22nd Meso American-Caribbean Sea Hydrographic Commission

22ª Comisión Hidrográfica Mesoamericana y del Mar Caribe

November 30th - December 3rd, 2021

30 de noviembre a 3 de diciembre de 2021

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Tuesday, November 30, 2021

Opening Remarks

Chair of the Meso American - Caribbean Sea Hydrographic Commission, Vice Admiral Edgar Barbosa

Vice Admiral Edgar Barbosa, Meso American - Caribbean Sea Hydrographic Commission (MACHC) Chair, opened the 22nd Conference of the MACHC on November 30, 2021, and welcomed the many members of the MACHC within the region and from other parts of the world and Dr. Geneviève Béchard from the Canadian Hydrographic Service. MACHC Chair reported that Brazil was very honored to organize the conference and hoped that the members of the Commission would find a safe harbor that promotes kindness and a spirit of cooperation.

MACHC Chair noted that unfortunately the pandemic prevented us from meeting in person again, this being the second time that the Commission met virtually, he added the importance of the face-to-face conference for the consideration of the Commission's concerns in addition to the difficulties of distance issues. He remembered and thanked all the videoconferencing infrastructure provided by the US, in addition to the guidance and training.

MACHC Chair highlighted that the international maritime community benefits greatly from the work of the regional commissions. These commissions are intended to encourage all countries in the region to expand their mapping activities, seek advice and technical assistance from IHO and other organizations to improve their capacities, and provide guidance for the implementation of the S-100. In addition, MACHC Chair reported that partnerships between government and non-governmental organizations, academia and industry are crucial to the progress of the commission's work.

Admiral Barbosa then introduced the IHO Director Luigi Sinapi and invited him to make his opening remarks.

Director of the International Hydrographic Organization, Admiral Luigi Sinapi

IHO Director Luigi Sinapi sent greetings from Monaco to the attendees and expressed the unfortunate for the second time in a row to held the conference in a purely virtual format.

Although Covid-19 is still haunting the world, he expressed that the will to meet and discuss current topics in the field of hydrography remains high that would lead to encouraging and fruitful discussions.

IHO Director Sinapi mentioned the enormous challenges that humanity faces in the marine and maritime sectors and the profound transformations that await the international community in the very near future, referring to the decade dedicated to the oceans by the United Nations. He also referred to the digital transformation needed to work with the S-100 Universal Hydrographic Data Model to which IHO is strongly committed through the implementation of the new strategic plan. He mentioned that the specific strategy for transitioning to S-100 standards is being carefully discussed and evaluated at all levels of the IHO, as recorded recently during the recent IHO Council meeting. The IHO Director thanked the presence of Dr. Geneviève Béchard in addition to all the members and guests of the Commission.

IHO Director Sinapi added that MACHC's regional cartographic production is a clear example to be followed around the world and plays a key role in regional coordination.

IHO Director Sinapi concluded by thanking the Chair of the MACHC for guiding the meeting and thanking its members for their commitment and proactive attitude. The IHO Director believes that the Commission can find adequate answers and interesting proposals to face the current challenges. Finally, he thanked the attendees for their attention and wished everyone a successful and interesting 22nd Conference of the MACHC.

Tuesday, November 30, 2021

Formal Open

MACHC Chair thanked the IHO Director Luigi Sinapi for his strong support to the MACHC. He wished a very fruitful and productive conference and then declared the 22nd Conference of the Meso American - Caribbean Sea Hydrographic Commission officially open.

MACHC Chair then moved to Agenda Item 1, MACHC Administration and Organizational Issues.

1. Meso American - Caribbean Sea Hydrographic Commission (MACHC) Administration and Organizational Issues

1.1 Introductions

MACHC Chair informed that there were 13 Full Members attending the meeting so the Commission would have the necessary quorum to hold the conference.

22.1.1	Decision: Established the necessary quorum to carry out the MACHC22 Conference.

MACHC Chair next moved to Agenda Item 1.2, Approval of Agenda.

1.2 Approval of Agenda

MACHC Chair informed that Agenda Revision 3 was in effect and the latest changes to the Agenda.

He explained that the Agenda had been primarily organized around the core work of the MACHC: MSDI; Nautical Cartography; Capacity Building; Survey & Risk; and Disaster Response.

MACHC Chair further explained that some events had been held in advance of the MACHC22 Conference with the support of the United States providing the Interactio videoconferencing platform. These events included a webinar on S-100; a webinar on the Seabed 2030 Project; pre-conference meetings of the MICC, MMSDIWG, MACHC Seabed 2030 POC and CBC. These events were open to all MACHC Members, as well regional organizations, industry, and other representatives who are important partners in these efforts. The results of all these events can be found on the MACHC Initiatives website, as indicated below:

November 3, 2021: MACHC Marine Spatial Data Infrastructure Working Group Meeting

November 10, 2021: Webinar on S-100

November 12, 2021: Webinar on the Seabed 2030 Project

November 16, 2021: MACHC Seabed 2030 POC Meeting

November 19, 2021: MACHC International Charting Coordination Working Group Meeting

November 24, 2021: MACHC Capacity Building Committee Meeting

MACHC Chair displayed and reviewed the topics of the four-day agenda and opened the floor for comments on the Agenda as presented. There were none comments and the Agenda was adopted.

22.1.2	Decision: Approved the MACHC22 Plenary Agenda.

MACHC Chair then moved to Agenda Item 1.3, List of Documents.

1.3 List of Documents

MACHC Chair said that the List of Documents was available on the MACHC22 webpage along with the List of Participants. He noted that there were some presentations that were still missing and encouraged participants to register their attendance at the conference.

22.1.3	Decision: Approved the MACHC22 Lists of Documents and Participants.

MACHC Chair next moved to Agenda Item 1.4, Matters Arising from Minutes of the MACHC21 Conference.

1.4 Matters Arising from Minutes of MACHC21 Conference

MACHC Chair noted that a MACHC Letter was submitted in February 2021 to the Commission with the draft minutes of MACHC21 and requested comments. The comments received were integrated into the report by February 28, 2021 leaving the approval of the minutes at the conference. There were no objections and the minutes of the MACHC21 Conference were approved.

22.1.4	Decision: Approved the minutes of the MACHC21 Conference.

With that, MACHC Chair moved to the Agenda Item 1.5, the MACHC21 Action List Review.

1.5. MACHC 21 Action List Review

MACHC Chair displayed a summary indicating a total of 20 MACHC21 Actions: twelve of them were completed (shaded in green), six were continuous actions (shaded in gray) and two were open actions (not shaded). He noted that only three continuous actions were truly new: the contribution to the International Hydrographic Review, mapping the entire seabed and to make seabed mapping data available to support the Seabed 2030 Project. Regarding four existing continuous actions, they suffered refinements and were consolidated.

MACHC Chair exposed the suggested approach to review the MACHC Actions: review/address only open actions; committee/WG Chairs would address all actions pertinent to their committee/groups; actions incorporated into the MACHC Seabed 2030 Work Plan would be closed; and continuous actions would be included only to show their resolution/determination.

There were four open actions with expiration date up to MACHC22: to check the quality of the information available in INToGIS II for Region B; to explore collaboration opportunities with CDEMA; responses from non-IHO coastal States about their crowdsourced bathymetry policy; and to develop an individual recognition scheme for Latin Americans. And there was another open action regarding the hydrography and cartography course that COCATRAM proposed to organize with the support of the MACHC. Due to the pandemic, it was postponed to December 31, 2022.

MACHC Chair noted that all members continued to suffer from the pandemic for the second consecutive year and it had been challenging and difficult, but found ways to overcome it. MACHC had still made progress since the last MACHC Conference with the work and coordination of the Committee/Working Groups. With that, the floor was opened for comments. There were no comments and thus the review of the actions from MACHC21 was approved and concluded.

22.1.5	Decision: Approved the "updated" version of the MACHC21 Action List.

2. Meso American - Caribbean Sea Hydrographic Commission (MACHC) Developments, International Hydrographic Organization (IHO) Bodies, Policy Aspects

MACHC Chair moved on to Agenda Item 2, addressing policy issues and reports from the IHO bodies that have implications for the MACHC, and welcomed IHO Director Luigi Sinapi to present the report from the IHO Secretariat.

2.1 IHO Secretariat Report (IHO Director Luigi Sinapi)

IHO Director Luigi Sinapi thanked the MACHC Chair for the opportunity to present the IHO Secretariat report to MACHC.

IHO's membership now stands at 95, with Lebanon and Kenya joining and the reinstatement of the Democratic Republic of Congo. The IHO Secretariat stands ready to assist non-IHO Member States with the application process for membership, and to pay High Level Visits to those States in the MACHC region not yet IHO Member States. And recommended MACHC to propose High Level Visits to those States not yet IHO Member States.

IHO Director Luigi Sinapi briefed about IHO Council activities: proposals from HSSC, IRCC and the Secretariat for delivery of the Strategic Performance Indicators (SPIs) for the implementation of the IHO Strategic Plan were approved; the need for IHO to support basic Capacity Building for the migration to S-100; the development of a governance document by HSSC in support of the dual-fuel concept; the IRCC October Workshop on the Strategic Plan showed interesting national and regional perspectives; Empowering Women in Hydrography (EWH) project was launched with a kick-off meeting; IHO e-Learning Center's success is dependent on contributions of online learning material from MS and partners. IHO Director Luigi Sinapi recommended MACHC: to continue on the implementation of the IHO Strategic Plan, to elaborate on the gap analysis and to support IRCC to measure those SPIs of regional interest allocated to IRCC, in accordance with IRCC CL 01/2021; to note the appropriate HSSC's governance document on the 'dual-fuel' concept; to participate at the EWH project and to provide proposals via the IHO EWH webpage; to provide contributions of online learning material to the Project Team established for the IHO e-Learning Center.

IHO Director Luigi Sinapi announced the establishment of a 'Baseline Symbology' Project Team under the IHO Nautical Cartography Working Group aiming to support the automated production of paper charts from S-101 data; the approval of a new set of WEND-100 Principles; and the development of the Guidelines of the WEND-100 Principles. And recommended MACHC to consider the future role of the Coordinator for Region B regarding S-100 services and to actively participate at the finalization of the WEND-100 implementation Guidelines for the transition from S-57 to S-100 Schemes.

Regarding capacity building, IHO Director Sinapi noted that 2021 CBWP would probably require a review and many projects would have to be moved to 2022, MACHC has five funded CB projects in the 2021 CBWP, for 2022 IHO Council approved the Capacity Building Fund to be raised from €85.000 to €100.000, and IHO Capacity Building strategy lays particular emphasis on providing a MSI service. He invited MACHC to continue follow and evaluate the possibility to contribute to the CB programme through the MACHC CB Coordinator and to identify suitable individuals to undertake both the online e-learning modules and the physical MSI training course.

In terms of Maritime Safety Information services, he said that the modernization of the communications and the Global Maritime Distress and Safety System (GMDSS) continues and that the Iridium SafetyCast service continues to be implemented. He encouraged all information providers to complete agreements with all RMSS and commence the testing of the SafetyCast system; recommended MACHC Members to establish and maintain effective communications with the relevant NAVAREA and METAREA Coordinators to ensure the timely provision of MSI, and to use and follow the guidance provided in IHO Publication S-53 to ensure the necessary facilities and capabilities are provided and maintained for the gathering and communication of MSI.

About crowdsourced bathymetry (CSB), he informed that the revision of IHO Publication B-12 is in progress, many coastal States continue to misunderstand the objectives and focus of the CSB initiative, the network of Regional Coordinators would be the major means of engaging with IHO Member States, the quality of data has grown considerably in the last years, and much closer cooperation and coordination with GEBCO and Seabed 2030 Project is needed to avoid duplication of effort and to leverage the momentum generated by the UN Decade and the Sustainable Development Goals (SDGs). IHO Director Luigi Sinapi then encouraged Members to officialize and/or review their positions on the conduct of CSB in their waters of jurisdiction and to identify further potential sources of bathymetric measurements and survey data providers to facilitate the further completion of the DCDB data holdings, as well as to make data openly available for inclusion in the DCDB and the widest possible use (IHO Resolution 1/2017, IHO CL 21/2020 and IRCC CL 1/2020) and invited Members to continue with its active participation in the initiatives such as UN Decade for Ocean Science and Seabed 2030.

