

# Arctic Regional Hydrographic Commission Minutes

For the 9<sup>th</sup> Arctic Regional Hydrographic Commission Conference (ARHC9)

16-19 September 2019, Murmansk, Russia

## Introduction and Administration

### **A.1 Opening of the Conference**

The ARHC Chair, Captain (Navy) Gennady Nepomiluev of the Russian Federation officially opened the meeting.

All ARHC Member States (MS), that is, the Russian Federation, Canada, Denmark, Norway, and the United States of America, were present at the meeting. In addition, associate Members Finland, Iceland, and Italy were in attendance. The IHO Secretariat was represented by Secretary General Dr. Mathias Jonas. In total, there were 26 participants.

Norway (NO) acted as the president of the meeting and Canada (CA) provided the secretarial support.

*Docs:*

- ARHC9-A1 Participants
- ARHC9-A1.1 List of Documents

### **A.2 Welcome from the Host Country**

The ARHC9 host, Capt. Nepomiluev welcomed all of the participants to Russia and Murmansk and he wished everyone a pleasant stay and fruitful discussions.

All participants were asked to introduce themselves.

### **A.3 Adoption of the Agenda**

NO outlined the strategy for conducting the agenda to which all participants agreed.

CA and Finland (FI) requested and were granted additional times in the agenda for information presentations.

The revised agenda was adopted.

*Docs:*

- ARHC9 A3 Agenda

### **A.4 Review of ARHC8 Meeting Minutes and the Review of Outstanding Actions**

The meeting minutes of ARHC8 were officially adopted with no further comments.

The outstanding actions for ARHC were reviewed. The status of these actions can be found in Annex A.

Most of the items had been completed, overtaken by events, or moved to permanent actions. Specific comments included:

-The item ARHC8-03 (*CA to update and enhance the A4 flyer “Effects of Noise on Arctic Marine Mammals” with relevant information based on the UN report on anthropological noise.*) was left open to allow for continued review of the research available [beyond the UN Report] in this area.

-Item ARHC8-10 (*MS to check if they have a socio-economic or other relevant studies and best practices and include it in the MSDI portal template.*) was made a permanent action and it was suggested to narrow the focus of these ancillary reports to those related to the Blue Economy.

-ARHC08-13 (*MS to review their Data policy for use in hydrographic services in order to support crowd sourced bathymetry [CSB] and report at ARHC9.*) was left open to allow MS to further internal discussions.

-Several participants stated that they are working with other internal agencies with the goal of establishing or clarifying a CSB policy.

-Currently most HOs will incorporate CSB data, particularly in poorly surveyed or charted areas, after an assessment of precision and quality. New recommendations from S-44 and DQWG may be useful for this assessment.

-IHO noted the utility of the CSB B-12 guidance document and the promotion of DCDB to support both the GEBCO grid and to enhance raw data in DCDB.

*Docs:*

*-ARHC9-A3 List of Actions from ARHC8*

## **A.5 Goals and Outcomes for ARHC9 [and Beyond]**

US introduced this item by noting the good working relationships in the ARHC that have developed in the first 9 years of the RHC’s existence and then asked the Members and Associates to consider what the substantial goals and objectives for the ARHC should be for the next ten years.

Internal to the ARHC, it was felt that the Commission needs to maintain its technical (non-political) focus and remain a clearinghouse for new ideas and best practices. At the IHO level ARHC must remain cognizant of the strategic directions of the organization, e.g. the IHO Strategic Plan, potential adoption of a 10-year S-100 implementation strategy, the potential application of a WENS approach, and etc.. In addition, the Commission must set some objectives that will represent meaningful engagement and contributions to the Blue Economy and other global initiatives . Examples cited included: Seabed 2030, UN Decade of Ocean Science, UN Sustainable Development Goals (SDGs), and the IMO Polar Code. ARHC must also be prepared to give voice to the many stakeholders in the Arctic region, who use the hydrographic services for both navigation and non-navigation purposes. In particular, ARHC should develop a good relationship with the Northern peoples who live and work in the Arctic.

Very much related to engagement, it was suggested that ARHC continue to cultivate its external relations with the other groups active in the region. Specifically, PAME and Arctic SDI.

It was agreed that the Statutes of the ARHC should be reviewed with consideration given to the topics discussed.

**ACTION:** *US and CA to review and draft new ARHC statutes for presentation at ARHC10.*

### B.1 IHO Secretariat's Report

The Secretary General presented the IHO Report which highlighted many issues related to IHO MS in general and to the ARHC specifically. Some of the key points are as follows:

- Guyana, Solomon Islands and Ghana are the 90<sup>th</sup>, 91<sup>st</sup>, and 92<sup>nd</sup> Member States of the IHO.
- Preparations are well underway for 2<sup>nd</sup> Assembly in April 2020.
  - The IHO work plan and budget will be presented for approval, as will the new Strategic Plan.
  - There will be a half-day session on the history, the present, and the future of international cooperation in hydrography.
- Outcomes of C-2 and preparations for C-3.
  - Except for Iceland, all ARHC MS are members of the IHO Council. RU is the current ARHC rep. ARHC will have one seat in the next Council. MS have until 20 October 2019 to declare which RHC they wish to be associated with.
  - Key items to be discussed and for which MS should be prepared to discuss include:
    - The approval of the IHO work plan and budget for the next three years;
    - The Strategic Plan review and what is to be presented at A2;
    - The roadmap for the decade of S-100 implementation; and,
    - The transformation of WEND (world-wide ENC database) to WENS (world-wide electronic navigation services).
- Great improvement to the INTToGIS will improve, among many other things, the management of INT chart and ENC production in Region N and all regions.
- The SG recommended that ARHC consider providing regional CATZOC practices to the DQWG.
- MSI is in transition from a propriety standards-based operational model to Web-based services.
- The report invited ARHC MS to identify capacity building opportunities (in funding and/or in-kind contributions), and if any such activities are being considered that they contact the relevant Capacity Building Coordinator.
- The crowd-sourced bathymetry (CSB) guidance document B-12 was approved and the results of Annex B of CL 11/2019 are being compiled and a positive list will be published prior to C3 and posted on the IHO website. The list will remain active so that MS may continue to add to it once their situations are clarified. It was noted that CSB does not fall under Marine Science Research (MSR) rules and the SG is working on clarity with various bodies.
- MS and other CSB practitioners should consider the DCDB to be the “basket” of CSB. MS are invited to identify further potential sources of bathymetric measurements and survey data providers to facilitate the further supplementation of the DCDB holdings.
- A new Director of Seabed 2030 will be hired by IHO and will be directed by the IHO Secretariat.
- The GEBCO grid coverage increase from 6% 2014 to 15% 2019
- ARHC MS encouraged to continue to contribute to Seabed 2030.
- ARHC was invited to look at the Quantarctica GIS package for the Antarctic operated by the Norwegian Polar Institute as a possible model and application for collecting similar spatial datasets for the Arctic.

