ICES WGOH REPORT 2017

SCICOM STEERING GROUP ON ECOSYSTEM PROCESSES AND DYNAMICS

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Report of the Working Group on Oceanic Hydrography (WGOH)

4–6 April 2017

Torshavn, Faroe Islands

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

Executive summary

The Working Group on Oceanic Hydrography (WGOH) meets yearly to review oceanographic conditions in the ICES region and to report on these in the ICES Report on Ocean Climate (IROC). The WGOH 2017 meeting was hosted by the Faroe Marine Research Institute, Torshavn, Faroe Islands, 4–6 April 2017. The highlights for the IROC for 2016 are presented below.

Highlights of the North Atlantic for 2016

Air and sea surface temperatures were higher than normal across most of the region, with the exception of the central subpolar North Atlantic (centred on 50N and including the Irminger and Iceland Basins). In Greenland and the Barents Sea record high air and sea surface temperatures were observed. North of Iceland record high sea surface temperatures were observed.

A cold anomaly in the surface and upper ocean of the central subpolar North Atlantic persisted in 2016, though it weakened through the year.

Heat content in the upper layer of the Norwegian Sea reached a record high value, and bottom temperatures across the northeast US Continental shelf were unusually high.

Salinity in the upper layer of the eastern subpolar North Atlantic and the Norwegian Sea has been decreasing since the late 2000s, and in 2016 a dramatic freshening and record low values were observed in the Faroe Bank Channel and Iceland Basin.

Ice cover in the Barents Sea reached a record low, with the first ice-free July on record. For the second winter in a row the Bothnian Bay was not completely ice covered and ice-cover elsewhere in the Baltic was lower than normal.

Experimental forecasts of sea level pressure and surface air temperature are included here for the first time.

Following recommendations from ICES SGWIDE and the recent publication of the sub polar Gyre Index, we include this data for the first time in the IROC.

Highlights of the north Atlantic atmosphere in winter 2015/2016

The winter North Atlantic Oscillation (NAO) index was positive (+0.98), for the third consecutive winter.

The Azores High was relatively strong with high pressure anomaly extending from Newfoundland across southern Europe, while the Iceland Low strengthened at its southern extent. Weaker winds than average were evident from the southwest of Iceland into the Norwegian Sea extending to Svalbard and the western Barents Sea.

Winter air temperatures were only below average (1981–2010) over the subpolar gyre, elsewhere temperatures were generally higher than normal and particularly so over the Middle Atlantic Bight, Fram Strait and the Barents Sea.

Beyond 2016: initial assessment of the north Atlantic atmosphere in winter 2016/2017

An initial assessment of the North Atlantic atmosphere at the end of the IROC year is included. Atmospheric conditions during winter are a determining factor of oceanic conditions for the following year; therefore, this outlook offers some predictive capability for spring to autumn 2017.

The sea level pressure pattern for December 2016 to March 2017 indicates that it was the 4th consecutive positive NAO index winter but again weaker than those preceding it. As expected for a weak NAO index the sea level pressure (SLP) anomaly is not a clear NAO pattern and there was no strong spatial pattern to the wind speed anomaly.

Air temperatures were cold over the subpolar gyre, including over the Irminger Sea and Iceland Basin. As in the winter 2016 warmer-than-average conditions were evident around the margins of the subpolar gyre, but the colder than average conditions ob-served in 2016 remained over the gyre itself.

1 Administrative details

Working Group name

Working Group on Oceanic Hydrography (WGOH)

Year of Appointment within current cycle

2015

Reporting year within current cycle (1, 2 or 3)

3

Chair(s)

Sarah Hughes, Scotland, UK

Karin Margretha H. Larsen, Faroe, Denmark

Meeting dates and venues

24–26 March 2015; Pasaia, Basque Country, Spain (15 participants)

5–7 April 2016; Sopot, Poland (20 participants)

4–6 April 2017; Tórshavn, Faroe Islands (19 participants)

2 Terms of Reference

a) Update and review results from Standard Sections and Stations;
b) Consolidate inputs from Member Countries to, and continue development of the ICES Report on Ocean Climate (IROC); work with ICES Data Centre to develop web based presentation of IROC data including full meta-data;
c) Explore areas of mutual interest with international climate monitoring, reanalysis & prediction programmes;
d) Provide expert knowledge and guidance to ICES Data Centre on request;
e) Collaborate with regional integrated ecosystem advice Expert Groups, review products of the ICES Regional Groups (WGIBAR, WGINOR, WGIAB, WGINOSE, WGEAWESS, WGNARS)
f) Provide expert knowledge, support and guidance to SCICOM and other Expert Groups requiring information on oceanic hydrography, and working to strengthen the role of physical oceanography within ICES in conjunction with groups such as WGOOFE, including: i) Sup-port SCICOM regarding elements of the EGs' work that are relevant to Marine Strategy Framework Directive activities;
g) Prepare contributions for the annual SSGEPD session during the ASC on the topic areas of the Science Plan – as & when requested by SSGEPD;
h) Evaluation and review of WG actions and purpose.