IHO Director Luigi Sinapi made some considerations about GEBCO support through Seabed 2030 Project: the GEBCO data coverage developed from 6% to 21% (more precisely 20.6%); UN Decade of Ocean Science for Sustainable Development clearly stated the need to complete a comprehensive map of the ocean floor; a new GEBCO Sub-Committee on Education and Training would be established; the Nippon Foundation GEBCO-Seabed 2030 project was endorsed as an Action of UN Decade of Ocean Science for Sustainable Development; Seabed 2030 project announced new partnerships; and new global survey calls for greater coordination of seabed mapping activities were launched in October 2021, in order to move towards an agreed list of strategically important priority areas for further action. MACHC Members were encouraged to become actively involved in the GEBCO programme and its subordinate projects, to support the collection of data within their waters, and to make more detailed and comprehensive seabed data available and to continue inviting GEBCO programme and Seabed 2030 project representatives to MACHC meetings to discuss options for deepened cooperation and support.

IHO Director noted that five WebGIS applications have been available to the public in this new environment and it is under development a GIS database application to support C-55 - Status of Hydrographic Surveying and Charting Worldwide and. CBSC established the C-55 Review Project Team (C-55RPT) to improve C-55 composite data (percentage of areas adequately surveyed / requiring re-survey / not surveyed) with CATZOC information. He then invited countries in the MACHC Region to update their information in the IHO Yearbook (P-5) and C-55.

Members were informed that the IHO Secretary-General proposed the theme "How hydrography can contribute to the United Nations Ocean Decade" for World Hydrography Day 2022 and were invited to consider the proposed theme and to provide comments in response to the IHO CL 43/2021.

IHO Director Luigi Sinapi described the events organized for the IHO Centenary Celebrations (IHO-100) and announced the publication in June 2019 of an IHO Prestige Book on "100 Years of International Cooperation in Hydrography".

IHO Director concluded the presentation informing that a digital repository of the complete library of the International Hydrographic Review (IHR) was developed and the volumes from the entire collections (1923 to 2018) are available online at https://journals.lib.unb.ca/index.php/ihr . A new IHR website is available in: https://ihr.iho.int/. He then invited Members to submit papers for publication in the IHR.

MACHC Chair thanked IHO Director Luigi Sinapi and noted that we can learn from the IHO Secretariat Report and he has the perception that MACHC's work has been largely aligned with that of IHO. He also said that he imagines that some of the proposed recommendations would overlap with upcoming reports and presentations and with current MACHC ongoing actions.

22.2.1.a	Decision: Noted the IHO Secretariat Report.

MACHC Chair then moved on to the IRCC Report and invited Captain Rodrigo Obino to present the IHO Inter-Regional Coordination Committee (IRCC) Update.

2.1.1 IHO Inter-Regional Coordination Committee Update (Captain Rodrigo Obino, MACHC Secretary)

Captain Rodrigo Obino emphasized the main topics presented at the last IHO IRCC meeting, which were:
- the approval of the proposal of IHO Resolution on the Principles of the WEND for S-1XX Products (WEND-100 Principles). IHO Secretariat issued IHO CL 25/2021 calling for approval by the IHO Member States and then IHO CL 37/ 2021 informed the approval of the IHO Resolution 1/2021;
- the approval of the questionnaire on High Density ENCs submitted by WENDWG. IHO Secretariat issued IHO CL 26/2021 inviting IHO Member States to participate in the survey and then IHO CL 42/2021 presented the outcome of the survey (https://iho.int/en/wendwg-repository);
- recognition of the "Marine Cartography and Data Assessment" (MCDA) program submitted by the UKHO as Category "B";
- the GEBCO Gazetteer is now hosted by IHO DCDB. This is a web tool that allows the public to search for, view, and download information of more than 4,500 undersea features (https://www.ngdc.noaa.gov/gazetteer/); and
- the Seabed 2030 Project published the GEBCO 2021 grid with 20.6% coverage, following established resolutions per depth range (https://www.gebco.net/data_and_products/gridded_bathymetry_data/).

Captain Rodrigo Obino introduced the 2 actions that the IRCC assigned to MACHC: to develop measurements to the Strategic Performance Indicators (SPIs) allocated and to include the measurement of these SPIs in the MACHC annual Work Plans. To deal with this the IHO Council agreed to the SPI metrics as proposed by IRCC and tasked IRCC to engage with the Regional Hydrographic Commissions to design relevant implementation procedures as appropriate. Therefore, IRCC Chair issued the IRCC CL 01/2021 on the Procedure for measuring SPI allocated to IRCC. Additionally, IRCC will organize a Workshop by April 2022 on the definition and design of SPIs methodologies.

He also gave an overview of the 20 recommendations that IRCC made for MACHC, with 15 recommendations either completed or in progress and 5 recommendations that needed to be addressed by MACHC. These 5 recommendations would be potential new MACHC actions, as follow:
- to Note the information on ECDIS anomalies and support the implementation of the recommendations given by the ENCWG (IHO CL 40/2021);
- to consider extend the role of Charting Regional Coordinators for the implementation of the S-100 Implementation Roadmap;
- to coordinate the efforts on the implementation of S-100 and promote the cooperation and exchange of experiences;
- to consult the Guidelines, the FAQs and the White Paper early in the process of preparing submissions for programme recognition
https://iho.int/en/standards-and-specifications
https://ihr.iho.int/articles/maintaining-the-standards-of-competence-for-hydrographic-surveyors-and-nautical-cartographers-a-modern-approach/
- to engage with the IHO Secretariat early in the process of them preparing submissions for programme recognition.

Finally, Captain Rodrigo Obino informed that IRCC organized a Workshop on IHO Strategic Plan in October 2021 (https://iho.int/en/ircc-ws-splan). It had the following presentations: the regional approach to address the IHO Strategic Plan by SWPHC; the national approach to address the IHO Strategic Plan by the *Maritime Autoriteit Suriname*; the French approach to Goal 1 - "Transitioning to S-100" by the *Service hydrographique et océanographique de la Marine*; and the national approach to Goal 2 - "Implementing MSDI" by the Maritime and Port Authority of Singapore. SWPHC was highly praised by the Gap Analysis on the Strategic Plan they carried out in their region for each costal State and many suggested that it could be used as an example for other Regional Hydrographic Commissions.

MACHC Chair thanked and noted the IRCC update.

22.2.1.1	Decision: Noted the IRCC update.

MACHC Chair commented that some of these recommendations and actions are in line with the recommendations of the IHO Secretariat, with regard to the role of Coordinator of the S-100 Implementation Roadmap, the need to develop and establish regular measurements of SPIs allocated to MACHC and the need for MACHC members to conduct a gap analysis of each goal in the IHO Strategic Plan.

MACHC Chair moved to Agenda Item 2.1.2 IHO Hydrographic Services and Standards Committee (HSSC) Update to be presented by Captain Rodrigo Obino.

2.1.2 IHO Hydrographic Services and Standards Committee Update (Captain Rodrigo Obino, MACHC Secretary)

Captain Rodrigo Obino presented that HSSC agreed that the ISO 9001 principles would be experimented on the development of the Product Specification for ENCs S-101 Edition 2.0.0 related to one IHO Strategic Plan Target which had been endorsed by the IHO Council.

Regarding the Roadmap for the S-100 Implementation Decade, priority would be given to the development by 2026 of the following products used by the Route Monitoring Mode: S-101 (Electronic Navigational Chart); S-102 (Bathymetric Surface); S-104 (Water Level Information for Surface Navigation); S-111 (Surface Currents); S-124 (Navigational Warnings); S-128 (Catalogue of Nautical Products); and S-129 (Under Keel Clearance Management). Afterwards, the products used in Route Planning Mode would receive priority. In addition to the Route Monitoring Mode products, S-122 (Marine Protected Areas), S-127 (Marine Traffic Management) and S-131 (Marine Harbour Infrastructure) would also be operational by 2026.

The S-100 Timeline for the prioritized IHO Product Specifications was exposed. HSSC agreed to postpone the publication of S-100 Edition 5.0.0 until 2022 and that the initial priority list of Product Specifications would be aligned with the S-100 Edition 5.0.0 by 2024.

The standard S-98 (Interoperability Specification) will handle the interoperability between different layers of S-100-based products in the future S-100 ECDIS and the Edition 1.0.0 would be submitted for endorsement until 2022.

By 2024, S-101 Product Specification would be ready for production and implementation and Hydrographic Offices could prepare their production systems and experiment with S-101 Edition 1.1.0 from 2022.

HSSC discussed the synoptic diagram to show other possible options for Hydrographic Offices for future production of ENCs in S-101 format in conjunction with production and maintenance of ENCs in S-57 format. The options would be:
- the Hydrographic Office would produce their ENCs from a database driven production system, since it is expected that production systems software companies will include support for parallel ENC production (ENC in S-57 format and ENC in S-101 format) when using a database driven system. This seems to be the preferred option for Hydrographic Offices;
- the Hydrographic Office would perform que conversion of S-57 to S-101, would update its production tools and provides only S-101. RENC or authorized data producer would convert automatically S- 101 to S-57; or
- the Hydrographic Office would continue with S-57 production tools and would provide only S-57. RENC or authorized data producer would convert automatically S-57 to S-101 with an interpretation agreement with the Hydrographic Office.

IMO had agreed with IHO on the revision of IMO Regulations on ECDIS: “ECDIS Guidance for Good Practice” and “ECDIS Performance Standard”. HSSC Chair group with the participation of CIRM, IEC and Intertanko would review these IMO regulations to be able to submit drafted documents to the 9th Meeting of the IMO Sub-Committee on Navigation, Communications and Search and Rescue in 2022.

The establishment of three Project Teams were highlighted: the “Baseline Symbology” Project Team to support automated production of paper nautical charts from S-101 data; the S-130 Project Team for polygonal demarcations of global sea areas (S-130PT); and the Maritime Autonomous Surface Ships (MASS) Navigation Project Team (MASS PT).

Finally, Captain Rodrigo Obino announced the inauguration in October 26, 2021 of the Joint IHO-Singapore Innovation and Technology Laboratory to coordinate and testbed initiatives.

MACHC Chair thanked and noted the IRCC update.

22.2.1.2	Decision: Noted the HSSC update.

MACHC Chair invited Mr. Christopher Janus of the United States National Geospatial-Intelligence Agency (NGA) and Chair of IHO Sub-Committee on the World-Wide Navigational Warning Service (WWNWS-SC) to present his report.

2.2 Maritime Safety Information/World-Wide Navigational Warning Service Report (Mr. Christopher Janus, IHO WWNWS-SC Chair)

Mr. Christopher Janus, Chair of the IHO Sub-Committee on the World-Wide Navigational Warning Service (WWNWS-SC), thanked the MACHC Chair and reminded that the IMO/IHO WWNWS is an internationally and nationally coordinated service for the promulgation of navigational warnings. There are three NAVAREA that are in the MACHC Region: NAVAREA VI, covering east coast of Central America, United States and Canada; NAVAREA V that covers offshore Brazil; and NAVAREA XII covers the west coast of Central America and United States.

NAVEREA IV and XII broadcast their navigation warnings on both INMARSAT and radio now. NAVAREA V broadcast on INMARSAT. All NAVAREA provide this service at no expense to the National Coordinators of the countries that are within their NAVAREA. The success of the service depends on the coordination between the NAVAREA Coordinators and the National Coordinators. The more information the mariners have for a decision, the more safely they can navigate.

WWNWS-SC Chair informed that the Strategic Performance Indicator (SPI) of the IHO Strategic Plan assigned to WWNWS as a measurement of success for maritime safety information is: Percentage of coastal States that are capable to provide marine safety information (MSI) according to the joint IMO/IHO/WMO manual on MSI. The measurement of this SPI for MACHC should have 90% of support from coastal States by 2026.