-ARHC MS were reminded to review their P5 and C-55 entries and update as required or to report no updates.

-IHO outreach:

-There will be a new IHO website by 1 January 2020.

-There is a new corporate design available and ARHC MS are encouraged to replace old logos on product with the new logos and designs as soon as possible.

-The International Hydrographic Review (IHR) has a new editor in the person of Brian Connon of the University of Southern Mississippi. Denis Hains has also joined the editorial board. The SG acknowledged the excellent contribution of the University of New Brunswick which took on the task of digitizing the whole IHR collection. This archive is now available to the public. MS are encouraged to make submissions to the IHR and there is a desire to make this publication rated.

-Centenary preparations are underway and the celebrations will culminate in 2021 at the IRCC meeting which will be held in Monaco.

-The report noted that Germany had published a tender to study the detrimental effects of underwater noise exposure for the Antarctic Ocean and it was suggested that the ARHC could be proactive and do something similar for the Arctic. DK indicated that the HELCOM report on the Baltic addressed this issue and that DK would report back to ARHC.

-The IHO will be accepting application for two assistant directors in 2020 (see CL 24/2019).

-The IHO will continue to pursue Observer status at the Arctic Council, though it was noted by IT that there are several other ways to influence the Arctic Council.

-During the discussion on the presentation by the SG, IT brought to the attention of the MS the importance of CATZOC and that at the next S-100 DQWG will make a presentation on the consistent use of CATZOC.

***ACTION:** (SG recommended) ARHC Member States who are members of more than one RHC are encouraged to express their preferences at their earliest convenience and no later than 20 October 2019.*

***ACTION:** (SG recommended) ARHC consider providing regional CATZOC practices to the DQWG.*

***ACTION:** (SG recommended) ARHC MS to identify capacity building opportunities (in funding and/or in-kind contributions), and if any such activities are being considered that they contact the relevant Capacity Building Coordinator.*

***ACTION:** (SG recommended) ARHC MS are invited to identify further potential sources of bathymetric measurements and survey data providers to facilitate the further supplementation of the DCDB holdings.*

***ACTION:** (SG recommended) ARHC members are invited to consider the future invitation of Seabed 2030 project representatives to ARHC meetings to discuss options for deepened cooperation and support.*

***ACTION:** (SG recommended) ARHC to inform PAME on the new ATCM Resolution on hydrography that was adopted at ATCM42 (annexed to this report) and whether it would be appropriate to pursue along the same lines report to the PAME for the same purposes.*

***ACTION:** (SG recommended) ARHC Member States are encouraged to replace the IHO old logo on all sorts of nautical publications and communication means by the IHO new logo soon the opportunity arrives.*

***ACTION:** (SG recommended) ARHC Members are invited to submit papers for publication in the IHR and to look for continued contribution to the IHR Editorial Board.*

***ACTION:** DK to report back to ARHC regarding information in the HELCOM report on detrimental effects of underwater noise exposure that may be applicable to the Arctic.*

*Docs:*

*- ARHC9 B1 IHO Secretariat's Report to ARHC*

## **B2. IRCC Summary Actions**

This report was delivered by RDML Smith (US) and this agenda item was to review the list of actions for RHCs that resulted from IRCC11.

Key points included:

- RHCs are encouraged to submit data in shallower waters to GEBCO, and to submit data, both HO data and CSB to DCDB. [DCDB data can be mined by GEBCO/Seabed 2030, but data submitted to GEBCO only does not get added to the DCDB.]
- RHCs are encouraged to resolve any remaining ENC overlaps. The overlaps in the ARHC region have all been assessed as low-risk.
- RHCs are encouraged to share CATZOC best practices. This action was captured previously.
- RHCs are encouraged to review the C3 submission on Decade of S-100 Implementation in preparation for discussion.
- ARHC must appoint a representative to the IHR editorial board.

**ACTION:** *Add the appointment of an ARHC IHR rep to the agenda of ARHC10.*

*Docs:*

*B2a IRCC Report to RHCs Annex C*

## **B3. Group Photo**

### National Reports

National Reports can be found on the ARHC9 website.

[http://iho.int/mtg\\_docs/rhc/ArHC/ARHC9/ArHC9Docs.html](http://iho.int/mtg_docs/rhc/ArHC/ARHC9/ArHC9Docs.html)

### **Canada**

The following items were reported:

- Organizational updates.
- The status of hydrography and charting in the Arctic and plans for the upcoming year.
- The launching of the first ship in the Arctic and offshore patrol vessel class by the Royal Canadian Navy.
- New developments were also highlighted:
  - Automation of paper chart production from ENCs. IT (and c/HSSC) reminded MS to complete the circular letter survey on the future of the paper chart.
  - Creation of a grid for ENCs and other S-100 products.

CA invited all ARHC MS to participate in these developments.

CHS is in the process of transformation and the developments above as well as the digitization of all source and navigation products, will increase the rate of data throughput that puts information in the hands of users in a more timely fashion, improves data management, data accessibility, and production efficiencies. The transformation will be in line with the IHO strategic direction.

The Arctic remains both a challenge and an opportunity.

*Docs:*

- ARHC9 B4.1 CA National Report Canada

## **Denmark**

It was reported that surveys are to cover 80% of in-shore routes of Greenland and that there is a backlog of survey data that must be processed into chart information. A new production plan for Greenland, based on several criteria, e.g. mining projects, areas of unpublished data, has been developed to accelerate coverage. The plan is projected to produce six new charts for Greenland per year.

Denmark is also implementing a new depth database (TeledyneCARIS) to support flexible production and data management. Some further cost/benefit analysis is required to determine how far back into the data archive to go. ESRI ArcGIS for Maritime has been selected as the unified (Denmark and Greenland) production system. This change management project is more than a technical project.

A business case for MSDI has been developed using the standardized business case development approach which is employed in Denmark. This was done with 11 other marine authorities and is open for more engagement from other organizations. The business case indicated a strong demand for the Danish MSDI.

A business case for free hydrographic data (everything except ENC's) was completed and it indicated great potential economic/financial and environmental benefits. Investment, new business model, change in distribution, and enhanced surveying were noted as ways to maximize the benefits of free hydrographic data. Accessibility to bathymetric data models was cited as the greatest "pay back".

*Docs:*

- ARHC9 B4.2 DK National Report Denmark

## **Norway**

The national hydrographer of Norway reported that the Norwegian Hydrographic Service (NHS) is in a constant state of change due to developments in technology and the evolving demands of data users. Several new developments and pilot projects were highlighted.

Norway is carrying out pilot projects for digital nautical publications, S-102 and other S-100 products production and distribution, and marine base maps in Norway. To those interested, it offered to demo the new digital nautical publications application.

NHS has been testing and developing condensed depth curves for use in the Port of Bergen. Other ports have expressed an interest in this product and NHS will start regular production of them in selected areas.