3 Summary of Work plan

Year 1	a) IROC 2015 production & recommendations for modifications to IROC format and content, including discussion on potential for reanalyses, forecast products to be included and addition of ICES Regional Ecosystem area focussed component, also potential move to purely web based product. b) WG Activities progress report including highlights of North Atlantic hydrographic conditions and any significant events synthesized from the national reports and IROC findings. c) Initial identification of climate monitoring, reanalysis and forecasting programmes.
Year 2	a) IROC 2016 production including first implementation of recommended changes. b) WG Activities progress report including highlights of North Atlantic hydrographic conditions and any significant events synthesized from the national reports and IROC findings. c) Map marine climate reanalysis and forecast parameters to ICES interests.
Year 3	a) IROC 2017 production and review of content and requirement to continue IROC process. b) WG Final report

4 Summary of Achievements of the WG during 3-year term

- Improvement of data delivery on IROC online portal (initiated in 2015 and ongoing);
- New team established in 2015 for delivery of Annual IROC;
- New deep-ocean time series added to IROC 2014;
- Delivery of IROC 2013/14 (CRR329);
- Science Plan Mapping Exercise submitted;
- New time series added to IROC 2015;
- Delivery of IROC 2015 (CRR331);
- IROC 2016 on target and new developments in progress.

5 Final report on ToRs, workplan and Science Implementation Plan

Report on the work done in connection to the meeting in 2017: as usual a mini-symposium was held on the first day of the meeting. The mini-symposia usually includes a combination of talks from the host institution and invited WGOH members. At the 2017 meeting, most of the time was spent reporting findings from the different ICES areas, work which addresses ToRs a) and b). The remainder of the meeting was spent working through the other ToRs (c–h) and the last couple of hours were spent working on the upcoming IROC.

ToR a: Update and review results from Standard Sections and Stations

Area Reports were presented to the WGOH and additional scientific work reviewed during a mini-symposium. WGOH were grateful to members whom, although unable to attend the meeting, were still able to offer an area report as this is incredibly useful to the group when preparing the IROC.

Some groups support their presentation with a formal report and these offer valuable comprehensive reviews of the different sea areas within the North Atlantic as covered by members of the WGOH. These reports contain much more detailed information than the ICES Report on Ocean Climate which can only summarise the general conditions. The area reports should therefore be more visible and the group suggested posting them on the WGOH webpage including an archive of previous reports. Table 1 below lists the area reports presented at the meeting.

Table 1. List of Area reports Presented to ICES WGOH in 2017.

Region of Report	Presenter	Country	Report/Presentation
Greenland	Boris Cisewski	Germany	Presentation
USA	Paula Fratantoni	USA	Presentation
Icelandic Waters	Hedinn Valdimarsson	Iceland	Presentation
Eastern Bay of Biscay	Almudena Fontán	Spain	Presentation
Iberian Coast Bay of Biscay	Cesar González-Pola	Spain	Presentation
Western English Channels	Kieran Lyons	Ireland	Presentation
Rockall Trough and Extended Ellet Line	Penny Holliday	UK	Presentation
Faroese Waters	Karin Margretha H. Larsen	Faroe, Denmark	Presentation
Scottish Waters	Sarah Hughes	Scotland, UK	Presentation
North Sea	Holger Klein	Germany	Presentation
Baltic – Sweden	Johanna Linders	Sweden	Presentation (via Skype)
Baltic – Finland	Meri Korhonen	Finland	Presentation
Baltic – Poland	Tycjan Wodzinowski	Poland	Presentation
Norwegian Seas and North Sea	Kjell Arne Mork	Norway	Presentation
Kola Section, Barents Sea	Alexander Trofimov	Russia	Presentation
Fram Strait	Agnieszka Beszczynska-Möller	Poland	Presentation

ToR b: Consolidate inputs from Member Countries to, and continue development of the ICES Report on Ocean Climate (IROC); work with ICES Data Centre to develop web based presentation of IROC data including full meta-data

The WGOH has faced a few challenges regarding the IROC the previous 2-3 years. The editorial group put a large effort in consolidating the inputs from the members and to write and setup the IROC, but despite of this the IROC 2013/14 was not published until March 2016, the main reasons being the editors occupied by other duties and the long design procedure at the ICES office. With the lessons learned in 2015 the editorial group was ready to manage the IROC 2015. The aim was to have it published on the website before summer 2016, but again delays in data and text deliveries slowed down the progress. Additionally, the editorial group found the communication with the ICES designers unhelpful, and as a result there was no time to proof-read the final copy prior to publication. In 2016 the IROC was published in September.