Mr. Christopher Janus said that NAVAREA IV/XII will measure this SPI in two ways: by noting that MSI has been received from the National Coordinators; or by confirming the points of contact for the National Coordinators, to be being checked twice a year. He then presented that in 2020 NAVAREA IV/XII received MSI from 54% of National Coordinators and had satisfied coordination with 69% of National Coordinators. In 2021, there was a little decrease in these percentages, which were respectively 52% and 65%.

He highlighted that there would be a MSI course tentatively scheduled to be held in Colombia to be confirmed in 2022 or in 2023 and noted the change of the MSI status of some countries in the last year with the raise of their level of MSI support provided to NAVAREA IV/XII: Antigua and Barbuda; Dominica; Guatemala; Grenada; St. Lucia; and St. Vincent and the Grenadines.

On the other side, he emphasized that more coordination would be needed as no MSI has been received and no confirmed point of contact has been provided in 2021 from: Bahamas; Costa Rica; France (Guadeloupe, Martinique, Saint-Martin, Saint-Barthélemy); Netherlands (Aruba, Bonaire, Saba, Saint Eustatius, Saint Maarten); Nicaragua; St. Kitts & Nevis; United Kingdom (Montserrat); and United States (U.S. Virgin Islands).

He reminded the Members to check their MSI status in the MSI section of the MACHC Initiatives website where the MSI status matrix can be reviewed and a list for points of contact can be accessed and needs to be regularly updated. Countries and territories in green means that they are fulfilling all obligations, providing regular MSI or regular coordination with the national coordinator. Countries and territories in red means that they received training, but are not providing MSI, or there is no regular coordination with

the National Coordinator. Countries and territories in white means that they did not receive training, or are not providing MSI, or did not provide point of contact.

Mr. Christopher Janus then provide the working points of contact (24x7) for NAVAREA IV/XII Coordinator (navsafety@nga.mil) and for NAVAREA V Coordinator (avradio@marinha.mil.br).

WWNWS-SC Chair finally requested the approval of actions to review the MACHC website to verify the MSI status, and to review and verify the National Coordinator point of contact for each country, reporting any changes to navsafety@nga.mil by 1 February 2022.

MACHC Chair thanked Mr. Christopher Janus and noted the report.

22.2.2	Decision: Noted the WWNWS NAVAREA IV, V and XII Report.

MACHC Chair was surprised to learn that we are far short of the 2026 target. He said it will be interesting to see the evolution of the measurement of this Strategic Performance Indicator in relation to coastal States able to provide MSI. In addition, he highlighted advances in coordination in 2021 and recognized the need for more coordination.

Questions and Answers

Before opening the floor for the questions and answers, MACHC Chair made some comments. He said he had the realization that MACHC's work had been, to a large extent, aligned with the IHO, as follow: the active participation of Associate Members and Observer States in MACHC activities; the support of Technical and High Level Visits to Associate Members; the revision of the Statutes of the MACHC in accordance with IHO Resolution 2/1997; the support given to international initiatives such as the United Nations Decade for Ocean Science and the Seabed 2030 Project; the standards and products based on the S-100; the support of the IHO Capacity Building Projects Empowering Women in Hydrography and e-Learning Centre; the support given to map the seabed and to send bathymetric data to the IHO DCDB; the support to GEBCO and Crowdsourced Bathymetry; MSI; the update of P-5 and C-55; and the submission of articles to the International Hydrographic Review (IHR).

He proposed that attention should be given and efforts should be focused on the recommendations related to the gap analysis of the IHO Strategic Plan, SPI measurements, the governance document on the concept of 'dual fuel', the future role of the Coordinator of the S-100 services, and WEND100 Implementation Guidelines.

With regard to the IRCC Update, he agreed with the 2 actions assigned to the Regional Hydrographic Commissions, the 5 IRCC recommendations to the Regional Hydrographic Commissions and the suggestion to MACHC carry out gap analyses for each goal of the IHO Strategic Plan.

MACHC Chair opened the floor for comments or questions.

IHO Director Luigi Sinapi requested the floor. He thanked Captain Obino about the accurate synopsis of both HSSC and IRCC Reports. He noted there was a very common theme in all the presentations around the Strategic Plan and he said that it offers great challenges to our community. He then spoke about the adoption of Australia and New Zealand's proposal to measure our progress in the Strategic Plan. MACHC Chair thanked IHO Director Luigi Sinapi and put it to a vote in the plenary and the proposal was accepted.

France and United Kingdom supported via chat this proposal.

22.2.1.b	Decision: Approved the proposal to adopt the SWPHC Gap Analysis format for MACHC.

As there were no further comments, the following actions were approved:

Action#	Reference	Action
22.2.1.1	IHO/13.1	MACHC to support IRCC in identifying figures and values to measure the Strategic Performance Indicators (SPIs) of regional interest allocated to IRCC, in accordance with IRCC CL 01/2021 (Annex A).
22.2.1.2	IHO/13.2	Members to note the appropriate HSSC's governance document on the 'dual fuel' concept.
22.2.1.3 22.2.1.1.3	IHO/16.1 IRCC 13	MACHC is invited to consider extend the role of Charting Regional Coordinators for the implementation of the S-100 Implementation Roadmap and the future role of the Coordinator of the S-100 products and services for Region B.
22.2.1.4	IHO/16.2	Members is invited to actively participate at the finalization of the WEND-100 implementation Guidelines for the transition from S-57 to S-101 Schemes.
22.2.1.5	IHO/23.2	Establish and maintain effective communications with the relevant NAVAREA and METAREA Coordinators to ensure the timely provision of MSI.
22.2.1.1.1	IRCC 13/5 IRCC 13/6	MACHC to develop measurements to the SPIs allocated by IRCC to the Commission and to include these measurements in MACHC Committee/Working Groups annual Work Plans.
22.2.1.1.2	IRCC 13	Members to Note the information on ECDIS anomalies and support the implementation of the recommendations given by the ENCWG (IHO CL 40/2021).
22.2.1.1.4 22.3.b.3.1	IRCC 13	MACHC to coordinate the efforts on the implementation of S-100 and to promote the cooperation and exchange of experiences and best practices.
22.2.1.1.5	IRCC 13	Members and submitting institutions are encouraged to consult the Guidelines, the FAQs and the White Paper early in the process of preparing submissions for programme recognition.
22.2.1.1.6	IRCC 13	Members and submitting institutions are encouraged to engage with the IHO Secretariat early in the process of them preparing submissions for programme recognition.

22.2.1.1.7	IRCC 13 IRCC CL 01/2021	Coastal States in the MACHC Region to review the IHO Strategic Plan and complete a high-level gap analysis for each goal (reference: SWPHC18 IHO Strategic Plan 2021-2026 Gap Analysis template - Annex E to SWPHC CL 05/2020).
22.2.2.1	MACHC 20.3 17.2.1.1	Members are invited to review the MACHC website to verify your MSI status matrix by 1 February of each year. Report any changes to navsafety@nga.mil
22.2.2.2	MACHC 20.3 17.2.1.1 IRCC11/8	Members are invited to review and verify the National Coordinator point of contact for your country by 1 February of each year. Report any changes to navsafety@nga.mil

MACHC Chair announced the end of the first session of the first day of the conference and started the break.

Break

MACHC Chair opened the second session of the first day of the conference.

He then moved to Agenda Items 8 Marine Spatial Data Infrastructure and 8.1 MACHC Marine Spatial Data Infrastructure Working Group (MMSDIWG) Report and invited Mr. James Rogers of the NGA and MACHC MSDI Working Group Chair to take the floor.

8. Marine Spatial Data Infrastructure (MSDI)

8.1 MACHC Marine Spatial Data Infrastructure Working Group Report (Mr. James Rogers, MMSDIWG Chair)

Mr. James Rogers, MMSDIWG Chair, presented the key accomplishments of the Working Group in the last year:
a) Completed the Bathymetric Data Protocols to support Disaster Response efforts in the MACHC Region;
b) Initially reached out to other RHC MSDI WG (SAIHC and SWPHC) to share best practices and knowledge;
c) Updated the MMSDIWG Work Plan to include new initiatives;
d) Updated MMSDIWG Webpage and used it as a method for sharing meeting materials and useful links.

He showed how the MMSDIWG webpage is organized, where to access all meeting documents as the last MMSDIWG meeting held on November 3, 2021.

MMSDIWG Chair recalled the two inventories on MSDI underway available on the MMSDIWG webpage: MACHC MSDI Main Inventory (16 responses) and MACHC MSDI Additional Layers Inventory (3 responses). These surveys would still be open and could be provided and updated.

e) Engaged with stakeholders on MSDI use cases / partnerships (Economic Assessment of Risks in Maritime Navigation across the Greater Caribbean Region Project - Ms. Dawn Seepersad, UWI; Risk Assessment and Mitigation Measures of Maritime Navigation in the Caribbean Sea - Ms. Amrika Maharaj, UWI; Disaster Response Support - Mr. Sudesh Botha, MapAction; Caribbean Marine Atlas - Ms. Carolina Garcia, INVEMAR; Caribbean GeoPortal - Ms. Linda Peters, Esri; European Marine Observation and Data Network - Dr. Thierry Schmitt, Shom, & Dr. Leendert Dorst, RNLN-NLHS).

MMSDIWG Chair gave an overview of the status of the MMSDIWG Actions, and introduced the future direction of the Working Group and its Work Plan for 2022.

MMSDIWG Chair concluded the presentation of the report requesting the approval of the 2022 MMSDIWG Work Plan and inviting all Members to work with the MMSDIWG to implement the proposed Work Plan.

MACHC Chair thanked Mr. James Rogers and noted the report. He would also consider the MMSDIWG Work Plan for 2022 approved if there were no objections.

22.8.1.1	Decision: Noted the MMSDIWG Report.

Ms. Kathryn Ries of the NOAA's Office of Coast Survey (OCS/NOAA) requested the floor, congratulated the MMSDIWG Chair for the accomplishments of the Working Group so far and asked how the bathymetric data protocols would be shared with other partners in the region. She gave an example of Caribbean Disaster Emergency Management Agency (CDEMA) that would have its own geospatial database infrastructure and that they would use to help support response efforts. They seem to be a natural partner to explore and it would be important for MACHC to make sure the protocols are available to them and to define how CDEMA would access bathymetric data from MACHC Members to help their support response efforts. MMSDIWG Chair answered that they made the bathymetric data protocols initially available on the MMSDIWG Website, they did not initially consider the CDEMA as an option but would take this advisement for consideration at the next MMSDIWG meeting. Ms. Kathryn Ries added that it would be important now that the bathymetric data protocols are available to communicate broadly so others would know that they are available and could be utilized.

MACHC Chair moved to Agenda Item 8.2 and said that Ms. Paola Echeverry of the *Dirección General Marítima* (DIMAR), the Colombian Maritime Authority, left a recorded presentation to be played at the conference.

8.2 Spatial communication. How Maritime y Coastal SDI contributes to the broadcasting, dissemination and appropriation of the knowledge of half of the Colombian territory (Ms. Paola Echeverry, Colombian Maritime Authority, DIMAR, Colombia)

Ms. Paola Echeverry, MSDI General Administrator of DIMAR, wanted to present how the Colombian Maritime, Riverine and Coastal Spatial Data Infrastructure use spatial communication to issue technical and scientific knowledge in their waters of national jurisdiction. To support DIMAR's mission, geographic information systems specialized in each subject are applied in oceanography, hydrography, coastal management, marine environment protection. She also recognizes the importance of MSDI to the decision-making process of DIMAR.

DIMAR MSDI was established to provide:
- a geographic database;
- interoperability of the database;
- geographic web services with all kinds of information of interest;
- geographic viewers and dashboards; and
- monitoring and technical support.

DIMAR MSDI is managed by the following team: one general administrator, one geographic database administrator, one geographic manager, one geographic developer, one GIS specialist of Esri, and one technical advisor of Esri.

Lastly, Ms. Paola Echeverry invited all to visit the DIMAR MSDI Geographic Portal.

MACHC Chair thanked Ms. Paola Echeverry for her presentation and noted the development of the MSDI and geoportal by DIMAR.

22.8.2	Decision: Noted the presentation on the development of the MSDI and geoportal by DIMAR (Colombia).

MACHC Chair then moved to the next Agenda Item and invited Mr. John Nyberg of the OCS/NOAA and UN-GGIM Working Group on Marine Geospatial Information Co-chair to present the Introduction to Integrated Geospatial Information Framework-Hydro.