The organization is developing and implementing a new hydrographic infrastructure that will be designed to automate processes (including self-service solutions), increase data throughput, and better position the organization to meet new user needs for products and services.

It continues to be active with other Norwegian mapping initiatives (e.g. MAREANO) in both coastal and open sea Arctic areas. For some projects the importance of being able to integrate land and sea data is becoming clear.

Related to several of the above, NHS is also participating in the development of a marine spatial planning tool. This is a cross-sectorial government initiative to integrate multi-thematic geospatial information relevant for marine management planning.

Norway emphasized its commitment to the Seabed 2030 initiative and continues its capacity building activities with its projects with Albania and Montenegro.

*Docs:*

- ARHC9 B4.3 NO National Report Norway

- ARHC9 B4.3 Presentation: New Hydrographic Infrastructure

- ARHC9 B4.3 Presentation: S-100 Developments
- ARHC9-D1.2 Marine Spatial Management Tool

## **Russian Federation**

An overview of the structure and the purpose of the Department of Navigation and Oceanography (DNO) was explained.

The fact that each fleet has its own hydrographic units was noted as was the programme to upgrade or replace hydrographic equipment (e.g. mobile multi-beam echosounders, etc.), ships, and launches.

The Russian Federation reported that DNO is responsible for 901 nautical charts in Arctic waters, and also reported on the new charts and updates (both paper charts and ENC) that have been produced.

Several new ENC schemes were presented as part of future plans. Updating of older charts of the Northern Route portfolio is a priority for DNO.

The link to the NOTMAR site was provided, and it was noted that DNO's current print-on-demand system contains more than 4111 charts.

Regarding MSI, the existing infrastructure and new infrastructures in accordance with the GWDSS plan, were discussed.

The Russian Federation continues to active on Regional Hydrographic Commissions and IHO sub-committees and working groups.

*Docs:*

- ARHC9 B4.4 RU National Report Russian Federation

## **United States of America**

USA reported that it is re-scheming its ENC portfolio and this effort will increase the portfolio from 1266 to over 9000 ENCs. A link to an up-to-date status of this project was given. Cells will be clipped to the US EEZ. Existing overlaps are being addressed.

Two Arctic surveys and autonomous survey vessel (ASV) testing were discussed.

The USA highlighted the publication "Projection of Maritime Activity in the US Arctic, 2020-2030". This publication describes the current and potential future scenarios for shipping activity, ice extent, length of shipping season, and temperate trends in the US Arctic.

There has been considerable work on VDatum and vertical transformation models. These efforts have enabled ellipsoid-referenced surveying and ties land datums to hydrographic datums. These are common challenges for all Arctic nations and asked other ARHC MS for input and/or collaboration on this project.

*Docs:*

- ARHC9 B4.5 US National report United States of America
- "A Ten-Year Projection Of Maritime Activity In The U.S. Arctic Region, 2020—2030" Executive Summary

## **Finland**

The Finnish Hydrographic Office became a part the Finnish Transport and Communications Agency Traficom on 1 January 2019. This structure will have about 1000 employees.

The focus of hydrographic surveys is moving towards shallow coastal nearshore areas, but the production of new editions of nautical charts is limited due to the ongoing system development projects. A project for the migration of bathymetric data to the new Bathymetric Data Management System (MERTA) is ongoing and a project to renew the nautical chart production system (AHTI) is also underway.

Finland has been gaining experience in new survey techniques, specifically LiDAR. Good results have been achieved but they are still in the development phase. There was a discussion regarding if and how LiDAR data is being shared. Generally, this does not happen “automatically”, though Norway noted that there is great interest in 0-5m data. Finally, it was noted that an implementation project called "New vertical chart reference N2000" has started.

*Docs:*

- ARHC9 B4.6 FI National Report Finland

## **Iceland**

It was reported that the name of the department as it is written in English has been changed to Hydrographic and Maritime Safety Department (ICG-HMSD). The department is within the Maritime division of the Icelandic Coast Guard. Iceland also described some of the personnel changes that are taking place.

Hydrographic surveys carried out by the department and Icelandic port authorities were highlighted, as were outputs and plans for both paper chart and ENC new products and updates. Internally, there are also some changes taking place to the production environment.

*Docs:*

- ARHC9 B4.7 IC National Report Iceland

## **Italy**

The Italian Navy – acting as national marine focal point for Arctic research activities – with the scientific support of the Italian Hydrographic Institute, in 2017 launched the Pluriannual Joint Research Program in the Arctic named «HIGH NORTH», to contribute to oceans knowledge, from a hydrographic point of view and, more generally, to the marine science.

The program’s main messages: data sharing, oceans knowledge, exploration, monitoring, new technology, and education. During the High North17 and High North18 campaigns, multibeam data was collected, using a Kongsberg EM 302 installed on board Italian R/V Alliance. All the collected hydro-oceanographic data were made available to the Norwegian Hydrographic Service and to the International Bathymetric Chart of Arctic Ocean (IBCAO), through the University Centre in Svalbard. Italy started the ArNaCoSky project (Arctic Navigation with COSMO-SkyMed) to distribute information on the state of the ice ahead of the route, and maritime traffic of cooperative and non-cooperative vessels.

*Docs:*

- ARHC9 B4.8 IT National Report Italy

## Discussions regarding A-2, C-3, and the IHO Strategic Plan.

It was noted that for the Second IHO Assembly (A-2), each regional hydrographic commission must submit a short brief of their activities since A-1 and their planned activities for the next Assembly cycle. For ARHC it was agreed upon that the report will focus on a very small number key messages. As c/ARHC, USA will prepare this report with support from CA.

The USA-NOAA, who is also the c/Council led the discussion on the preparations for C-3 including a review of the Red Book items. The key items on the agenda are: the draft IHO Strategic Plan; the S-100 implementation roadmap; the transition from WEND to WENS; and, the proposed IHO lab in Singapore.

There was general agreement that the proposed strategic plan was workable and it met most of the objectives that the Council tasked to the SPRWG. Some of the strategic plan indicators (SPIs), that is, indicators for success toward the goals, need some more work, but it was felt that these could be put in an appendix or separate document where the Council, in conjunction with the Committees and Working Groups, could develop them further. c/Council stated his intention to endorse the draft strategic plan but to also to propose amending the TOR of the SPRWG so that the mandate of the group can be extended so that it can coordinate the final SPI for presentation to C-4.

Regarding the S-100 Implementation road map, the Secretary General reminded members that the IHB was established nearly 100 years ago on the philosophy to strive for the greatest uniformity for nautical charting. With the move to digital navigation and S-100 this philosophy is as important as ever. Unlike paper charts, the IHO MS need partners (IMO, OEMs, RHCs, etc.) to make this happen and that is why the road map for the next decade is so important. A step-wise implementation with engagement of stakeholders can help generate a “pull” for S-100 and related e-navigation products and services. Implementation must be thoughtful (focus on areas like ports where impact is highest) and coordinated (RHC working together to ensure no gaps in coverage).