Based on the experience from the two previous years the editorial group has decided to setup the IROC themselves using the program LaTeX. When this is done, the IROC will be handed to the ICES as a finalised PDF document. This first year will be a test to see if this method is achievable and if successful the plan is to continue to develop and publish the IROC within this framework. There were no objections from the meeting participants to moving to this layout. The data providers can still submit regular text and the editors will take care of the input. Additionally, in this format new series can easily be added.

To improve the submission of data for the IROC Hjalte Parner at the Data Centre has established a method to ease the submission process for the contributors. Prior to the meeting reminders are sent by email, but still roughly half of the data was submitted at the time of the meeting. The improvement of the procedures is therefore an ongoing process for future years.

Hjalte Parner provided information about further developments of the IROC web page. The map projection has been changed as agreed in 2016. Meta data are to be submitted for each time series and we will move on with the contribution. Still most contributors are to deliver this information. The metadata can include acknowledgement and citation information. Different details for the metadata were discussed. Sarah Hughes compiles a list of metadata that we can add for each series. When finalised Sarah sends the list to Hjalte for emailing to all data providers. The metadata list will be evaluated at the next meeting.

Hjalte offered the providers to submit time series next year. He will make the calculations of monthly and annual averages, but these can be overruled by the owners own calculations (if submitted). Hjalte showed the group the possibilities of creating all kind of forms on the map on the IROC webpage. E.g. lines and polygons can be added as requested by the data providers. A request was to have the index numbers added to the front page dropdown menu - Hjalte will add the numbers. Areas should be removed as these are replaced with ecoregions. The group wants information on how to cite the most recent IROC on the front page. This information used to be there, but there was some issue. Hjalte will look at this as well as the webpage counter that takes counts of downloads etc.

Plots are already created automatically and can go directly into the IROC. The layout can be changed upon request from the editorial group. This will be very helpful in the pro-

duction of the IROC. On the IROC webpage "Buttons" can be created for each plot where we can select different add-ons to the plot like std dev, smoothed line, etc.

WGOH agreed that data providers should provide as much additional information as possible, following the metadata template that would be provided by Hjalte. Members were reminded of the need to submit their data in a standard format as this allows the dataset to work efficiently in supporting the development of the summary figures for the IROC. WGOH thanked Hjalte and the ICES Data Centre for their commitment to supporting the IROC.

ToR c: Explore areas of mutual interest with international climate monitoring, reanalysis & prediction programme

WGOH members continue to work in collaboration with researches on other international climate monitoring projects. Members do their best to raise awareness of the outputs from the ICES WGOH and the IROC publication when participating in international conferences and meetings.

ToR d: Provide expert knowledge and guidance to ICES Data Centre on request

No specific actions were taken relating to this ToR at the 2017 meeting. However, Hjalte Parner has attended recent meetings which is incredibly valuable. Bot at the meeting, and in-between meetings the WGOH are working very closely with him in relation to developing the IROC product online and streamlining the process of preparing the IROC.

ToR e: Collaborate with regional integrated ecosystem advice Expert Groups, re-view products of the ICES Regional Groups (WGIBAR, WGINOR, WGIAB, WGINOSE, WGEAWESS, WGNARS)

No specific actions were taken relating to the ToR at the 2017 meeting. The following WGOH members have contributed or have strong links with the regional integrated assessments and have provided a short description on their involvement in the groups. The members are encouraged to give a short presentation of these groups at the WGOH meeting in 2018.

Working Group on the Integrated Assessments of the Norwegian Sea (WGINOR)

WGOH link: Kjell Arne Mork

The Working Group on the Integrated Assessments of the Norwegian Sea (WGINOR) aims to conduct and further develop Integrated Ecosystem Assessments for the Norwegian Sea as a step towards implementing the ecosystem approach. The work is based on international fish-plankton centred surveys in the Norwegian Sea in May and since the mid-90s. In the most recent years these surveys have transitioned into ecosystem surveys that capture most of the key components of the ecosystem. These data sets are a firm foundation for undertaking integrated assessment of ecosystem status in the Norwegian Sea which is yet to be done. At present a multispecies fisheries model and an end to end ecosystem model are being set up for the Norwegian Sea.