8.3 Introduction to the Operational Framework for Integrated Marine Geospatial Information Management or the Integrated Geospatial Information Framework - Hydro (Mr. John Nyberg, UN-GGIM Working Group on Marine Geospatial Information Co-chair)

Mr. John Nyberg of OCS/NOAA, UN-GGIM Working Group on Marine Geospatial Information Co-chair, thanked to the MACHC for the opportunity to introduce the Operational Framework for Integrated Marine Geospatial Information Management. He said that it was the primary project of the UN-GGIM Working Group on Marine Geospatial Information (WGMGI).

He explained that WGMGI aims to provide a leading international role of the policy level to raise political awareness on the importance and liability of the geospatial information in the marine domain, being responsible for inland waters, seas and oceans. It would encourage the use of established standards and would be responsible for authoring guides and standards to increase significantly the availability of high quality, timely and reliable geospatial information.

Mr. John Nyberg gave an overview of the Integrated Geospatial Information Framework (IGIF) defined by the UN-GGIM. IGIF is presented in three parts: the overarching strategic framework representing the "why", why it is important, why it is critical for national social, economic and environmental development; the "what", that describes the actions it can be taken to strengthen the geospatial information management and should serve as a resource to provide information for governance to design, plan, establish, implement and maintain national integrated geospatial information frameworks; and the "where", where the national implementation of the IGIF will be described. The Framework is anchored by 9 Strategic Pathways and recently it moved from focusing on developing programs to acknowledging that IGIF should be suitable for best practices for established programs as well.

The information above would help support the progress and monitoring of the UN Sustainable Development Goals. WGMGI would focus on SDG 14 ("Conserve and sustainably use the oceans, seas and marine resources for sustainable development.") but it should be recognized that marine geospatial information impacts much more (e.g. clean water, energy).

With the introduction above, Mr. John Nyberg began explaining that the Operational Framework for Integrated Marine Geospatial Information Management is also known as the Integrated Geospatial Information Framework - Hydro (IGIF-H or IGIF-Hydro). This work of the WGMGI would supplement IGIF with its third part ("where") and will produce the thematic implementation that would assist geospatial program in the aspects of the water domain. The document will be developed in two parts: Part One would serve for introduction, to discuss main challenges and to describe value proposition for the marine domain; and Part Two would work to address principles, goals and IGIF Strategic pathways.

Finally, he encouraged MACHC to be ready for a separate global consultation in the form of a workshop between February and May/June 2022. The plan would be to have an agreed upon document for the next UN-GGIM session in August 2022.

MACHC Chair thanked Mr. John Nyberg and noted his presentation.

22.8.3	Decision: Noted the presentation on the Operational Framework for Integrated Marine Geospatial Information Management (IGIF-H).

Questions and Answers

MACHC Chair opened the floor for questions and answers about the MMSDIWG Report and the two other presentations on MSDI but before he proposed MACHC to approve the MMSDIWG Work Plan for 2022 with the new actions suggested by MMSDIWG Chair.

As there were no comments, the MMSDIWG Work Plan for 2022 was approved.

22.8.1.2	Decision: Approved the MMSDIWG Work Plan for 2022.

MACHC Chair moved to Agenda Item 8.4 Industry Support for MSDI Challenges and invited Dr. Mike Osborne of OceanWise to make the first presentation of the Industry with the title "Ten steps to MSDI success".

8.4 Industry Support for MSDI Challenges

8.4A Ten steps to MSDI success (Dr. Mike Osborne, OceanWise)

Dr. Mike Osborne, Managing Director of OceanWise, thanked for the opportunity to make the presentation on ten easy steps to realizing the benefits of a MSDI.

OceanWise provides data management training and advise to marine and maritime related organisations globally.

He said that the concept of MSDI was first introduced as far as IHO concerns in 2008/2009, is explained as four Pillars (Policy & Governance; Technical Standards; Information Systems; Geographic Content), and included in the IHO Publication on MSDI known as C-17. But it is in reality a means of giving people what they want and people want data that is easily accessible in one place often called 'Common Operating Picture' (COP) or 'Recognised Environment Picture' (REP).

Some questions would be necessary to achieved the 'Common Operating Picture' for the data layers (maritime services, S-100 based products): What is the source? Provenance? Data Quality? Update/Life Cycle? Pre-preparation? Plan for improvement? The answer for these questions is that MSDI is achieved via Data Governance that provides oversight, establishes 'order' and is similar to Corporate Governance but for data and information.

Dr. Mike Osborne began talking about the ten steps to implement a MSDI:
1) Understand the Problem - data exists in departments or tied to or embedded in applications resulting Inconsistency / Replication / Inefficiency / Confusion and making data sharing difficult / time consuming.
2) Make Data a Business Priority - best is to include Data Governance in the Business Management Framework.
3) Create a Data Policy - high level document for implementing Data Principles and Governance.
4) Get to know and Apply Data Principles.
5) Put Data at the Centre - allowing data to be shared.
6) Recognize Data Governance as a Change Management Issue.
7) Define your Data Lifecycles / Data Audit.
8) Implement a Data Quality Management System - ISO Data Quality Model 8001.
9) Engage with your Stakeholders - agree what data to share and how to do it (memorandum of understanding, contract, agreement, license).
10) Use Web Services - a modern way to exchange data. There is some excellent opensource software available to help with this: RDBMS (e.g. PostGIS); and Web Server (e.g. GeoServer).

He then gave some examples of MSDI/SDI web services and online geographical information interface using opensource software.

Finally, Dr. Mike Osborne said that OceanWise is sharing their white paper, 'Developing a Marine Spatial Data Infrastructure', after entering the contact details in the MSDI section of the OceanWise webpage.

MACHC Chair thanked Dr. Mike Osborne of OceanWise for his presentation.

He then invited Mr. Alejandro Gerones of IIC Technologies to make the last presentation of the Industry of the day with the title "MACHC and MSDI: a regional analysis".

8.4B MACHC and MSDI: a regional analysis (Mr. Alejandro Gerones, IIC Technologies)

Mr. Alejandro Gerones of IIC Technologies said that he would make a tour of the status of MSDI and SDI in the MACHC region.

As background about MSDI, he recalled the IHO Resolution 5/2009 on MSDI policy adopted by the 4th Extraordinary International Hydrographic Conference in 2009, the IHO Marine Spatial Data Infrastructures Working Group (MSDIWG) established by HSSC in 2009, MACHC established the Maritime Economic Infrastructure Programme Working Group (MEIP) in 2011 and MACHC converted MEIP into a broader MSDI Working Group in 2018.

Mr. Alejandro Gerones said that IIC Technologies is helping with the effort to communicate broadly about MSDI and currently have two IBSC recognized programs, one for S-8 and another for S-5, both on Category "B", being delivered fully online and having over 30 students from around the globe. They also delivered a MSDI/S-100 training to Papua New Guinea with 12 students fully remotely. They had been also working in the background with 4-5 Hydrographic Offices restructuring their Hydrographic Production Database (HPD) to assimilate S-100 datasets. And have been providing their support on the development of S-100 related standards and have been working with several IHO Working Groups in this regard.

He showed some positive initiatives available to the MACHC community in respect to MSDI: the MACHC ENC Viewer; that some MACHC Members have been contributing with bathymetric data to the IHO DCDB that could be accessed through the DCDB Viewer; and that some MACHC Members have developed their own online data sharing as is the case of the ENC coverage by Colombia.

Mr. Alejandro Gerones introduced the situation of data and products available in some geographic information systems of the MACHC region: *Portal Geográfico* of Colombia, *Infraestructura de Datos Espaciales de Guatemala* (IDEG), *Instituto Nacional de Estadística y Geografía* (INEGI) of Mexico, Caribbean Marine Atlas (CMA), Caribbean GeoPortal. He wanted to emphasize that these systems might have missing hydrographic data and cartographic products.

He concluded his presentation suggesting that MACHC Members could contribute with their knowledge and benefit MSDI initiatives in the MACHC region.

MACHC Chair thanked Mr. Alejandro Gerones from IIC Technologies for his presentation.

Before the MACHC Chair closed the day session, the support team requested the participants to send their photos or "selfies" in order to compose the official photo of the MACHC22 Conference.

With that, the MACHC Chair invited all attendees to join the Conference the following day and closed the first day of the conference.

End of First Day of the Conference

Second Day of the Conference

MACHC Chair opened the second day of the conference giving some announcements.

He informed that he had been assigned to another mission as the Commander of the Naval Command of the Brazilian East Amazon with its headquarters in the city of Belém, inside the MACHC Region, to assume his new assignment the following week of the conference, and would introduce the next Director of Hydrography and Navigation of Brazil, Vice Admiral Arruda, his successor as Chair of the MACHC, on the last day of the conference.

Moving forward with the announcements, MACHC Chair showed where to access the List of documents and the List of participants of MACHC22 and shared the guidelines to register for the conference.

He also shared the draft List of Actions and the draft List of Decisions from the first day of the conference for the review of the participants.

The third day of the conference would be reserved for the National Report presentations. So, the composition of the Breakout Groups where the countries would present their National Reports was announced by the MACHC Chair. He informed about the Breakout Group Instructions available on the MACHC22 webpage.

MACHC Chair then moved to Agenda Items 9 Nautical Cartography and 9.1 MACHC International Charting Coordination Working Group (MICC) Report and invited Ms. Bernice Mahabier of the Maritime Authority of Suriname and MICC Chair to present the MICC report.

9. Nautical Cartography

9.1 MACHC International Charting Coordination Working Group Report (Ms. Bernice Mahabier, MICC Chair)

Ms. Bernice Mahabier of the Maritime Authority of Suriname, MICC Chair, presented the agenda of her presentation with the following topics: MICC membership and the work procedure; MACHC ENC boundary; MICC updates: ENC progress, INT Chart progress and cruise ship port analysis; MACHC Regional ENC Scheme Proposal; S-100 updates; and Work Plan for 2022.

She listed the MICC members and explained how MICC has been carrying out its work through quarterly conference calls, sub working group on ENC scheme calls and the annual meeting, by resolving chart overlaps and providing ENC and INT Chart updates.

MICC Chair announced that Lieutenant Ana Silva from Brazil will present the proposal submitted from Brazil to make an adjustment of a MACHC boundary to include the whole Amazon basin that was approved by MICC. She informed that a similar proposal from Brazil was submitted to SWAtHC and approved by that Regional Hydrographic Commission, as MACHC and SWAtHC share one same boundary.

She illustrated with a graph of an overview of the MACHC ENCs availability. There was an increase in the production of ENCs over the year 2021 of approximately 52% (from 964 to 1,465). She also showed a graph with MACHC ENCs produced by different Usage Bands in the last 4 years registering for 2021 a large increase in ENC production of Usage Band 4 (navigational purpose ‘Approach’) of more than 200% (from 300 to 950) and a decrease in ENC production of Usage Band 5 (navigational purpose ‘Harbour) of

approximately 37% (from 432 to 274). The large increase in ENC production of Usage Band 4 is due to ENC rescheming by some Hydrographic Offices and new ENCs covering inland waterways and port gaps.

MICC Chair announced that MICC sub working group on the MACHC Regional ENC Scheme would be reporting on the proposal for the MACHC Regional Usage Band 1 ENC (navigational purpose 'Overview') Scheme. So, Mr. Julio Castillo of OCS/NOAA would present this proposal later with the support of Ms. Olga Bonfante from Colombia.

She reported on the INT Charts update that there were no pending submissions, no update to current coverage, and that the INT Charts produced total 51 and the schemed INT Charts are 33.

MICC Chair gave an overview of the Cruise Ship-Port Gap Analysis update. The status now is that out of a total of 193 ports, only 14 ports are not covered. To follow this situation, MICC has built a cruise ship-port gap analysis list that is regularly updated and is available on the MICC webpage. She asked the Members to check this list and to evaluate the need to produce the appropriate ENC.