As an example, the proposed transition from S-57 to S-101 ENC's will involve a period of dual-fuel where HO's are providing ENC's in both formats. Afterwards, e.g. five years the S-57 can begin to be withdrawn. Convertors are already available that will lessen the stress on some HO's to produce and maintain ENC's in the transition.

After a discussion on the transition of WEND to WENS, ARHC9 approved the concept.

For C-3, Singapore has submitted a proposal to setup and maintain an innovation and technology lab at its own expense under the banner of the IHO. Members were generally supportive of this proposal, but there were requests for more information regarding IHO branding, the governance, and the objectives of the lab. It was noted that the intention is not to QC products but the IHO should be involved in setting out the work programme of the lab. One Member had already visited the facility and agreed that this was a good opportunity for the IHO, once the outstanding issues were sorted out. It was pointed out that there are some precedents for IHO relationships with other agencies. The MOU with ROK for A-100 infrastructure and the NOAA-supported IHO DCDB were cited as examples. The Secretary General reminded Members that each arrangement does add an incremental amount of work to the IHO Secretariat.

*Docs:*

*ARHC9 B5 Agenda C3 (includes Strategic Plan Review Working Group)*

*ARHC9 B5.1 Redbook C3*

## Reports from ARHC Working Groups.

### **Operational and Technical Working Group (OTWG) Report**

c/OTWG, Mr Corey Allen (US), delivered this report. He reported that there has been some recent changes to membership of the group, but it was hoped that there will be a period of stability that will allow the group to be more active.

**ACTION:** MS to confirm OTWG membership by end of next week.

CA and FI also made presentations under this item.

The OTWG is the custodian of the ARHC's Arctic Hydrographic Adequacy report. It was proposed by the c/OTWG that this report be updated on a five-year cycle. ARHC endorsed this proposal. For this to be useful, each MS must provide CATZOC data to the OTWG for this cycle.

**ACTION:** *MS to provide the OTWG with their latest CATZOC data.*

The Secretary General suggested that the OTWG look at the Baltic Sea Hydrographic Commission as a good example of a status of survey assessment approach.

Understanding the water level regime is also important for providing the best inputs possible, as is understanding of the requirements for Northern communities. All of these items should go into a Best Practices and Outreach document.

ARHC endorsed the OTWG recommendation for pan-arctic vertical datums.

**ACTION:** *OTWG to review the vertical datum situation in the Arctic and report back to ARHC.*

CA presented on its Arctic chart adequacy methodology which has several basic similarities with the ARHC method. Participants were asked to consider how these methodologies could be streamlined under C-55 and INTOGIS.

Finland provided ARHC9 an overview of its Intelligent Marine Fairway project. There were three test data sites for bathymetric surface data based on the S-102 specification. The testing was carried out on a bridge simulator and some pilots did some evaluation as well. The pilots were quite interested, however, there were some operational issues, e.g. interoperability between the water level data and the bathymetric surface. The system used OpenCPN with the 'Depth Plugin' extension. ARHC noted that this was a very pertinent project and a good outreach effort by Finland. When asked if this project is part of the groundwork for autonomous vessels, FI replied, "Yes".

*Docs:*

*ARHC9 C.1 Report of the Operations and Technology WG*

*ARHC9 C.1a v2 Arctic Hydrographic Adequacy (CA)*

*ARHC9 F.1 Intelligent Fairway Project (FI)*

**ACTION:** *US and CA to draft the ARHC report to A-2.*

### **Arctic International Charting Coordination Working Group (AICCWG) Report**

Norway, as Chair of the AICCWG delivered this report.

In a follow-up to an Action item from ARHC8, the WG presented its proposed revised TOR. ARHC endorsed these changes.

The status of the ENC scheme in Region N was presented. There has been new ENCs released from several countries and it was noted that the USA has produced two new ENCs based on its new gridded layout.

Significant work on resolving ENC overlaps in Region N was reported and all but three situations have been resolved. The remaining overlaps have been assessed as "low risk".

Finally, the AICCWG coordinator has been involved in the testing of INTOGIS II and has provided feedback to the IHO.

**ACTION:** *c/AICCWG to investigate the ENC scheme looking at the existing ENC coverages.*

**ACTION:** *AICCWG to consider appropriate gridding of ENC-schema for the Arctic, taking into consideration CA national report.*

**ACTION:** *AICCWG to consider renaming their WG in recognition of focus on ENC's and other services .*

*Docs:*

*ARHC9-C2 Report of AICCG*

## **Arctic Marine Spatial Data Infrastructure Working Group (ARMSDWG) Report**

The last ARMSDWG meeting was held back-to-back with the Arctic SDI meeting. These meetings highlighted that there are different levels of maturity vis-à-vis MSDI between MS. There was some discussion on whether or not ARMSDWG should establish a formal working arrangement with Arctic SDI, but it was determined that the informal relationship that now exists is working well enough. Arctic SDI appears to be less interested in a formal agreement.

**ACTION:** *MS are encouraged to ask their Arctic SDI representatives why they are not supporting collaborative ARHC projects.*

Regardless of the type of structure, a draft joint statement between ARHC and Arctic SDI is being developed.

Other outreach activities continue on many fronts and the c/ARMSDWG attended the 9<sup>th</sup> UN-GGIM meeting (August 2019) in New York.

**ACTION:** *MS are encouraged to complete AVPG questionnaire by October 25<sup>th</sup>.*

This feedback is essential for planning and prioritizing future work.

The WG is now using on-line tools to work collaboratively and this has been quite effective. It will investigate increasing the use of virtual meetings to keep participants' costs as low as possible.

The reuse of hydrographic office and marine networks data using the Arctic SDI Portal was demonstrated. It was noted that this is fairly straightforward to do (though not particularly user friendly) and that there are many possibilities in this domain. Norway mentioned that its marine spatial planning tool could be used as a demonstrator to get more people interested and involved.

There does appear to be the need for more discussion on what ARMSDWG/ARHC wants to provide: its own portal or some other arrangement.

**ACTION:** *c/ARMSDIWG to develop AVPG plan for ARHC.*

**ACTION:** *c/ARMSDIWG investigate if the Arctic SDI portal is useful for ARHC.*

It was reported that the OGC-IHO Marine Spatial Data Infrastructure Concept Development Study (MSDI-CDS) has been completed and the engineering report has been posted. A group will review the report and determine what are the most useful and applicable items.

The WG still requires support and the c/ARMSDIWG asked if MS are willing to increase contributions of time and effort e.g. technical expertise, to the WG.

**ACTION:** *All MS to update participants list for ARMSDIWG.*

*Docs:*

*- ARHC9 D1a Arctic MSDIWG report*

*-ARHC9-D1.1 ARMSDIWG & Arctic SDI Collaboration Decision Paper: Resource Support*

Hydrographic Office: Policy, Practice and Technology

## **Unmanned Systems for Hydrography (NOAA)**

This presentation highlighted the OCS experience and strategy for unmanned systems.