Working Group on the Integrated Assessments of the Barents Sea (WGIBAR)

WGOH link: Alexander Trofimov

WGIBAR conducts and develops integrated ecosystem assessments for the Barents Sea as part of the Ecosystem Approach to Fisheries Management. WGIBAR's aim is to summarize and analyse up-to-date knowledge on the state of the Barents Sea ecosystem.. WGIBAR prepares relevant datasets and other relevant information, including pollution, to describe and analyse fluctuations and changes in the Barents Sea ecosystem and prepares an annual report "State and drivers of the Barents Sea", which is available on the ICES WGIBAR page as a separate document. The Integrated multivariate (PCA, CCA, and NMDS) analyses of the time series, grouped into abiotic, biotic and pressures, are performed by WGIBAR. There are 17 abiotic variables reflecting meteorological and oceanographic conditions, a set of variables including zooplankton biomass in three size fractions and sum total for the Barents Sea, 3 time series of krill, abundance of 0-group fish of 9 species (capelin, cod, haddock, herring, polar cod, long-rough dab, Greenland halibut, redfish, and saithe), 23 variables reflecting stock size, growth and maturation of cod (7 variables), haddock (6 variables), capelin (5 variables), polar cod (2 variables), and herring, long-rough dab and shrimp (1 variable each).

WGIBAR identifies knowledge gaps and priority research items that when addressed, can improve future integrated ecosystem assessments, explores the use of available ecosystem and multispecies models as an analytical tool in integrated ecosystem assessment for the Barents Sea, and provides recommendations to improve the monitoring of the Barents Sea ecosystem for integrated ecosystem assessments.

Baltic Integrated Fish Survey Working Group (WGBIFS)

WGOH link: Tycjan Wodzinowski

It is obligatory to attach the hydrography and meteorology chapter to the after cruise report. The descriptive information consists of water temperature, salinity and oxygen content on the fishing depth for the pelagic trawling and for near bottom water for the bottom trawling (additional for the pelagic trawling). The additional parameters are temperature, salinity and oxygen content on surface water and the same parameters through transection. A transection route is often the same, if it is possible, or similar for all cruises. All parameters are presented in the form of maps and graphs. In the above mentioned chapters additional information is included when some special occurrences such as the Mayor Baltic Inflow take place. The after cruise reports are the part of the year report of the WGBIFS.

The Working Group on Northwest Atlantic Regional Sea (WGNARS)

WGOH link: Paula Fratantoni

The Working Group on the Northwest Atlantic Regional Sea (WGNARS) develops scientific support for Integrated Ecosystem Assessments of the Northwest Atlantic region to support ecosystem approaches to science and management. WGNARS' spatial scope focuses on the Northwest Atlantic continental shelf, extending from Labrador, Canada to Cape Hatteras, North Carolina, USA. Work includes identifying key drivers that influence the Northwest Atlantic continental shelf and characterizing the ecosystem response;

developing representative indicator time series for these drivers and responses; setting thresholds that can be used to quantify ecosystem status; performing ecosystem-level management strategy evaluation to test strategies for achieving management objectives; and developing conceptual models linking ecosystem services to broad-scale drivers in the system. This work relies heavily on ocean observations collected through existing long-term Canadian and U.S. monitoring programs operating on the Northwest Atlantic continental shelf.

The WGOH does not have members linking to the Working Group on Integrated Assessments of the North Sea (WGINOSE), the Working Group on Integrated Assessments of the Baltic Sea (WGIAB) and the Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS). However there are some links through colleagues that make it likely that awareness of the IROC and its products should be adequate within these groups.

ToR f: Provide expert knowledge, support and guidance to SCICOM and other Expert Groups requiring information on oceanic hydrography, and working to strengthen the role of physical oceanography within ICES in conjunction with groups such as WGOOFE including: i) Support SCICOM regarding elements of the EGs' work that are relevant to Marine Strategy Framework Directive activities

At the 2017 meeting it was acknowledged that the collaboration with SCICOM has not been so good. Heðinn Valdimarsson has now become a member of SCICOM and this is expected to improve the collaboration. Heðinn says that the SCICOM intends to have more oceanography in the assessments and we should therefore definitely continue and strengthen the collaboration with the SCICOM and the other Expert Groups. Our role is important in ensuring that physical processes are considered in fishery and ecological research/assessments.

The WGOH members have waved the flag for the WGOH at relevant meetings. Boris Cisewski has presented the group at NAFO meetings, Holger Klein has given presentations and circulated pdf versions of the IROC at various Climate change meetings in Germany and Karin M. H. Larsen has presented the IROC webpage at the OceanSITES meeting 2016.

Paula Fratantoni and Heðinn Valdimarsson expect to attend the upcoming ASC 2017 and they were willing to give presentations of the WGOH at the meeting.