She recalled the S-100 Webinar was held in November 2021 in support of the implementation and the production of S-100-based products. Additionally, MICC Chair pointed out that the Netherlands has been doing test bed for S-102 (Bathymetric Surface), the United States has been making test beds for S-102 and S-111 (Surface Currents), and France has been doing test beds for S-102 and S-122 (Marine Protected Areas). United Kingdom, IC-ENC and PRIMAR have been offering online trainings on S-100.

MICC Chair introduced the MICC Work Plan for 2022 with two sections covering ENC and INT Chart activities.

Finally, she asked the Commission to approve the MICC Work Plan for 2022, to approve the change the MACHC boundary (proposal to be presented by Brazil), to provide feedback on the proposed approach for a standardized MACHC Regional ENC Scheme (proposals to be submitted by United States and United Kingdom), and to note the submission procedure of new INT Chart through the IHO Web Catalogue and maintenance procedure of ENC using INToGIS II.

MACHC Chair thanked Ms. Bernice Mahabier for her presentation and took note of the MICC Report. He observed the evolution of ENC availability and the large increase in the number of ENC Usage Band 4 (navigational purpose 'Approach'), in addition to the reduction in the number of ports in the MACHC region not covered by ENCs in recent years.

22.9.1.1	Decision: Noted the MICC Report.

MACHC Chair then moved to the Agenda 9.2 Proposal to change the area of coverage of the MACHC and invited Lieutenant Ana Silva of the Directorate of Hydrography and Navigation of Brazil and MICC Vice-Chair to present the proposal.

9.2 Proposal to change the area of coverage of the MACHC (Lieutenant Ana Silva, Directorate of Hydrography and Navigation, Brazil)

Lieutenant Ana Silva of the Directorate of Hydrography and Navigation of Brazil started her presentation noting that the proposal concerns the expansion of the current area subject to the MACHC in order to include the waters of the Brazilian Amazon basin that flow into the Atlantic Ocean.

In the Brazilian Amazon basin there are two main cities (Manaus to the west and Belém to the east) where Regional Hydrographic Branches are located to support hydrographic and cartographic activities. This region has around 50 ENCs produced.

The limit separating MACHC Region from the South-West Atlantic Hydrographic Commission (SWAtHC) Region was located at the Equator.

The proposal is to change on the east part of MACHC Region the limit from 0° (Equator) to 01° South so that the Brazilian Amazon basin was fully included in the MACHC Region.

The goal of this proposal was to harmonize the MACHC Region (corresponding to the IHO International Charting Region B) with the region where the Brazilian hydrographic and cartographic activities by the two Regional Hydrographic Branches in the Amazon basin were being reported at the MACHC Conferences. The change of the limit to 01° South would include the city of Belém in the MACHC Region.

She explained that the Brazilian hydrographic and cartographic activities in the Amazon basin were not being reported at the SWAtHC meetings and that no changes to the INT Chart and ENC schemes would be necessary.

Lieutenant Ana Silva stressed that similar proposal was submitted to the 14th SWAtHC Meeting in August-September 2021 and that Regional Hydrographic Commission approved a new border with MACHC at 01° South.

If this proposal was approved by MACHC, the IHO Secretariat would be informed of this change in order to update its website and related documents (e.g. IHO International Charting Regions).

Lastly, she presented two recommendations to the Commission:
1) Replace the image in Annex 2 of the Statutes of the MACHC with the image of the Annex to that proposal; and
2) In Article 1 b) of the Statutes of the MACHC: add the sentence “The hydrographic basins flowing into the defined geographic Region are part of it.”.

MACHC Chair thanked Lieutenant Ana Silva for her presentation and noted the proposal.

22.9.2.1	Decision: Noted the proposal to change the area of coverage of the MACHC.

MACHC Chair mentioned that the MACHC had decided to include the Brazilian Amazon basin in the MACHC Region and Brazil had studied one way to make this a reality. SWAtHC approved in September 2021 the change of the northern limit of its region to allow for the change of this boundary limit of the MACHC Region. He explained that with that boundary limit, the city of Belém, where Brazil hosted a MACHC Conference in 2016 and is home to a Regional Hydrographic Branch in the eastern part of the Amazon basin, was then outside the MACHC Region.

MACHC Chair moved to Agenda Item 9.3 Update on MACHC Regional ENC Scheme and invited Mr. Julio Castillo of NOAA’s Office of Coast Survey to take the floor.

9.3 Update on MACHC Regional ENC Scheme (Mr. Julio Castillo, NOAA's Office of Coast Survey, United States)

Mr. Julio Castillo of NOAA's Office of Coast Survey (OCS/NOAA), member of the MICC sub working group on the MACHC Regional ENC Scheme, began his presentation thanking Ms. Olga Bonfante and Mr. Dagoberto David from Colombia and Ms. Stephanie Vincent, Mr. Lee Truscott and Mr. Nick Rodwell from the UKHO for their help to put that presentation together.

He introduced the objectives of the MACHC Regional ENC Scheme sub working group: to review current coverage; to analyze possible Usage Band 1 (navigational purpose 'Overview') ENC Schemes in the MACHC Region; and to consider future Usage Bands by the MACHC Members.

Mr. Julio Castillo noted the current state of Usage Band 1 ENC cells in the MACHC Region, which stands at 9 Usage Band 1 ENCs cells (one from NOAA and 8 from UKHO), ranging scales from 1:1,500,000 to 1:3,000,000.

The advantages for the adoption of gridded systems were listed: standardization of ENC cell size; predictable coverage; allow easier planning by Hydrographic Offices; and data consistency across ENC cells letting to easily identify inconsistencies and dangers to navigation.

The disadvantages for that approach were also presented: generation of potential costs of overhead to implement; and conform to geographical and navigational features.

A research was carried out by analyzing Usage Bands 1 and 2 (respectively, navigational purposes 'Overview' and 'General') ENCs to determine the relationship between existing ENC scales and product size and by comparing average ENC scales within Usage Bands to examine across different Regional Hydrographic Commissions. This research would provide elements to establish guidelines when considering a new grid.

Mr. Julio Castillo then showed the Plans for Re-scheming of MACHC, NOAA, and UKHO for comparison. All plans have their own pros and cons.

He made additional considerations about the ENC re-scheming: Usage Band 1 ENC scheme to be selected would impact on Usage Bands 2 and 3 (respectively, navigational purposes 'General' and 'Coastal') ENC schemes of MACHC producers; MACHC producers should analyze the scales that might be used; it would be necessary to seek compatibility with the schemes of other neighboring Regional Hydrographic Commissions; and two MACHC Members are interested in moving towards an ENC re-scheming in the near future.

So, in his opinion it would be important for MACHC Members to send their input how these re-scheming plans will affect them at Usage Band 2 (9 producers) and Usage Band 3 (greater number of producers).

Finally, Mr. Julio Castillo requested the Commission to endorse an incremental approach beginning with Usage Band 1 ENC scheme, after sending out these data and schemes to MACHC Members and receiving comments by the next MACHC meeting.

MACHC Chair thanked Mr. Julio Castillo and noted the report of the MICC sub working group on the MACHC Regional ENC Scheme.

22.9.3.1	Decision: Noted the report of the MICC sub working group on the MACHC Regional ENC Scheme.

He noted that considering how Usage Band 1 will incorporate Usage Bands 2 and 3 seems critical and it looks like we need more research to advance the MACHC Regional ENC Scheme. And at some point, MACHC will have to talk to neighboring Regional Hydrographic Commissions to find compatibility between ENC schemes.

MACHC Chair then moved to Agenda Item 9.4 UKHO worldwide gridding and invited Mr. Nick Rodwell of the United Kingdom Hydrographic Office (UKHO) to make that presentation.

9.4 UKHO worldwide gridding (Mr. Nick Rodwell, United Kingdom Hydrographic Office, United Kingdom)

Mr. Nick Rodwell of the United Kingdom Hydrographic Office explained that a gridded scheme to support the global coverage of 1,800 GB ENCs at different scales for current and future S-100 products resulted in a complicated problem in order to manage data in the future.

The approach adopted to solve that problem would be a first step for scoping study with a two-phase study to conduct research and propose options for consideration, another step for trialing when each option is tested against the GB ENC coverage to consider the best fit for the coverage and a third step for processes when trial areas are defined to test and develop draft processes and policies.

He said that some options were tested for the best fit against current GB ENC coverage (including ENCs produced as Primary Charting Authority). The chosen solution aligns best with the GB ENC coverage, as follow:
Usage Band 1 – Grid Size 20
Usage Band 2 – Grid Size 4
Usage Band 3 – Grid Size 0.8
Usage Band 4 – Grid Size 0.2
Usage Band 5 – Grid Size 0.1
Usage Band 6 – Grid Size 0.05

Another reason for the chosen solution was because the 0.1 grid fitted nicely with the S-102 Product Specification. So, the chosen grid would tesselate with the S-102 grid.

Mr. Nick Rodwell then showed one example of the change on the gridded scheme from the current scheme to the proposed one and how the grid would fit together and interact across scale bands. As the scale increases, the previous smaller scale grid is subdivided and the number of subdivisions changes in different scales.

He pointed out that that solution should be flexible enough to support future coverage and expansion as is the case with the S-100 products.

Lastly, Mr. Nick Rodwell said that the application of the grid is part of a large data improvement workstream that includes scale harmonization, improving the consistency of linear and area features, and resolving isolated dangers with incomplete attribution.

MACHC Chair thanked Mr. Nick Rodwell and noted the UKHO worldwide gridding. He also suggested the MICC sub working group on MACHC Regional ENC Scheme could take into consideration this approach.

22.9.4	Decision: Noted the presentation on the UKHO worldwide gridding.

Questions and Answers

MACHC Chair asked for approval of the MICC Work Plan for 2022, of the proposal to change the area of coverage of the MACHC and its recommendations, and of the survey proposed by MICC and the sub working group on MACHC Regional ENC Scheme.

MACHC Chair then opened the floor for comments.

Mr. Pierre Yves-Dupuy from France thanked all previous presenters of the Nautical Cartography section. On behalf of General Director of Shom, IGA Laurent Kerléguer, he said the issue of scheming should address first the benefits to mariners, end users and producers, and the technical considerations related to the schemes, particularly the proposed grid options of MACHC, NOAA and UKHO, should come afterwards. France so far does not see the benefit for mariners and producers of rescheming ENC on the basis of regular grid as exposed in all presentations made in different forums. For the mariner, the loading of ENCs into ECDIS is automatic and the transition from one ENC to another ENC is transparent in the Route Monitoring Mode as far as scheming. Therefore, the structure of ENC distribution scheme has no impact on the end user experience. For the Route Planning Mode, the tools already made available by RENCs and VARs accommodate with problems in current schemes. Then, the selection of full ENCs for voyage would benefit more from regular grid. Regarding the producers, the maintenance of regular ENC schemes in not easier than irregular one, in particular the same interface problems would exist with neighboring ENCs. Moreover, whether or not the scheme is regular, does not affect the need for two producers to agree on the production of ENC. So, risks of overlaps or gaps at the interfaces will remain the same. In the opinion of France, the priority for producers and cartographic coordination should be really to analyse the scales and the cartographic content of the ENCs to ensure data consistency within the product for the benefit of end users. France is not directly concerned with the rescheming of Usage Band 1 in the proposal and has no objections. At this stage, considering that rescheming costs a lot, the current ENC schemes published by Shom are complete for French waters, they don't present disadvantage for the dissemination of data to end user, and they meet the safety needs of navigation.

IHO Director Luigi Sinapi commented on the proposal to change the coverage area of MACHC. IHO Secretariat recognized the work done by the two Regional Hydrographic Commissions, MACHC and SWAtHC, in this regard. IHO Secretariat is keen and ready to receive a coordinated, consistent and well-aligned proposal from the two RHCs, and is ready to amend the related publications accordingly. He added that the procedure was in accordance with the IHO Resolution 2/1997.