Since 2004 OCS has been working with both small and larger unmanned systems, and to a lesser extent with unmanned aerial systems (small drones). Launches modified for unmanned operation have also been tested.

Two examples new technologies are the iXBlue Drix ASV being tested at UNH and the SailDrone being tested at USM. The SailDrone has been previously tested in Arctic waters.

Whatever system has been deployed, there is always the need for enabling technologies, e.g. high bandwidth. Skilled personnel are required to operate and maintain these systems. Ships almost always need infrastructure upgrades and the crew must have the required skill set to hand the equipment. NOAA has found that these systems can be worthwhile only if they provide new capabilities; a one-for-one replacement of manned platforms in existing mission profiles is not effective. Strategically, NOAA is developing enabling technologies (reduce shipboard processing), maintaining operational expertise, supporting operational innovation, and collaborating with others to moderate the cost of the systems. It is also being pro-active with operations best practices (to get ahead of regulation).

At the end of the presentation, it was suggested that NOAA share this information with the wider community, perhaps via an article in IHR.

*Docs:*

*ARHC9 C2 "OCS Unmanned Strategy"*

### **Briefing on the visit of IMO General Secretary to Greenland August 2019**

The polar region has different operational requirements and the cooperation of many stakeholders is a necessity.

Denmark led the discuss on how the ARHC can engage with the IMO. IHO reported to the IMO during the development of the Polar Code but there have been no further discussions on the Arctic since.

A couple suggestions were for ARHC to make a presentation to NCSR and/or to re-send the 2017 ARHC communication on the need for caution when navigating in Arctic waters.

In the opinion to the Secretary General, the best approach is for HOs to firstly ensure that they have the maximum amount of data, particularly ENC's, available in the region.

*ACTION c/ARHC to investigate the best way to engage on this matter, e.g. PAME.*

### **Change of paradigm on production plan for Greenlandic charts**

DK realized that it had to accelerate throughput of hydrographic data in order to increase service to end users. For this to happen, it meant being more pro-active e.g. meeting with pilots and nautical committee, other stakeholders.

It also required a change in its approach to production. To this end, it implemented the simple ENC project. Next step is to go to a simplistic ENC. There will be no new paper charts in these areas, for the time being. This allows the organization to be much more nimble; this is not a production strategy but a portfolio strategy.

### **Sunset of NOAA Raster Chart Production**

OCS-NOAA outlined its plans and rationale to discontinue raster chart production. Its analysis of data indicates that ENC sales continue to increase while the trend in sales of paper charts continues downward. At the same time, paper charts constrain HOs to years-to-decades timeline. Breaking the link between paper charts and ENC's allows HOs to provide information that is much more dynamic.

To this end, NOAA will stop raster chart production by 2024. Stakeholder engagement (users, dealers/distributors, after-market service providers, etc.) is required to smooth the transition from raster to ENC only. Their plan is to start cancelling raster charts and related products in 2020. There is no intention to make paper charts for new re-schemed ENC's. No traditional paper charts will be produced but PODs from ENC's will be available.

This new approach will allow the organization to re-focus internal resources on new ENC production. In fact, NOAA has stopped training in cartography.

NOAA will continue to supply NOTMARs but will not add chart maintenance info to paper charts, that is, no chart corrections.

ENC scales will be reduced to 8 and all ENCs available by a “custom chart” application and there will be some areas where ENCs will not be built because there is no data.

This subject led to a lively discussion and it was evident that there are great differences between HOS in the level of preparedness to transition away from paper. One MS noted that it uses POD of paper charts and that its Navy ships will need paper as primary or backup navigation for the foreseeable future. A question was asked about standardization and there was an exchange of ideas on paper chart demands. It was agreed that these discussions will continue for some time to come.

*[ACTION:](#) Member States are invited to send ENC samples to CA for paper chart 2.0 testing*

*[ACTION:](#) Member States to include their plans for paper chart production/maintenance in their national reports next meeting*

*Docs:*

*ARHC9-D9.1 Sunset of NOAA Raster Chart Production*

### **Status on preliminary findings for defining our future role as the Danish Hydrographic Office – initiated due to implementation of new chart production system and the need for a ‘National Depth Administrator’**

Discussion on this subject was deferred.

### **New Hydrographic Infrastructure (NO)**

Discussion on this subject was deferred.

### **New Chart ambassador Project in Greenland – how to improve the use of charts for small boat users**

Discussion on this subject was deferred.

### **Marine Spatial Management Tool: Norwegian project “Improving access to marine data in the Arctic” NO**

See NO National Report.

### **Data Policy, Crowd Source Bathymetry**

See discussion on CSB.

## ARHC Coordination, Liaison and Outreach

### **IHO MSDIWG Report**

The MSDIWG10 meeting of IHO Marine Spatial Data Infrastructures Working Group (MSDIWG) took place in Busan, Republic of Korea, 4 - 5 March 2019. The meeting was followed by the OGC Marine DWG Meeting, 6 March 2019 and the UN-GGIM Working Group on Marine Geospatial Information (WGMGI1) Meeting, 7 - 9 March 2019.

It was noted that while these back-to-back-to-back meetings were strenuous, there was the synergetic effect of having many of the key groups involved in spatial data infrastructures meeting in the same location during the same week.

Work Plan 2018–2021. The Work Programme was discussed and evaluated at the MSDIWG10 based on recent achieved results with a focus on MSDI from an international, regional and national perspective. In order to deliver this Work Programme, eight MSDI Tasks have been established.

The IHO/MSDIWG will continue to facilitate a MSDI Open Forum which would allow non-MSDIWG stakeholders (e.g., Regional Hydrographic Commission (RHC) Members, government, academia, industry, funding agencies and NGOs) to attend to identify what the MSDIWG and the commercial partners can offer. The key interest for the IHO is enabling Member States to ensure MSDI provides a framework for the provision of hydrographic information beyond the traditional field of surface navigation. The MSDIWG is working with the UN-GGIM Shared Guiding Principles for Geospatial Information Management as a framework and the principles are incorporated in the existing work program for the MSDIWG.

From IRCC9/18 RHC Chairs to encourage Member States in the region to nominate RHC MSDI Ambassadors to promote MSDI and to help Member States to prepare the national reports with respect to the status of MSDI. At ARHC8 it was decided that this was not necessary for this region given the high degree of ARHC representation on the MSDIWG.

MSDI was highlighted at IRCC as an important component of the future development of hydrographic offices, but there is very little, basic teaching material available for MSDI training. To address this situation IRCC tasked the IHO MSDIWG to establish basic MSDI training material. The Danish Geodata Agency (DGA) volunteered to finance the development of the training material. The MSDI training material should be available free of charge from the IHO webpage and from the DGA webpage. There are two phases to the training: Phase 1 – MSDI Orientation; and, Phase 2 Fundamentals of a Marine Spatial Data Infrastructure.