There is some synergy between the data delivered to the IROC and the needs for understanding underlying climate processes (prevailing conditions) in MSFD assessments. As far as possible using links with national MSFD working groups the datasets presented in the IROC are being used for such assessments. In a similar way the data presented here underpin the assessments of environmental conditions made by OSPAR.

ToR g: Prepare contributions for the annual SSGEPD session during the ASC on the topic areas of the Science Plan – as & when requested by SSGEPD

The SSGEPD requested a Science plan mapping exercise early in 2016. The exercise (spreadsheet) was handed to the attending members at the 2016 meeting where after preliminary answers were added to a joint reply. The exercise was completed by the chairs and submitted to SSGEPD.

No request was received for the 2017 meeting.

ToR h: Evaluation and review of WG actions and purpose

WGOH continually review the IROC and the data presented within. The aim is to develop the product to be as useful as possible, whilst remaining a sustainable task for the Working Group. The development of this remains clearly within the existing Terms of Reference.

At the 2017 meeting the WGOH discussed how to develop and improve the IROC in future. It was suggested to

- Include and improve the metadata provided with each dataset.
- Improve the visibility of the underlying national reports by linking directly on the website rather than embedding them into the WGOH report.
- Improving citations and referencing within the IROC.
- Continue work to align the IROC product with marine regions such as the ICES ecoregions and Large Marine Ecosystems.

The group also found it necessary to improve the visibility of the IROC and it was suggested to

- Give presentations at conferences to draw attention to the data within the IROC.
- Develop ideas for further joint publications based on the observations.

The group discussed developing interactions with ICES:

- A planning for future theme sessions is needed.
- Participation in ICES/PICES symposium in June 2018 – Washington.
- Initiate preparations for a next decadal symposium.
- Website still available.
- Stephen knows about registration etc.
- Possible locations to be Galway or Bergen?

AO ICES matters

Heðinn Valdimarsson mentioned the ICES – PICES symposium in June 2018, Washington. He said that in 2008 WGOH submitted a paper to that conference and asked whether the group should contribute to the symposium? A possible topic could be the extreme freshening that is being observed in the North Atlantic. Sarah volunteered to email all regarding this topic.

IROC highlights and key issues from the national reports

This report describes the discussion and outcomes relating to the individual terms of references of the WGOH. The bulk of the science discussed by the WGOH is contained in the area reports (added to the WGOH webpage), which in turn underpin the information presented in the ICES Report on Ocean Climate (IROC).

The IROC represent the scientific highlights of the WGOH meeting, the highlights intended for this report representing the 2016 status are presented here.

Highlights of the North Atlantic for 2016

Air and sea surface temperatures were higher than normal across most of the region, with the exception of the central subpolar North Atlantic (centered on 50N and including the Irminger and Iceland Basins). In Greenland and the Barents Sea record high air and sea surface temperatures were observed. North of Iceland record high sea surface temperatures were observed.

A cold anomaly in the surface and upper ocean of the central subpolar North Atlantic persisted in 2016, though it weakened through the year.

Heat content in the upper layer of the Norwegian Sea reached a record high value, and bottom temperatures across the northeast US Continental shelf were unusually high.

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Beyond 2016: initial assessment of the north Atlantic atmosphere in winter 2016/2017

An initial assessment of the North Atlantic atmosphere at the end of the IROC year is included. Atmospheric conditions during winter are a determining factor of oceanic conditions for the following year; therefore, this outlook offers some predictive capability for spring to autumn 2017.

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Air temperatures were cold over the subpolar gyre, including over the Irminger Sea and Iceland Basin. As in the winter 2016 warmer-than-average conditions were evident around the margins of the subpolar gyre, but the colder than average conditions observed in 2016 remained over the gyre itself.

Election of Chairs

This meeting was the third and final meeting for Sarah Hughes and Karin Margretha H. Larsen as chairs and therefore new chairs were to be elected. Paula Fratantoni (US) and César González-Pola (Spain) approved on request to be candidates. No other member offered to be a candidate. Thus Paula and César were elected with applause.

Next meeting

The WGOH received an invitation from Stephen Dye to host the next meeting in Norwich, UK. The group accepted the invitation with applause and decided to hold the next meeting in Norwich, UK, 20–22 March 2018.

6 Cooperation

Cooperation with other WG

See reply to ToR e)

Cooperation with Advisory structures

WGOH is not an Advisory group as such but the group contributes its advice via the IROC.