Mr. John Nyberg of the OCS/NOAA congratulated the MICC Chair for her excellent and very comprehensive report and to see the progress being made in the region. He noted the it was very encouraging to see the metrics about the S-101 and S-102 production and that it would be a good start in support of the Strategic Performance Indicators of the IHO Strategic Plan for the MACHC Region. As the Chair of the IHO Worldwide ENC Database Working Group (WENDWG), Mr. John Nyberg said that WG would be discussing how the WEND Principles will affect products in the S-100 domain, beyond charting (S-101). He considers that the work being done on scheming is extremely important with regard to the WENDWG that would be looking on how to offer best practices for transitioning from S-57 to S-101 and is actively working to prepare recommendations and draft guidelines on the establishment of S-101 ENC schemes that meant to be an Annex to the WEND-100 Principles. Finally, he also supported the MICC Work Plan for 2022.

Captain Marc van der Donck from the Netherlands presented similar concerns expressed by France about the extent to which advantage outweighs the effort to do common re-gridding for all the MACHC Region. He announced the Netherlands had re-gridded recently all their ENCs in MACHC Region, fitting nicely over their islands and the approaches, and they are looking at the data inside the ENCs. The Netherlands are apprehensive with the need for rework based on a purely regular grid. Finally, Captain Marc van der Donck stressed that he was supporting the concerns expressed by France.

The MACHC Chair noted that some differences of opinion on the re-scheming plan were identified.

MICC Chair explained that MICC had approved a decision to continue with Usage Band 1 to develop an ENC Scheme. She committed to having further discussions within the MICC, to provide feedback at the next MACHC conference and also, if necessary, to issue circular letters to the MACHC Members in that regards.

Captain Marc van der Donck from the Netherlands added that it was not his intention to avoid any studies on the matter.

Mr. Pierre Yves-Dupuy from France added that it was not his intention to stop the review of Usage Band 1 scheme. He emphasized that France's concerns were for the need to be closer first to the benefit for mariners and to the impact/interest for producers before deciding on a new scheme.

Mr. John Nyberg of the OCS/NOAA is supportive of the current approach given as it would be incremental and not moving the entire scheme in one direction all at once. He recognized that it would be important to better articulate some of the benefits for re-scheming, since in his opinion there are many benefits beyond the ENC navigation purpose.

MACHC Chair proposed that the ENC re-scheming subject be further studied by the MICC, specifically by the sub working group, with a view to the benefits for mariners and producers.

The MICC Work Plan for 2022 and the proposal to change the area of coverage of the MACHC and its recommendations received support and no objections.

With no more comments, the following decisions were approved:

22.9.1.2	Decision: Approved the MICC Work Plan for 2022.
22.9.2.2	Decision: Approved the proposal to change the area of coverage of the MACHC and its recommendations.
22.9.3.2	Decision: Endorsed the continuation of the discussions on ENC re-scheming by the MICC sub working group on the MACHC Regional ENC Scheme, taking into account the coastal States positions.

MACHC Chair gave the floor to Mr. Rafael Ponce of Esri to make the first presentation of the Industry in support of charting challenges, but that was not possible due to technical problems.

With that, he decided to move on the next scheduled presentation of the Industry in support of charting challenges and gave the floor to Mr. Juan Carballini of Teledyne CARIS.

9.5 Industry Support for Charting Challenges

9.5B S-100 Capability within the CARIS Product Suite (Mr. Juan Carballini, Teledyne CARIS)

Mr. Juan Carballini of Teledyne CARIS covered his presentation with an overview of what had been implemented in the last year and what had been possible for the S-100 production. It had the following contents: CARIS HPD S-100 capability; ENC S-101 production workflows with CARIS HPD; S-102 support; and training, consultancy and test environment.

Mr. Juan Carballini announced that Teledyne CARIS had implemented support to S-100 and the current version of the HPD is 4.1. As the functionalities of the HPD, it has the options to create with the same database S-101, S-57, web services, nautical publications and nautical paper charts, to edit S-100 vector features, to convert S-57 ENC to S-101 ENC and vice-versa, to carry out 'dual fuel' S-57 & S-101 ENC production, to export S-101 new editions and updates, to create, to edit and maintain S-100 exchange sets, and to migrate and do data holding. He added that would be possible to start producing and testing S-101 by adding S-101 production line with no risk to the existing S-57 production lines. It would be possible to make S-57 feature conversion to S-101 layer or product automatically on-the-fly being over 90% of the conversion out of the box. All these options are enabled by the S-100 Module for HPD/S-57 Composer 4.

He showed the workflows for HPD 4 series - HPD S-57 Source; for HPD Hybrid Source; and for HPD S-100 Source.

Mr. Juan Carballini presented the possibility of producing S-102 Bathymetric Surface in HDF5 format (Raster bathymetry with accompanying metadata), supported by Bathy DataBASE and HIPS & SIPS.

Lastly, he announced that Teledyne CARIS offers an Expert Instructor Led Training onsite and for remote training; an Expert Led Consultancy for data model assessment, migration assistance, workflow service and best practices analysis; e-Learning trainings regarding S-57, S-100 ad S-101; and a solution to test environments (S-100 Sandbox).

MACHC Chair thanked Mr. Juan Carballini for his presentation and then invited Mr. Friedhelm Moggert-Kägeler of SevenCs to make his presentation.

9.5C Challenges of S-101 Validation (Mr. Friedhelm Moggert-Kägeler, SevenCs)

Mr. Friedhelm Moggert-Kägeler gave a quick overview about SevenCs/ChartWorld, products and services, and their involvement in the IHO standardization activities (S-100WG, ENCWG, S-101PT, S-102PT).

SevenCs had developed S-100 PlugIns through platform 'Feature Manipulation Engine' (FME) to allow read and write S-101, to build data conversion of S-57 to S-101 and vice versa, including other digital data in the conversion flow.

As S-102 high-resolution data tends to create clutter on the screen, SevenCs developed the ENC Bathymetry Plotter for optimization of the bathymetry of the S-102 in order to improve the visual presentation and to contribute to better readability without loss of resolution. ENC Bathymetry Plotter carry out automated contour generation for nautical charts, advanced sounding selection, generalization of bathymetric surface, and production of Regular and High Density ENCs.

SevenCs main activity dealing with S-101 is the validation with the 7Cs Analyzer software. This tool is well established for S-57 ENC validation, already includes checks for S-101 ENC validation and could help to facilitate and speed up the relevant activities (standardization, S-100 testbeds).

MACHC Chair thanked Mr. Friedhelm Moggert-Kägeler for his presentation.

MACHC Chair proposed a break and then announced the end of the first session of the second day of the conference.

Break

MACHC Chair opened the second session of the second day of the conference giving some announcements.

He said that the presentation of Esri by Mr. Rafael Ponce would be made at the end of that session and after the last Industry presentation in support of the capacity building challenges.

MACHC Chair was pleased to announce that at that moment there were 92 participants attending the conference with representatives from all Full Members, from some Associate Members and from some Observers, such as Spain, IALA, University of West Indies, University of Southern Mississippi and IC-ENC.

He then moved to Agenda Item 5 Capacity Building and 5.1 Capacity Building Committee (CBC) Report and invited Ms. Lucy Fieldhouse of the UKHO and CBC Chair to take the floor.

5. Capacity Building

5.1 Capacity Building Committee Report (Ms. Lucy Fieldhouse, CBC Chair)

Ms. Lucy Fieldhouse of the UKHO, CBC Chair, covered the 19th Meeting of the IHO Capacity Building Sub-Committee (CBSC19) including its Projects; the IHO Member States Capacity Building opportunities; MACHC activities scheduled for 2022; MACHC Capacity Building 3-Year Plan (2022-2024) review; and the proposal submissions for IHO funding for 2023.

CBSC19 was held virtually with much discussion around the impact on the capacity building activities. Efforts to deliver them virtually were acknowledged such as the S-100 Webinar. Virtual meetings have helped with engagement but it is recognised that many events could not fully replace face to face meetings or could not be well delivered by online means. It was not possible to understand the long-term impact that could have on the IHO Capacity Building Work Programme on the capacity building regional development. But it was agreed that successfully funded events that could not be delivered in 2021 would be carried in the 2022 IHO Capacity Building Work Programme.

CBSC19 made a reminder for coastal States to keep C-55 up to date that is used in IMO audits, as Key Performance Indicator with regards of MSI courses, and to demonstrate the impact that the trend of the advance on Cat A and Cat B courses has on capability.

The International Hydrographic Review (IHR) was discussed and it was encouraged to submit papers, reports, notes, being an excellent way to champion the work that had been undertaken in the Region. IHO Representative for the MACHC Region is Mr. Nathanael Knapp (Nathanael.Knapp@UKHO.gov.uk).

Some projects are in progress: the IHO Capacity Building Strategy review; the IHO capacity building calendar development; the e-Learning Project; and the Empowering Women in Hydrography (EWH) Project.

Ms. Lucy Fieldhouse asked Ms. Kathryn Ries of OCS/NOAA to give some more information about the NOAA's support to the EWH Project.

Ms. Kathryn Ries announced that NOAA would host candidates over the four-year span of the EWH Project (2021-2025) for an at-sea experience/advanced training on NOAA hydrographic survey vessels. She had the hope that the pandemic conditions would allow NOAA to provide one opportunity starting in 2022 for the MACHC Region. This in-link contribution would be reflected in the draft MACHC Capacity Building Plan (2022-2024). The main point of contact of NOAA is Mr. Jonathan Justi (jonathan.justi@noaa.gov).

Ms. Lucy Fieldhouse continued her presentation.

She congratulated Colombia, Guatemala and Venezuela for having representatives nominated to the Training for Trainers programme in Basic Hydrography sponsored by the Republic of Korea, and informed the postponement of the GEOMAC course to early 2022 with participants from Colombia, Dominican Republic and Guyana.

The MACHC funded activities in the 2021 IHO Capacity Building Work Programme not completed in 2021 would be carried over to 2022 (High Level Technical Visit to Dominican Republic, Technical Visit to Honduras, High Level Technical Visit to Jamaica, Seminar on Raising Awareness in Hydrography, and Tides Workshop for Spanish Speakers). There is also a Technical Visit to Belize planned for 2022.

Ms. Lucy Fieldhouse introduced the following MACHC funded proposals for endorsement for 2023 that were approved by the CBC at the meeting on November 24, 2021:
- High Level and Technical Visits in Colombia and Costa Rica;
- MSI Workshop (Colombia and SWAtHC);
- S-100 Production Course (S-57 transition to S-101); and
- Seminar Raising Hydrographic Awareness - MSDI Workshop.

She then reviewed the draft MACHC Capacity Building 3-Year Plan (2022-2024).

Finally, Ms. Lucy Fieldhouse requested the Commission to consider contributing to the CBSC projects (Empowering Women in Hydrography and IHO e-Learning Centre), to approve the 2022-2024 MACHC Capacity Building 3-Year Plan, and to approve the MACHC capacity building submissions to CBSC20 for 2023.

MACHC Chair thanked Ms. Lucy Fieldhouse for her presentation and noted the CBC Report.

22.5.1.1	Decision: Noted the CBC Report.

MACHC Chair then moved to Agenda Item 5.2 Education and Training opportunities at the University of Southern Mississippi and invited Mr. Alberto Costa Neves of the University of Southern Mississippi to take the floor.

5.2 Education and Training opportunities at the University of Southern Mississippi (Mr. Alberto Costa Neves, University of Southern Mississippi, United States)

Mr. Alberto Costa Neves introduced the infrastructure available at the University of Southern Mississippi (USM) for the trainings in hydrography supported by the Hydrographic Science Research Center (HSRC). USM offers the following academic programs in Hydrography: Doctorate in Marine Science (Hydrography); Master of Science in Hydrographic Science; and Bachelor of Science in Marine Science (Hydrography).

The Master of Science in Hydrographic Science program is recognized as Category "A" level by IBSC and can be taken in 1, 2 or 2,5 years.

The Bachelor of Science in Marine Science (Hydrography) program is recognized as Category "B" level by IBSC.

Both the Master of Science in Hydrographic Science and Bachelor of Science in Marine Science (Hydrography) programs include the subjects of geospatial data management and nautical charting in addition to the IHO S-5A/B minimum standards.

Mr. Alberto Costa Neves noted that HSRC will create a MSDI according to IHO standards.

The students of the USM hydrography programs have access to survey vessels/boats and to autonomous vehicles, such as ASV, AUV and gliders.