The MSDIWG has discussed data security from a MSDI perspective. The conclusion the MSDIWG came to when looking at these issues from the MSDI perspective was that one of the main priority is actually data “integrity”, also dealt with comprehensively by IHO S-63. Data integrity establishes two pieces of knowledge for data users, (1) knowing who a piece of data came from and (2) the knowledge that the data has not changed in its journey to the end user.

*Doc:*

*ARHC9-D1b Report of MSDIWG*

## **UNGGIM**

a) UNGGIM MGIWG work plan and activities was to focus on UN sustainable development goals

-Discussion on this subject was deferred.

b) Integrated Geospatial Information Framework (IGIF) by UN-GGIM

NO stated that MS should become familiar with this framework and DK noted that MSDIWG already working with this.

[ACTION:](#) *Member States to Include UNGGIM MGIWG work plan and IGIF brief to next ARHC meeting.*

## **Crowd Source Bathymetry, ARHC contribution to Seabed 2030**

### **(includes GEBCO/IBCAO/SB 2030 and CSBWG)**

These reports given by Norway (Evert Flier).

GEBCO has made good progress in the last few years, primarily through making existing data accessible.

Seabed 2030 (sponsored by Nippon Foundation) has been initiated and can be connected to the UN Decade of Ocean Science and UN SDG-14 (Life below water). The strategy of Seabed 2030 includes partnership, sharing and acknowledging. Sources include governments, academia, industry, private citizens, and others. The “crowd” may be a key player.

ARHC should consider itself a stakeholder. Fortunately ARHC has a POC in NO who has a seat on the GEBCO Guiding Committee (GGC).

At ARHC9, US nominated NO (Evert) seconded by CA, to be ARHC rep to Seabed 2030.

The goal of Seabed 2030 is 100% coverage of the seafloor with a data point. What does 100% mean? It means at least one depth measurement (or sounding) for each grid cell. The grid sizes vary with depth. This is what is expected:

Depth range	Grid cell size	% of world ocean floor
0–1500 m	100 × 100 m	13.7
1500–3000 m	200 × 200 m	11
3000–5750 m	400 × 400 m	72.6
5750–11,000 m	800 × 800 m	2.7

Source: <https://seabed2030.gebco.net/fag/#q3>

There is a need for GEBCO to provide RHCs with better information on what data is required, or perhaps, for the RHCs to ask and/or carry out their own analysis.

Other challenges for “completing the map include”: existing data that is not yet integrated; metadata that is good enough for data that exists but cannot be made public (for various reasons); the costs of new data acquisition. Fortunately, technology and innovation can help the acceleration of data input. It was noted that there is a need for updates in the Arctic region.

NO has MOU with the Marine Research Institute in Norway for their research vessels to collect and submit bathymetric data whenever they can. This requires the engagement of scientific staff which can present some mission challenges, of course. Engagement with industry must also take place

ARHC acknowledged the letter from c/DCDB regarding data holdings for Region N.

NO presented a CSBWG update.

IT commented that most HOs are okay with CSB (e.g. B-12 has been accepted), but the use of CSB on official products, can be problematic.

It was mentioned that there is an MOU between IHO and ICPC (who presented at IRCC11), but it does not specifically mention data sharing because most of this data is under national control.

It was noted by CA that case studies could be used demonstrate the value of contributing with DCDB and perhaps, that should be built into CB programs. RU stated they are trying to make use of DCDB and CSB.

CA described its intent to use DCDB as another source which is build it into process, but there is a need to invest in DCDB to make it easier to input and extract data. It should also have a 'gatekeeper' function to ensure all mandatory metadata is present on upload.

DK pointed out that CATZOC knowledge by end users is limited. There is a need to address this gap and clear up the confusion between S-44 Hydrographic Survey standard and CATZOC.

**DECISION:** *Evert Flier nominated and appointed ARHC rep to Seabed 2030 project .*

**ACTION:** *ARHC Seabed 2030 rep to deliver a gap analysis for Seabed 2030.*

**ACTION:** *Review content of letter from d/DCDB and submit comments to c/ARHC10.*

**ACTION:** *c/ARHC to respond to same letter from DCDB.*

*Doc:*

*ARHC9-D2 Crowdsourced Bathymetry*

*ARHC9-D3 IHO DCDB Letter dated 16 September*

*ARHC9-D3 IHO DCDB Presentation*

### **Arctic Council Working Group**

#### **Arctic Shipping Best Practice Information Forum and future cooperation with PAME**

The Forum topic related to Polar Code and a very large and a wide community participated.

A portal is now available related to the Polar Code. MS should review with aim to provide comments for improvements, particularly Chapter 9 on Safety of Navigation ( <https://pame.is/index.php/chapter-9> ).

IHO MS and perhaps the ARHC should take ownership of some of the data components in the portal. [Is this a place where the ARHC Caution Note on Navigation in the Arctic should reside?]

It discussed that ARHC should try to participate in a future forum to promote cross-participation.

A discussion on whether or not there should there be a WG (permanent or ad hoc) for a more structured approach to outreach, or at least a list of strategic partnerships.

**ACTION:** *US-CA to report back with next steps at ARHC10.*

This action may link with the statutes review action.

The draft ARHC-PAME MOU key points were reviewed.

It is a high-level, non-binding agreement, which PAME has approved in principle.

ARHC9 had no further comments on the circulated draft MOU and, hence, ARHC agreed in principle to this MOU.

**DECISION:** *ARHC approves in principle the PAME-ARHC MOU*

**DECISION:** *ARHC9 confirmed that c/ARHC can sign on behalf of the Commission.*

*Docs:*

*ARHC9 D4 Arctic Shipping Best Practices Forum Update*

*ARHC9 D4.1 ARHC-PAME Draft MOU*

### **Status of IHO-EU Network WG**

DK reported on the activities of the IENWG.

An MOU exists between the IHO and the EU, which is represented by the Directorate General for Maritime Affairs and Fisheries (DG-MARE). All effected RHCs participate in the working group and DK is the ARHC rep.

EMODnet is an marine information initiative under DG-MARE which aims to improve marine data access. Of particular interest to the IHO MS are the themes on bathymetry and coastal mapping.

The IENWG has gained an observer seat on the EU Sub-group for Marine Spatial Planning. One of the objectives of the group is to develop the coordination between the EU member states for the production and diffusion of interoperable data useful for MSP. This is quite relevant to all HOs. The DK report also noted an issue extremely relevant to many European HOs: That an EU Directive on the re-use of public data and information (that is, data/information to be distributed freely and without charge) is currently being promulgated. DK reiterated the importance for all HOs to engage in the dialogue in regards to the definition of High Value Datasets.

