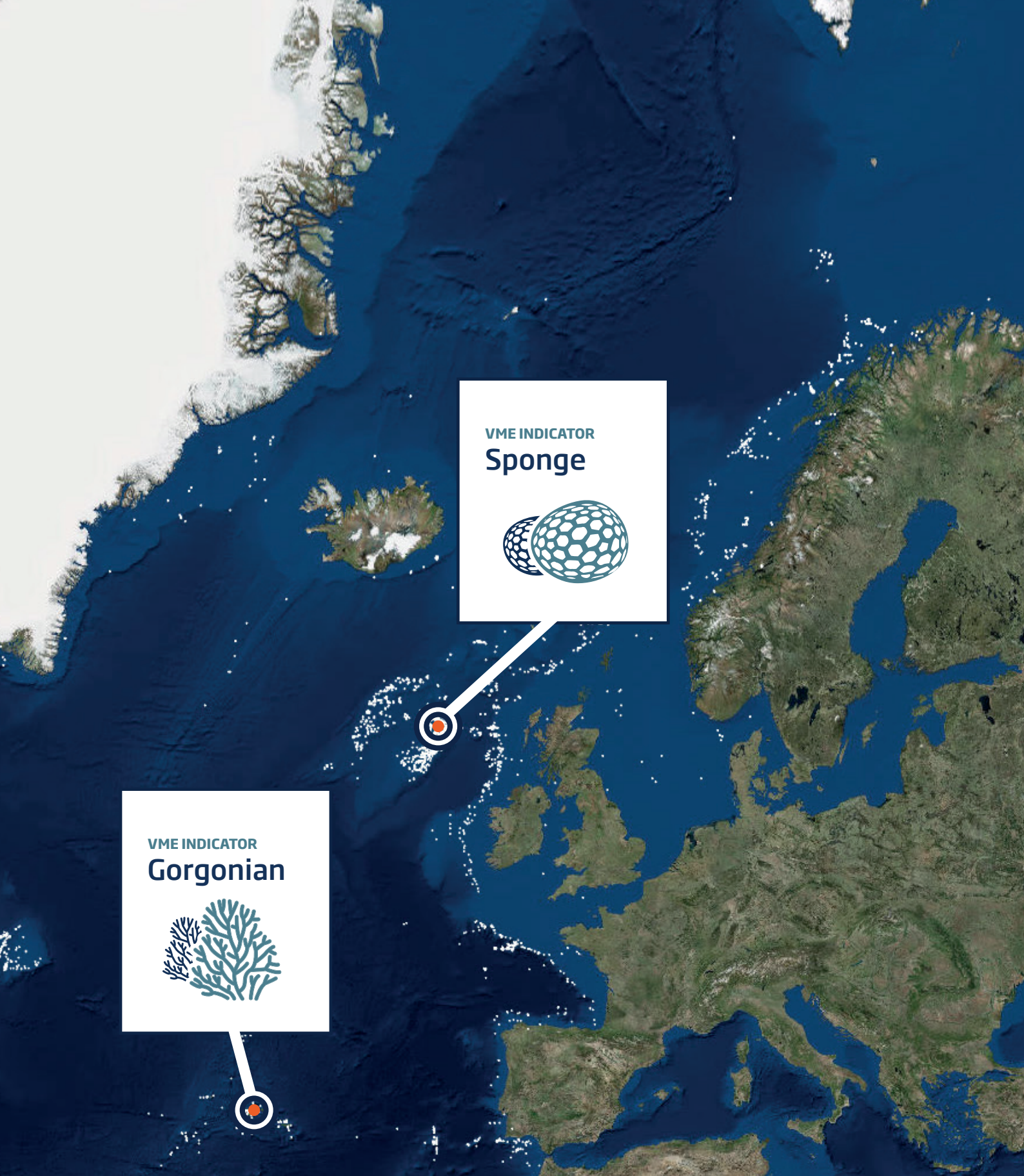
"It was clear that the stakeholders had different points of view, but their input was valuable when setting up scenarios and helped us keeping a focus on making the outputs understandable and relevant."

Josefine Egekvist, Co-chair of two workshops which were part of the advice process



CASE

Vulnerable Marine Ecosystems



The [VME Portal](#) lets users view and download observations of Vulnerable Marine Ecosystem (VME) indicators and habitats in the North Atlantic. The database was set up by the Joint ICES/NAFO Working Group on Deep-water Ecology. ICES uses it when providing advice on the distribution of VMEs and recommending possible management solutions such as bottom fishing closures within NEAFC (North East Atlantic Fisheries Commission) waters to protect VMEs.

ICES IN NUMBERS

Selected numbers from our activities



140



140 participants joined the ICES/PICES Early Career Scientist Conference in Busan, Korea

44



Participants from **44** countries took part in our training courses in 2017



Experts from **56** countries engaged with and contributed to our activities in 2017

56

ICES BUDGET

All amounts in Danish kroner

Income from national contributions		2017
Belgium		836,000
Canada		1,254,000
Denmark		1,254,000
Estonia		418,000
Finland		627,000
France		1,672,000
Germany		1,672,000
Iceland		1,254,000
Ireland		836,000
Latvia		418,000
Lithuania		418,000
The Netherlands		1,254,000
Norway		1,672,000
Poland		1,254,000
Portugal		836,000
Russia		1,254,000
Spain		1,254,000
Sweden		1,254,000
United Kingdom		1,672,000
USA		1,254,000
Total national contribution		22,363,000
Contributions from Faroe Islands & Greenland		418,000
Total contributions		22,781,000

Income from products and services		2017
EC		10,400,000
HELCOM (data handling)		470,000
NASCO contribution (advice)		539,492
NEAFC		2,356,743
Norway MoU		840,000
OSPAR (advice)		600,000
OSPAR (data handling)		650,000
Special requests		250,000
Total income from products and services		16,106,235
Other income		2017
ASC		490,000
Income from ICES Journal of Marine Science		1,400,000
Net income from projects		2,880,650
Sale of publications		5,000
Miscellaneous		1,080,000
Total other income		5,855,650
Expenditure		46,825,885
Transfer from equity		1,983,000
Interest		100,000
Balance of the year		0