The research themes that HSRC has been involved are Data Sharing (e.g. Seabed 2030 Project), Coordinated Survey Planning, Standards Development and Integration (e.g. S-100), and Innovation and Technical Development (e.g. uncrewed systems, Precise Positioning).

Finally, Mr. Alberto Costa Neves introduced the current and previous projects that HSRC has been carrying out.

MACHC Chair thanked Mr. Alberto Costa Neves for his presentation and noted the presentation on Education and Training opportunities at the University of Southern Mississippi.

22.5.2	Decision: Note the presentation on Education and Training opportunities at the University of Southern Mississippi.

Questions and Answers

MACHC Chair said that the Commission needed to endorse the MACHC IHO-funded proposals for 2023 and to approve the MACHC Capacity Building Plan for 2022-2024.

IHO Director Luigi Sinapi made considerations on Capacity Building. He informed the commitment from IHO Secretariat taken as an Action from the IHO Council to increase the budget dedicated to Capacity Building through the allocation of the anticipated surplus for 2022 and announced the increase of the budget dedicated to Capacity Building in 15,000 Euros.

Another matter pointed out was about education and training program at global level. Despite pandemic, he thanked the active contribution from major donors, namely Republic of Korea and Nippon Foundation, and also USM and UKHO for hosting courses that received great attendance from IHO Member States. So, this was a good sign for the IHO Secretariat to continue with the education and training program at global level giving opportunities to IHO Member States.

The last comment made by IHO Director Luigi Sinapi was to remind that the budget for the Empowering Women in Hydrography (EWH) Project had been allocated thanks to the agreement signed between IHO and Canada. He thanked Canada for that generous contribution. He added that the participation in this project is accessible to all using the forms available in the specific webpage under the IHO website and encouraged all IHO Member States to submit proposals following the instructions.

MACHC Chair open the floor for any other comment.

The capacity building submissions to CBSC20 for 2023 and the MACHC Capacity Building Plan for 2022-2024 were approved, as there were no objections.

22.5.1.2	Decision: Approved the capacity building submissions to CBSC20 for 2023
22.5.1.3	Decision: Approved the MACHC Capacity Building Plan for 2022-2024

The proposal of the CBC Chair to support the EWH and e-Learning Projects received some support and no objections. Therefore, two actions were approved accordingly, as follows:

Action#	Reference	Action
22.5.1.1	Capacity Building IHO/13.3	Members are invited to consider participating on the Empowering Women in Hydrography Initiative hosted by NOAA OCS (for more information, contact: jonathan.justi@noaa.gov) and providing proposals via the IHO EWH webpage (https://iho.int/en/basic-cbsc-ewh).
22.5.1.2	Capacity Building IHO/13.4	Members to consider contributing to the IHO e-Learning Centre project. See https://iho.int/en/miscellaneous-2

MACHC Chair then moved to Agenda Items 5.3 Industry Support for Capacity Building Challenges and 5.3A Modelling coastal vulnerability in Belize: an application of Satellite-Derived Bathymetry (SDB) for coastal management and invited Mr. Harry Cook of ARGANS to take the floor.

5.3 Industry Support for Capacity Building Challenges

5.3A Modelling coastal vulnerability in Belize: an application of Satellite-Derived Bathymetry for coastal management (Mr. Harry Cook, ARGANS)

Mr. Harry Cook of ARGANS introduced his company that is specialized in Satellite-Derived Bathymetry (SDB), data calibration, coastal ocean application.

He said that he would talk about a project that ARGANS has been running with the utilization of new methods of SDB, to evaluate coastal vulnerability and to see how then datasets can be incorporated into the application of coastal management. There are key aspects of an Integrated Coastal Zone Management to promote sustainable management being beneficial is using satellite data: regular revisit periods, freely and openly available having a lot of measurements with low cost.

The Caribbean Sea in special Belize would be an excellent environment for this project as their optically clear waters are well suited to test ARGANS SDB packages.

ARGANS worked with the European Space Agency in project and came out with two innovations: did not see value using very high-resolution sensors compare with Sentinel-2 10-m resolution (better signal to noise ratio); and use of normalized time series of Sentinel-2 images to applying statistics techniques (best fit) to obtain the 'perfect' image.

Mr. Harry Cook also showed other methods and models that would provide good solutions for water quality, coastal slope assessment and coastal vulnerability.

Finally, he noted that coastal areas could be surveyed cheaply, regularly and efficiently using SDB from Sentinel-2. The resulting datasets could be implemented into coastal models for efficient decision-making tools for coastal managers.

MACHC Chair thanked Mr. Harry Cook for his presentation, he said the next presentation would be about Satellite-Derived Bathymetry (SDB) uses and benefits for Small Island Developing States and then invited Mr. Edward Albada of EOMAP to make his presentation.

5.3B Satellite-Derived Bathymetry uses and benefits for Small Island Developing States (Mr. Edward Albada, EOMAP)

Mr. Edward Albada from EOMAP began presenting about the company that had been involved with the development of satellite remote sensing applications and products including SDB and has been working with applications as coastal zone management, coastal planning and engineering, coastal resilience, updating of nautical charts, risk and assessment, safety of navigation. He showed a map of the Caribbean region with countries shaded where EOMAP had been working in projects (higher frequency in Belize, Dominican Republic, Jamaica, Mexico, United States).

EOMAP's technology using physics-based SDB is slightly different than the traditional empirical methods, doing corrections on the imagery for the presence of land, for the sun glitter, for the water column and based on that they extract information not only of SDB but also of the water quality, reflectance of the seafloor and benthic habitats.

Mr. Edward Albada gave two examples of using SDB for charting, one of them by the UKHO in a reef region of Antigua and Barbuda.

He also illustrated the use of SDB to determine bathymetric change, dynamic coastal change and therefore the morphology of the seabed overtime, as SDB can continuously monitor shallow water dynamics.

EOMAP also used SDB for survey optimization that would employ the Satellite-Lidar Bathymetry (SLB).

Lastly, Mr. Edward Albada showed another application in the Caribbean region combining SDB with SLB.

MACHC Chair thanked Mr. Edward Albada for his presentation, he said the next presentation would be about Bowden Harbour Collaboration Project and the Caribbean GeoPortal and then invited Ms. Carol Fisher of TCarta to take the floor.

5.3C Bowden Harbour Collaboration Project and the Caribbean Geoportal (Ms. Carol Fisher, TCarta)

Ms. Carol Fisher of TCarta started talking about the company that is working with remote sensing, GIS, hydrographic services, programming, geospatial software, web services development, and applications such as Satellite-Derived Bathymetry (SDB), marine habitat mapping, water quality monitoring, and shoreline monitoring.

She said that TCarta had developed novel approaches to SDB by integrating multiple methods, sensors and utilization of machine learning and developed scalable approaches to surveying broad areas.

So, TCarta had developed the Trident software as result of grant research for automation of the SDB method. That software enables user not familiar with SDB to produce their own bathymetric model using a systematic workflow.

Ms. Carol Fisher introduced a case study of Bowden Harbour in support of the National Land Agency (NLA) of Jamaica. TCarta provided initial SDB dataset to NLA for reconnaissance and planning of hydrographic survey and NLA provided TCarta with sonar dataset for merging of both datasets to produce final surface. The final surface produced would include more details of the shoal areas plus a more seamless and detailed dataset. The use of this method would provide a seamless dataset, would fill gaps, would identify shoal areas for planned lines, would identify no-go areas for safety of staff and equipment, would provide environmental monitoring for change detection of the seafloor, could map a wide geographic area using both SDB and echosounder in a shorter time span.

She announced that TCarta can provide training on SDB production using Trident Toolbox.

Finally, Ms. Carol Fisher informed that TCarta put their catalogue of bathymetric data of Yucatán Peninsula and Bahamas available to the Caribbean GeoPortal.

MACHC Chair thanked Ms. Carol Fisher for her presentation and then invited Mr. Rafael Ponce of Esri to give his presentation on S-100: A Gateway to Hydrospatial.

9. Nautical Cartography (Continuation)

9.5 Industry Support for Charting Challenges (Continuation)

9.5A S-100: A Gateway to Hydrospatial (Mr. Rafael Ponce, Esri)

Mr. Rafael Ponce of Esri explained the meaning of hydrospatial: "all about the Blue of our Blue Planet… & its contiguous zones (Coastal, Bottom, Sub Bottom, Surface & Atmosphere)"

He then explained that GIS integrates all types of geospatial data (maps, imagery, unstructured data, real-time data, Lidar data) building models and bring this information to a common language of maps, scenes, fundamental layers for features, combining this information to create traditional products and new ones.

Mr. Rafael Ponce introduced the ArcGIS Pro Maritime software, Esri new solution for chart production. This software allows automation across the platform and has enhanced S-100 editing tools. He went over the procedure for ingesting the S-101 Feature Catalogue in the registry, converting S-57 to S-101 cell, importing S-101 cell into a geodatabase (a collection of geographic datasets of various types held in a common file system folder), exporting to S-101 cell, and publishing the S-101 cell.

MACHC Chair thanked Mr. Rafael Ponce for his presentation.

He next gave two announcements.

One regarding the third day of the conference when Members would present their National Reports, informing about the Breakout Group Instructions.

The other issue was to remind that on the last day of the conference the Commission would discuss about the next conference and made a call to those interested in hosting the next conference.

With that, the MACHC Chair invited all attendees to join the conference the following day for the National Reports' presentations and closed the second day of the conference.

End of Second Day of the Conference

Third Day of the Conference

In order to conduct the Agenda Item 3 with the presentations of the National Reports, MACHC Members were distributed approximately evenly across three groups. Each group would join the meeting in separate, parallel virtual rooms.

Additional delegation Members and Observers were free to access any group they wish to follow the presentations and to participate on the discussions moderated by each Chair.

3. National Reports

3.A Breakout Group Instructions

Some time before the conference, MACHC Chair invited Colombia, Guatemala and The Netherlands to be group Chairs for the session of National Reports session, which they accepted.

MACHC Chair then had a videoconference call with the group Chairs before the beginning of the conference when he was able to transmit the instructions for the National Report Breakout Groups taking place the third day of the conference.

Each Chair would facilitate their group, moving through the National Report presentations in a timely and efficient manner, leading subsequent question and answer periods for each report. The National Reports would provide information on the year's top achievements, challenges and/or obstructions, and plans that affect the region.

After hearing each National Report, the Chairs would then facilitate the discussions on overall points of synergy or potential collaboration and implications and messages for MACHC plenary. The results of these discussions would be summarized by each group Chair the following day of the conference.

MACHC Members were distributed approximately evenly across three groups, according to the table below.

Group A (English and Spanish)	Group B (English and Spanish)	Group C (English only)
Belize (A)	*Barbados (A)*	Antigua and Barbuda (A)
Cuba	**Colombia (Chair)**	Brazil
Dominican Republic	Costa Rica (A)	France
El Salvador (A)	*Grenada (A)*	Guyana
Guatemala (Chair)	Jamaica	Haiti (A)
Honduras (A)	*Panama (A)*	**Netherlands (Chair)**
Mexico	*St. Vincent and the Grenadines (A)*	*St. Kitts and Nevis (A)*
Nicaragua (A)	Trinidad and Tobago	*Santa Lucia (A)*
United States	United Kingdom	Suriname
	Venezuela	
(A) Associate Member		

MACHC Members in italic means that until the end of the second day of the conference they had not submitted their National Reports or their National Report Presentations.

Group Sessions

Groups A and B had simultaneous translation services provided, while Group C would be English only.

Group A was chaired by Alférez de Navío Roger Valenzuela Jaimes from Guatemala. There was no representation from Honduras and Nicaragua in this session. There were 7 presentations, 5 of which were by Full Members.

Group B was chaired by Jefe Técnico (RA) Dagoberto Uriel David Viteri from Colombia. There was no representation from Barbados, Grenada and Panama in this session. Representatives from St. Vincent and the Grenadines and Venezuela attended this session but could not give a presentation. There were 5 presentations, 4 of which were by Full Members. IHO Council Chair and the representative of IALA Academy also participated in the discussion in Group B.