*Docs:*

*ARHC9 C3 Status of IHO-EU Network*

## **Recap and Reflections**

The President of ARHC9 thanked the Russian Federation host for evening the night before and for the extremely interesting visit to the icebreaker *Lenin*.

### **Other Business**

#### **Application for Associate Membership by UKHO**

It was suggested that the statutes be re-written first before making a final decision.

One point to verify is the language regarding associate membership in other RHCs. It was further suggested that there not be more Associate Members than regular members.

The next c/ARHC (USA) will consider an ad hoc meeting at the Assembly

**ACTION:** *Decision delayed c/ARHC10; c/ARHC to inform UKHO.*

*Docs:*

*ARHC9 Application for Associate Membership by UKHO*

#### **ARHC Council representation**

MS who are members in more than one RHC (all ARHC Members) must first declare which RHC they wish to be aligned with for the purpose of the Council. After that, the statutes give the rules for the selection process.

### **Election of next Chair and Vice-Chair**

According the ARHC Statutes USA and CA are scheduled to be nominated next Chair and Vice-Chair, respectively.

Both Members accepted the nominations and all MS voted in favour of the new officers.

### **Next Meetings**

**ACTION:** *Convene an extraordinary ARHC-meeting for core members only at A-2 with main purpose of revision of ARHC statutes.*

The USA invited ARHC to Alaska in August 2020.

The USA pointed out that there are good opportunities for engagement, perhaps a Science day in Anchorage on the way in.

The week of 10 August 2020 was confirmed as the date by the MS.

*Docs:*

*-ARHC9-H U.S. Proposal for Dates and Venue of ARHC10.*

### **List of Actions**

A draft List of Actions can be found in Annex B of this document.

## Close of Meeting

Captain (Navy) Gennady Nepomiluev of the Russian Federation formally closed the meeting, not before receiving a very warm 'thank you' from all of the participants, including the IHO Secretary General.

## ANNEX A

**List of Actions**  
**ARHC8 Meeting, Longyearbyen, Svalbard Norway,**  
**September 11-13, 2018.**

**(STATUS REPORT AS OF SEPT 19, 2019)**

Action #	Agenda Item	Action	Responsible	Deadline / Status	Comments
ARHC6-02	4	MS asked to review entries to IHO C-55, P-5 (Yearbook), and ECDIS back-up, at least annually.	All IHO MS	Permanent	n/c
ARHC6-03	4	Provide updates to S-11 Part B for INT Region N through the INTtoGIS tool, as required (Reminder: in accordance with IHO CL 89/2015), DK and RU are invited to request their ID and password to be able to provide these updates).	All IHO MS	Permanent	n/c
ARHC6-04	4	ARHC International Charting Coordination WG Chair, MS and Associate Members (AM) to report to the IHB on the status and description of the ENC schemes in Region N, for UB1, UB2 and UB3 in particular.	All ARHC MS and AM / AICCWG	Permanent	n/c
ARHC7-13		ARHC MS to include information about Autonomous Vehicles in their National Report DOne	All	Remove	Report, when applicable.
ARHC7-23	5	IHO to include the information about nautical charts of the Arctic Waters in their report to IMO NCSR - Pending	IHO	Pending	?
ARHC7-24	5	NO to produce a Polar projection of chart coverage in the Arctic and send it to IHO for the IHO report to IMO NCSR - Pending	NO	Completed	
ARHC8-01	B.10b	ARHC MS to comment and report to NO on the revised version of IHO RESOLUTION 2/1997 (Annex C of IRCC10 REPORT).	All	Complete	

ARHC8-02	C1	ARHC MS to propose replacement for chair to the OTWG.	All	Complete	Corey Allen (US) new chair
ARHC8-03	C1	CA to update and enhance the A4 flyer “Effects of Noise on Arctic Marine Mammals” with relevant information based on the UN report on anthropological noise.	CA	In progress	CA to report back to ARHC10
ARHC8-04	C2	NO to propose new/revised TORs for the AICCWG in order to include the provisioning of other hydrographic services in the region.	NO	Complete	
ARHC8-05	C2	AICCWG Chair to include data from Iceland in the INT chart and ENC scheming.	AICCWG Chair	Complete	
ARHC8-06	D1	All MS to reply to the ARCTIC MSDI questionnaire published in June 2018.	All	Complete	
ARHC8-07	D1	Connect GEBCO Undersea feature names Gazeteer for the Arctic and Into GIS II charting info into the Arctic SDI Geoportal base map.	ARMSDIWG	Closed	Reported by ARMSDIWG at ARHC9
ARHC8-08	D1	Review joint statement of intent regarding cooperation between Arctic SDI and ARHC	US & IHO sec	Closed	Reported by ARMSDIWG at ARHC9
ARHC8-09	D1	ARMSDIWG Chair to circulate the proposed logo to the MS and ask for comments and/or approval.	ARMSDIWG Chair	Complete	
ARHC8-10	D1	MS to check if they have a Socio-economic study or other relevant studies and best practises and include it in the MSDI portal template.	All	Permanent	MS to send socio-economic study results related to the Blue Economy to the IHO MSDIWG
ARHC8-11	D1	MS to consider participating in the OGC workshop in Washington D.C 23 <sup>rd</sup> of October 2018. Possible to participate online.	All	Complete	
ARHC8-12	D2	US to present their work on datum modelling to ARHC national experts on tides and water level in an online presentation.	US	Closed	Included in US National Report
ARHC8-13	D2	MS to review their Data policy for use in hydrographic services in order	All	In progress	Reported during ARHC9

		to support crowd sourced bathymetry and report at ARHC9.			
ARHC8-14	D2	US to ask on behalf of ARHC to the GCC on how Regional Commissions can best contribute to / support Seabed 2030, specifically for Gap analysis	US	Closed	US (Lowell) attended 35 <sup>th</sup> GEBCO GC meeting
	D6	US and CA to respond to the US and CA representatives of PAME and take appropriate steps to develop a MoU.	US & CA	Closed	Reported to ARHC9
ARHC8-15	D7	NO and DK to pay attention to possible EU projects for cooperation in the arctic region and report to ARHC MS when identified.	NO and DK (as representatives in the IHO-EU Network)	Closed	Reported at ARHC9
ARHC8-16	D9	MS to report to relevant regional CB coordinators if they engage with CB activities in that region	All	Remove	Report when applicable
ARHC8-17	D9	US and CA to participate with GIS experts in the C-55 PT online meeting	US & CA	Closed	CA attended
ARHC8-18	D9	MS to share the best practice on the population of CATZOC values and report to the DQWG	All	Closed	Overtaken by events from C-55 PT
ARHC8-19	E1	ARHC chair to set up an agenda item discussing future membership of and participation in ARHC conferences by observers and stakeholders for the next ARHC conference	ARHC chair	Completed	On agenda for ARHC9
ARHC-20	E2	ARHC-chair to add to the agenda of the next ARHC conference the deferred discussion on the application of UK to become an associate member. NO to inform UK		Completed	
ARHC8-21	E2	Provide input to the 2019 and 2020 IHO Work Program for ARHC	US/ RU	Made permanent	ARHC members to be mindful of the timing/deadlines of contributions to the IHO workplan