Cooperation with other IGOs

WGOH does not have procedures for formal cooperation with other IGOs, but as some WGOH members participate in other IGO meetings, such as NAFO and NEAFC meetings, informal links are developed. These members raise awareness of the work of WGOH at the IGO meetings and feedback relevant information to the WGOH.

7 Summary of Working Group self-evaluation and conclusions

The WGOH contribute very significantly to the first objective of the science plan, "Describe and Quantify the state of North Atlantic Ocean regional systems". We assess the physical state of regional seas and describe changes in the predominant climatic and hydrological processes important for regional ecosystems.

We contribute vital information which can be used by others who wish to try and understand the impacts of climate variability and change on marine ecosystems.

The key output from this working group is the ICES Report on Ocean Climate and its associated website. The Ocean and Atmosphere Highlights from the IROC represent our summary of oceanographic conditions in the latest year and should be used in the Advisory process together with the national reports. Outputs from this working group also feed into assessments for NAFO and regional and national assessments of climate variability.

We believe that the information we prepare is incredibly valuable to ICES and the wider community and we therefore seek to continue with this work. We aim to continue to develop the IROC website and to publish the ICES Report on Ocean Climate each year.

Annex 1: List of participants

Name	Country	Email
Agnieszka Beszczyn-ska-Möller	Poland	abesz@iopan.gda.pl
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Hjalte Parner	Denmark	hjalte@ices.dk
Holger Klein	Germany	holger.klein@bsh.de
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Sarah Hughes	Scotland, UK	S.Hughes@MARLAB.AC.UK
Tycjan Wodzinowski	Poland	tycjan@mir.gdynia.pl

Annex 2: Recommendations

RECOMMENDATION	ADDRESSED TO
1. The WGOH recommends that ICES holds a new decadal symposium in 2021. The WGOH prepared the decadal symposium in Santander in 2011 and the group is willing to help preparing the next symposium as well. It takes time to prepare such a large event and therefore the WGOH recommends initiating the preparations already next year.	WGOH
2. The WGOH continuously tries to improve the IROC and its outreach. An important part of the background material is the national reports from the WGOH members. To improve the visibility of these underlying national reports the group recommends linking them directly on the website rather than embedding them into the WGOH report.	ICES Data Centre
3. The WGOH wish to develop summary publications useful for raising awareness of the IROC, for example a leaflet and/or poster that can be distributed at conferences and meetings.	WGOH

Annex 3: WGOH draft terms of reference 2018–2020

The **Working Group on Oceanic Hydrography** (WGOH), chaired by Paula Fratantoni, USA and César González-Pola, Spain, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2018	20-22 March	Norwich, UK	Interim report by 1 May to SSGEPD	
Year 2019			Interim report by DATE to SSGEPD	
Year 2020			Final report by DATE to SSGEPD, SCICOM	

a) Update and review results from Standard Sections and Stations;

b) Consolidate inputs from Member Countries to, and continue development of the ICES Report on Ocean Climate (IROC); work with ICES Data Centre to develop web based presentation of IROC data including full meta-data;

c) Explore areas of mutual interest with international climate monitoring, reanalysis & prediction programmes;

d) Provide expert knowledge and guidance to ICES Data Centre on request;

e) Collaborate with regional integrated ecosystem advice Expert Groups, review products of the ICES Regional Groups (WGIBAR, WGINOR, WGIAB, WGINOSE, WGEAWESS, WGNARS)

f) Provide expert knowledge, support and guidance to SCICOM and other Expert Groups requiring information on oceanic hydrography, and working to strengthen the role of physical oceanography within ICES in conjunction with groups such as WGOOFE, including: i) Support SCICOM regarding elements of the EGs' work that are relevant to Marine Strategy Framework Directive activities;

g) Prepare contributions for the annual SSGEPD session during the ASC on the topic areas of the Science Plan – as & when requested by SSGEPD;

h) Prepare Decadal Symposium to be held in 2021;

i) Evaluation and review of WG actions and purpose.

ToR descriptors

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
	This should capture the objectives of the ToR	Provide very brief justification, e.g. advisory need, links to Science Plan and other WGs	Use codes	1, 2 or 3 years	Specify what is to be provided, when and to whom
a	Examine the hydrographic variability of the North Atlantic and its subpolar seas. Identify events, trends and drivers in the region .	The contributors to the WGOH bring together a wide range of observations taken by various national programmes. Here we annually monitor developments in the environmental conditions that they sample.		3 years	Annual interim reports will include details of national programmes and most up to date findings.
b	Standard Sections and Stations summarized into the production of the IROC report and submitted to IROC data portal.	The Working Group recognises the need for disseminating climate information in a timely and appropriate manner. This agenda item will allow WGOH members to prepare the document during the meeting. We will review proposed new developments in IROC content.		3years	Annual. IROC report for CRR submission. Text and figures to ICES by June 30th each year. Data to portal by 1st September each year.
c	Report on developments within international climate monitoring, multi decadal reanalyses & prediction programmes relevant to ICES	Benefit both to ICES and the international monitoring programmes to enhance internal information exchange. Additionally developments in the capacity to make climate forecasts of hydrographic parameters are being made by the international community, that may have the potential to aid future ICES work.		2 years	Identify the products of potential use to ICES. Report as part of 2nd year progress.