<sup>1</sup> [https://www.iho.int/mtg\\_docs/com\\_wg/DQWG/DQWG12/DQWG12-04.4A\\_USA\\_CATZOC\\_project.pdf](https://www.iho.int/mtg_docs/com_wg/DQWG/DQWG12/DQWG12-04.4A_USA_CATZOC_project.pdf)  
[https://www.iho.int/mtg\\_docs/com\\_wg/DQWG/DQWG13/DQWG13-06B4\\_CATZOC\\_Guidance\\_US.pdf](https://www.iho.int/mtg_docs/com_wg/DQWG/DQWG13/DQWG13-06B4_CATZOC_Guidance_US.pdf)

ARHC8-22	F	RU to confirm location of the ARHC conference and confirm the proposed date: 17 to 19 September 2019.	RU	Completed	
ARHC8-23	F	Vice Chair to make a proposal for amendments to the Statutes, in particular to make it possible to arrange alternative venues for the conference.	US	Closed	On agenda of ARHC9

## ANNEX B

**List of Actions**  
**ARHC9 Meeting, Murmansk, Russian Federation**  
**September 17-19, 2019.**

Action #	Agenda Item	Actions	Responsible	Deadline/Status	Comments
ARHC9-01	A.5	Draft updated ARHC Statutes	CA & US	Before A-2	
ARHC9-02	B.1	(SG recommended) ARHC Member States who are members of more than one RHC are encouraged to express their preferences at their earliest convenience and no later than 20 October 2019.	All		
ARHC9-03	B.1	(SG recommended) ARHC to consider providing regional CATZOC practices to the DQWG.	OTWG		Task assigned to OTWG
ARHC9-04	B.1	(SG recommended) ARHC members are invited to identify opportunities in national or regional funding agencies to incorporate hydrographic development in the broader projects supporting developing countries.	All		
ARHC9-05	B.1	(SG recommended) ARHC members are invited to identify further potential sources of bathymetric measurements and survey data providers to facilitate the further completion of the DCDB data holdings.	All		
ARHC9-06	B.1	(SG recommended) ARHC members are invited to consider the future invitation of Seabed 2030 project representatives to ARHC meetings to discuss options for deepened cooperation and support.	US + NO		
ARHC9-07	B.1	(SG recommended) ARHC to inform PAME on the new ATCM Resolution on hydrography that was adopted at ATCM42 (annexed to this report) and whether it would be appropriate to	US		

		pursue along the same lines report to the PAME for the same purposes.			
ARHC9-08	B.1	(SG recommended) ARHC Member States are encouraged to replace the IHO old logo on all sorts of nautical publications and communication means by the IHO new logo soon the opportunity arrives.	All		
ARHC9-09	B.1	(SG recommended) ARHC Members are invited to submit papers for publication in the IHR and to look for continued contribution to the IHR Editorial Board.	All		
ARHC9-10	B.1	DK to report back to ARHC regarding information in the HELCOM report on detrimental effects of underwater noise exposure that may be applicable to the Arctic.	DK	ARHC10	
ARHC9-11	B.2	Add the appointment of an ARHC IHR rep to the agenda of ARHC10.	c/ARHC	ARHC10	
ARHC9-12	C.1	OTWG to report back to ARHC regarding Arctic vertical datums.	OTWG	ARHC10	
ARHC9-13	B.5	Draft ARHC report to A2	CA & US	ASAP	2019-12-15
ARHC9-14	C.1	Confirm OTWG membership	All	28 Sept 2019	
ARHC9-15	C.1	MS to provide the OTWG with their latest CATZOC data.	All	ASAP	
ARHC9-16	C.2	Investigate the ENC scheme looking at the existing ENC coverages	c/AICCWG	ARHC10	
ARHC9-17	C.2	AICCWG to consider renaming their WG in recognition of focus on ENC's and other services	c/AICCWG		
ARHC9-18	C.2	AICCWG to consider appropriate gridding of ENC-schema for the Arctic, taking into consideration CA national report	c/AICCWG	30 November 2019	
ARHC9-19	D.1	Complete and submit AVPG questionnaire to c/ARMSDIWG	All	25 October 2019	
ARHC9-20	D.1	Evaluate AVPG questionnaire and present a paper on the way forward with the AVPG	Chair ARMSDIWG	ARHC10	
ARHC9-21	D.1	Confirm ARMSDIWG membership to its chair	All	25 October 2019	
ARHC9-22	D.1	MS are encouraged to ask their Arctic SDI representatives why they are not supporting collaborative ARHC projects.	All	ARHC10	
ARHC9-23	D.1 / D.4a	Evaluate the Arctic SDI portal for ARHC use	c/ARMSDIWG	ARHC10	

ARHC9-24	n/a	Member States are invited to send ENC samples to CA for paper chart 2.0 testing. Send to <a href="mailto:douglas.brunt@dfo-mpo.gc.ca">douglas.brunt@dfo-mpo.gc.ca</a> and <a href="mailto:louis.maltais@dfo-mpo.gc.ca">louis.maltais@dfo-mpo.gc.ca</a>	All	31 December 2019	This is an open invitation.
ARHC9-25	D	Member States to include their plans for paper chart production/maintenance in their national reports next meeting	All	ARHC10	
ARHC9-26	D.1.4	Include UNGGIM MGIWG work plan and IGIF brief to next ARHC meeting.	c/ARHC10	ARHC10	
ARHC9-27	D.3	Decision: Evert Flier nominated ARHC rep to Seabed 2030 project	n/a	Effective immediately	
ARHC9-28	D.3	ARHC Seabed 2030 rep to deliver a gap analysis for Seabed 2030	ARHC Seabed 2030 liaison	ARHC10	
ARHC9-29	D.3	Review content of letter from d/DCDB and submit comments to c/ARHC10	All	25 October 2019	
ARHC9-30	D.3	c/ARHC to respond to same letter from DCDB	c/ARHC	31 December 2019	
ARHC9-31	D.4a	Follow-up on Arctic Shipping Best Practice Information Forum and future cooperation with PAME (and perhaps baselines for other partnerships) and report to ARHC10	CA & US	ARHC10	Talk to Iceland as current Arctic Council chair
ARHC9-32	D.4	Decision: ARHC approves in principle the PAME-ARHC MOU	n/a	n/a	
ARHC9-33	D.4	Decision: ARHC approved the signing of the non-binding PAME-ARHC MOU by the c/ARHC	n/a	n/a	
ARHC9-34	F	Have extraordinary ARHC-meeting for core members only at A-2 with main purpose of revision of ARHC statutes	Chair		
ARHC9-35	F	Letter to UKHO in response to their application for associate membership	c/ARHC	25 October 2019	