d, e, f	Support for ICES processes on hydrographic data and ocean scale marine climate variability. Including Data Centre, other EGs, and advice programmes where and when requested	As required support for ICES Data centre on hydrographic data. Oceanic hydrography remains a fundamental component of assessing the state of marine ecosystems. WGOH documents interannual to multidecadal variability and trends in the oceanic hydrography for most ecoregions and will review the available 'Ecosystem Overviews' as they become available for each regional sea.	ongoing	Response to requests and reviewing input from Datacentre at WG meetings. Submit review to the annual interations of Ecosystem Overviews.
g	Contribute to objectives, activities of parent science steering group SSGEPD	A flexible ToR to allow WGOH to contribute to SSGEPD requirements as they develop over the term of the current science plan.	3 years	As and when defined by our steering group SSGEPD
h	Prepare a new decadal symposium in 2021	The WGOH has been responsible for previous decadal symposia (e.g. the 2011 symposia in Santander). Such a large event requires thorough preparation and starting the preparation early acts to assure a successful event.	3 years	Progress to be reported annually
i	Ongoing self evaluation of the EGs work.	WGOH is a long established EG within ICES and has ToRs that are closer to an annual workplan. The main product is the annual IROC which has been produced for 15 years, and must be continually developed - through ongoing self evaluation and review	3 years	WGOH Final Report under multiannual TORs 2020

Summary of the Work Plan

Year 1	a) IROC 2018 production & recommendations for modifications to IROC format and content, including discussion on potential for reanalyses, forecast products to be included and addition of ICES Regional Ecosystem area focussed component, also potential move to purely web based product. b) WG Activities progress report including highlights of North Atlantic hydrographic conditions and any significant events synthesized from the national reports and IROC findings. c) Initial identification of climate monitoring, reanalysis and forecasting programmes. d) develop plans for Decadal Symposium
Year 2	a) IROC 2019 production including first implementation of recommended changes. b) WG Activities progress report including highlights of North Atlantic hydrographic conditions and any significant events synthesized from the national reports and IROC findings. c) Map marine climate reanalysis and forecast parameters to ICES interests. e) Prepare for for Decadal Symposium
Year 3	a) IROC 2020 production and review of content and requirement to continue IROC process. b) WG Final report c) Participation and delivery of Decadal Symposium

Supporting information

Priority	Oceanic hydrography remains a fundamental component of assessing the state of marine ecosystems. WGOH documents interannual to multidecadal variability and trends in the oceanic hydrography setting the vital context for prevailing conditions & ecosystem change. The IROC has been cited more than 110 times (http://tinyurl.com/ICES-IROC) demonstrating that it is an important resource for the marine science community within and beyond ICES.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by about 15–20 members and guests. SSGEPD, ICES Data Centre participant.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	There is a very close working relationship with all the groups of SSGEPD. The most direct link is to WGOOFE where the activities of the 2 groups are complementary. WGOH focusses on the larger Atlantic space and long term climate scales. Link to PUBCOM for the annual production of the IROC.
Linkages to other organizations	IOC, JCOMM, CLIVAR

Annex 4: WGOH self-evaluation

1) ICES Working Group on Oceanic Hydrography

2) Year of appointment: 2015

3) Current Chairs: Karin Margretha H. Larsen and Sarah Hughes

4) Venues, dates and number of participants per meeting:

San Sebastian, Spain, 24-26 March 2015 (15)

Sopot, Poland, 5-7 April 2016 (20)

Torshavn, Faroe Islands, 4-6 April 2017 (19)

WG Evaluation

5) If applicable, please indicate the research priorities (and sub priorities) of the Science Plan to which the WG make a significant contribution.

The WGOH contribute very significantly to the first objective of the science plan, Describe and Quantify the state of North Atlantic Ocean regional systems. We assess the physical state of regional seas and describe changes in the predominant climatic and hydrological processes important for regional ecosystems.

We contribute vital information which can be used by others who wish to try and understand the impacts of climate variability and change on marine ecosystems.

6) In bullet form, list the main outcomes and achievements of the WG since their last evaluation. Outcomes including publications, advisory products, modelling outputs, methodological developments, etc. *

- The key output from this working group is the ICES Report on Ocean Climate and its associated website. The working group aims to publish this report each year. The 2014 report was published but delayed and the 2015 report was published prior to the Annual Science Conference in Sept 2016. The WGOH are on track to publish the 2016 report in time for the ICES ASC in Sep 2017.
- Many of the members use the data and information provided in the IROC in order to provide advice within their own institutes. In this way each member is able to add considerable value to their own assessments by participating in this working group and understanding how the variability observed in their area fits into the context of broader changes in the North Atlantic. This knowledge exchange is incredibly valuable and can often lead to collaborative research output.
- Outputs from this working group feed into assessments for NAFO and regional and national assessments of climate variability. For example in the UK, it is cited within climate assessments like MCCIP and national reports. In Germany the data in the report is reported to national climate groups. It is also a reference for knowledge of climate variability needed for MSFD assessments and will feed into the next OSPAR intermediate assessment.

- The website holding the data that are contained within the IROC has been developed with cooperation from the ICES Data Centre.
- The IROC is cited multiple times and so in this way is contributing to wider scientific knowledge. To date the collected reports have 118 citations. http://tinyurl.com/ICES-IROC.
- Members of the working group are working collaboratively on a number of related research projects. For example, recently members of WGOH were invited to a workshop on seabirds organised by RSPB and Birdlife. Also WGOH members make a large contribution to EU projects such as Blue-Action and NaClim. Participation in the ICES working group on Oceanic Hydrography was the underpin to this research.

7) Has the WG contributed to Advisory needs? If so, please list when, to whom, and what was the essence of the advice.

7.1) WGOH is not an advisory group. The group has contributed its advice via IROC.

7.2) The IROC is cited multiple times and so in this way is contributing to wider scientific knowledge. To date the collected reports have 118 citations. http://tinyurl.com/ICES-IROC.

8) Please list any specific outreach activities of the WG outside the ICES network (unless listed in question 6). For example, EC projects directly emanating from the WG discussions, representation of the WG in meetings of outside organizations, contributions to other agencies' activities.

8.1) NAFO, Ocean Sites, Marine strategies meetings and climate change meetings in Germany (Holger), OSPAR intermediate assessment, Mccip and opeg in the uk (Stephen), Scottish ocean climate report, NACLIM, Blue-Action, RSPB birdlife.

9) Please indicate what difficulties, if any, have been encountered in achieving the workplan.

9.1) Money and time. This is a difficult period for sustained time series and we have seen the cancellation of a number of key projects. Many organisation report limitations to ship time which can affect the quantity of data collected and so impact on the uncertainty of the observations

9.2) There have been some difficulties in ensuring continuity with the IROC publications. We continue this work and have confidence that the report will develop and improve further.

Future plans

10) Does the group think that a continuation of the WG beyond its current term is required? (If yes, please list the reasons)

10.1) Yes. We believe that the information we prepare is incredibly valuable to ICES and the wider community and we seek to continue with this work.

11) If you are not requesting an extension, does the group consider that a new WG is required to further develop the science previously addressed by the existing WG.

11.1) Not applicable

(*If you answered YES to question 10 or 11, it is expected that a new Category 2 draft resolution will be submitted through the relevant SSG Chair or Secretariat*.)

12) What additional expertise would improve the ability of the new (or in case of renewal, existing) WG to fulfil its ToR?

12.1) We have asked for help from the Data Centre and we got that, this has been extremely helpful for the working group and we hope this will continue.

12.2) We need to ensure we have representation from all of the ICES regions. We have limited representation in some areas (France, Portugal, and Netherlands). Our colleagues from Canada participate by correspondence but often struggle to attend the meetings. In some areas we have lost members due to retirements and have struggled to find a dedicated replacement. This is often due to retirement and we need to seek replacements.

12.3) In 2017 we allowed some participation using Skype which we felt worked quite well and is a useful option to have open for each meeting. Facilities and technology for this are often unreliable though. It is preferable for people to attend in person and the meeting could not continue if purely virtual.

13) Which conclusions/or knowledge acquired of the WG do you think should be used in the Advisory process, if not already used?

13.1) The Ocean and Atmosphere Highlights from the IROC. These represent our summary of oceanographic conditions in the latest year and are a key deliverable for the WGOH.

13.2) The detailed national reports that describe conditions in each region. We recommend more visibility is given to these reports by linking to them online.

13.3) However, the oceanographers who present their data to WGOH also have a wealth of knowledge about oceanographic processes and conditions which could be of great value to other working groups. Unfortunately wider participation of physical oceanographers in ICES is limited by funding and resources.