Group C was chaired by Captain Marc van der Donck from The Netherlands. There was no representation from St. Kitts and Nevis and Santa Lucia in this session. Representatives from Haiti attended this session but could not give a presentation. There were 6 presentations, 5 of which were by Full Members.

In this way, there were a total of 14 presentations by Full Members and 4 presentations by Associate Members.

End of Third Day of the Conference

Fourth Day of the Conference

MACHC Chair opened the fourth day of the conference giving some announcements.

He said that the QPS company that was scheduled to give the first presentation of the Agenda Item 6.3 Industry Support for Survey and Risk was not possible to attend the conference. With that, he suggested bringing forward the presentations on the Global Maritime Traffic Density Service and the World Port Index to after Agenda Item 6.1 MACHC Seabed 2030 Report.

MACHC Chair proceeded with the program of the conference continuing with Agenda Item 3 National Reports and Agenda Item 3.B Reports of the Groups.

He informed that Venezuela in Group B and Haiti in Group C could not make their presentations on the third day of the conference in the National Reports session but their presentations would be available on MACHC22 webpage.

MACHC Chair then invited Alférez de Navío Roger Valenzuela Jaimes from Guatemala to present the summary of the National Reports presentations in Group A.

3. National Reports (Continuation)

3.B Reports of the Group

Breakout Group A summary

As the overall points of synergy or potential collaboration between MACHC Members, Group A Chair said that would be important to consider the establishment of agreements between States for the exchange of knowledge and capacity in the fields of hydrography and oceanography; that NGA would be willing to establish or to review the cooperation agreements with the Members to enhance the engagement in the Region in the fields of hydrography and nautical cartography; that the cooperation on the publication of Notices to Mariners and the broadcast of Local and Navigational Warnings would be of great benefit for the safety of navigation; that Members involved with IALA activities in the Region could consider the accession to the Convention of the newly established International Organization for Marine Aids to Navigation; that there would be a need for support or collaboration on the transition from the S-57 ENC to the S-101 ENC; and that some Members showed concerns on the need for the update of their hydrographic software.

The Group A Chair introduced issues that could have implications for MACHC Plenary: the need of some Members to acquire hydrographic and oceanographic tools and equipment for better capability and to enhance development; the need for staff trainings in hydrography and oceanography; the need for high-level awareness in the States of the importance of Hydrographic Offices/Services; the IHO Empowering Women Hydrography Project was considered very important; and the announcement of the public launch by NGA of the 'Global Maritime Traffic Density Service' (GMTDS).

He finally presented the surprising achievements and innovations of many Members despite the pandemic situation: hydrographic surveys were carried out with the purpose to update paper and Electronic Navigational Charts (ENC); aids of navigation and lighthouses were recovered; online and face-to-face courses (e.g. IALA trainings) were conducted; and the implementation of the 'Web Port Index' (WPI) developed by NGA with the participation of bathymetry capacity.

MACHC Chair thanked Alférez de Navío Roger Valenzuela Jaimes and noted the Group A Report.

22.3.b.1	Decision: Noted the National Reports Breakout Group A Summary Report

MACHC Chair invited Jefe Técnico (RA) Dagoberto Uriel David Viteri from Colombia to present the summary of the National Reports presentations in Group B.

Breakout Group B summary

As the overall points of synergy or potential collaboration between MACHC Members, Group B Chair pointed out the common capacity building or training needs on MSI, S-100 and MSDI; the need for sharing best practices and information due to the pandemic effects, less budget and failing infraestructures; and the need for short trainings offerings and to continue applying to the CBSC offerings.

He presented the issues that could have implications and messages for MACHC Plenary: the need of new additions to the Capacity Building Plan (e.g. common training needs) looking for the transition to the S-1XX era, MBES, and Technical Visit (e.g. Costa Rica); there have been significant projects and/or accomplishments, as satellite-derived bathymetry surveys, USM offerings, and IALA trainings in Spanish and English, that the Members could be benefitted; and the need to build regional strategic alliances between Members, universities, government environmental entities, and international organizations (e.g. IMO, IALA) to enable funding.

Despite de pandemic, there were some surprising achievements and innovations identified by the Group B Chair: UKHO supported many online courses; IBCCA project ended its first phase; Jamaica has acquired a long range RTK system and would install some permanent tide gauges; Trinidad and Tobago have adquired a MBES; and Colombia would have new facilities and could be a good center of training for the Region.

Group B Chair mentioned that the assessment of the hydrographic survey coverage in waters of national jurisdiction was that depth water regions were poorly surveyed and that harbours, ports and approaches were better surveyed.

Lastly, he added other interesting highlights that were noticed: there were general interest to contribute to the Seabed 2030 Project; there were general interest to participate in the EWH Project; the tsunami monitoring system had continued its development; and the general understanding of the importance of hydrography for the development of the States.

MACHC Chair thanked Jefe Técnico (RA) Dagoberto Uriel David Viteri and noted the Group B Report.

22.3.b.2	Decision: Noted the National Reports Breakout Group B Summary Report

MACHC Chair invited Captain Marc van der Donck of the Netherlands to present the summary of the National Reports presentations in Group C.

Breakout Group C summary

The overall points of synergy or potential collaboration between MACHC Members identified by Group C Chair were: to exploit possibilities for traineeships during survey campaigns, but should not be limited to the MACHC Region alone; to share experience of 5C ('Caribbean Community Climate Change Centre') Lidar program with the aim to tailor the survey effectively to (at least) the charting requirements; and mostly

notably to become involved with S-1XX implementation. Most Members seemed to face the same challenge regarding the S-1XX implementation, but were at various stages of planning or development. Therefore, there would be a need to share experience and best practice, avoiding pitfalls in the Region. This led to a question if the States would like to produce all products by themselves or if they would accept to produce products for other States or would agree other States to do that for them. All these possibilities are expressed in the WEND-100 Principles. He then proposed the Action for the Commission to find a place on the MACHC agenda to facilitate this S-1XX exchange by sharing experience and best practice, avoiding pitfalls in the Region.

Group C Chair pointed out the issues that could have implications and messages for MACHC Plenary: the need to identify opportunities in the Region to participate in the EWH Project and to consider participating in the 3-day forum (to be planned) of that Project; the need for data sharing, but Members seemed to be in varied levels of execution, that depends on legal, proprietary and security issues, despite their willingness, considering the difficulty to have a common norm/policy on open data in the Region; and the future hydrographic capability affected by new and matured technologies (e.g. hydrographic drones) that would need to meet object detection requirements for CATZOC A1 and A2. He then proposed the Action to the Commission to share findings on future hydrographic capability.

There were some surprising achievements and innovations despite the pandemic situation noted, as follow: the continuation of the development of MSDI (e.g. Brazil, France, Suriname); there is available an option of voluntary contribution of bathymetric data to EMODnet that would be automatically shared with the IHO DCDB and the Seabed 2030 Project; and application of CATZOC compliant hydrographic survey. Group C Chair finally proposed the Action to the Commission share within MICC the CATZOC/C-55 policies adopted by Members in order to gain insight and to potentially harmonize.

MACHC Chair thanked Captain Marc van der Donck, noted the Group C Report and the suggestions generated the following actions:

22.3.b.3	Decision: Noted the National Reports Breakout Group C Summary Report

MACHC Chair congratulated all Members for their National Reports and in special the Breakout Group Chairs. He emphasized that it was not an easy task to seek the consolidation of common aspects and of issues that deserve to be highlighted in the presentations.

Questions and Answers

He opened the floor for comments.

As there were no comments, the Actions proposed by the Group C Chair were approved, as follow.

Number	Reference	Action
22.3.b.3.1	National Reports S-100	Facilitate this S-1XX exchange by sharing experience and best practice, avoiding pitfalls in the Region.
22.3.b.3.2	National Reports Hydrographic Surveys	Share findings on future hydrographic capability of new technologies.
22.3.b.3.3	National Reports Hydrographic Surveys	Share CATZOC/C-55 policies, in order to gain insight, and seek harmonization.

MACHC Chair then moved to Agenda Items 6 Survey and Risk and 6.1 MACHC Seabed 2030 Project and invited Ms. Cecilia Cortina from Mexico, MACHC Coordinator for the Seabed 2030 Project and Crowdsourced Bathymetry, to present her Report.

6. Survey and Risk

6.1 MACHC Seabed 2030 Report (Ms. Cecilia Cortina, MACHC Coordinator for Seabed 2030/Crowdsourced Bathymetry)

MACHC Coordinator for Seabed 2030/Crowdsourced Bathymetry pointed out that MACHC was already acting to meet the two recommendations of the IHO Secretariat in their report on crowdsourced bathymetry (CSB) through the MACHC-IOCARIBE Seabed 2030 Strategy 2021-2030.

She announced that The Nippon Foundation-GEBCO Seabed 2030 Project was endorsed as part of the UN Ocean Decade contributing to the Ocean Decade Challenge 8 ("Develop a comprehensive digital representation of the ocean") through the collaboration of multiple stakeholders. MACHC-IOCARIBE Seabed 2030 Strategy 2021-2030 is the effort in the Region to support the Seabed 2030 Project.

Regarding the two recommendations of the IHO Secretariat in their report on GEBCO and Seabed 2030 Project, MACHC Coordinator said that the Seabed 2030 Work Plans for 2021 and 2022 address this purpose.

She recalled about the two MACHC virtual events organized in 2021 regarding the Seabed 2030 Project: the Webinar on exploring applications and on remote bathymetric data processing (November 12) and the Meeting of the MACHC points of contact for the Seabed 2030 Project (November 16).

MACHC Coordinator shared the information received from Dr. Vicki Ferrini, Head of the Regional Data Assembly and Coordination Center for the Atlantic and Indian Oceans, about the Members (Brazil, Dominican Republic, France, Netherlands, USA, Venezuela) and other countries that recently contributed to the GEBCO program. The GEBCO 2020 grid had mapped 20% of the MACHC Region and the GEBCO 2021 grid had a coverage of 23% of the Region.

Then, she showed the status of the accomplishment of the MACHC Seabed 2030 Work Plan for 2021. She reminded about the MACHC-Seabed2030 Web Application developed to foster communication and coordination among stakeholders within the MACHC Region. This WebApp presents several layers of information relating to the most recent GEBCO bathymetry products, existing data in the region, and upcoming mapping efforts. For the submission of polygons about upcoming surveys and data acquisition opportunities in waters of national jurisdiction to define data gaps and plan coordinated mapping campaigns or any other contribution to the MACHC-Seabed2030 WebApp, she asked to contact Mr. Percy Pacheco of NOAA (Percy.Pacheco@noaa.gov).

MACHC Coordinator presented the draft Work Plan for 2022 with amendments to Actions 3, 11, 12 and 15 in order to share examples and provide informative webinar.

She next explained how someone could contribute with CSB data in either CSV or GeoJSON, and should capture the minimum required information (XYZ, timestamp). Besides that, those interested in contributing data or becoming a 'Trusted Node' should contact the DCDB at bathydata@iho.int.

Finally, MACHC Coordinator for Seabed 2030/Crowdsourced Bathymetry requested the approval of the MACHC Seabed 2030 Work Plan for 2022.

MACHC Chair thanked Ms. Cecilia Cortina for her presentation and took note of the MACHC Seabed 2030 Report.

22.6.1.1	Decision: Noted the MACHC Seabed 2030 Report

MACHC Chair has noted that it was very important to make the association of the IHO Secretariat Recommendations with the MACHC Seabed 2030 Work Plan Actions. He considered that MACHC is ahead of the average of other regions in terms of mapping the seabed, according to the spatial resolutions established by the Seabed 2030 Project. He added that MACHC Seabed 2030 Strategy had been in place for one year and it was expected that every year there would be more participation from the Members with the support of the Coordinator. The coordination work is considered a little complicated, but it is fundamental in this process.

Questions and Answers

MACHC Chair proposed to approve the MACHC Seabed 2030 Project Work Plan for 2022.

He then opened the floor for comments.

IHO Director Luigi Sinapi asked the MACHC Coordinator for Seabed 2030/Crowdsourced Bathymetry if MACHC would propose an action for the Ocean Decade, given that the second call from IOC has already started.

MACHC Coordinator responded that MACHC had little time to submit an action for the Ocean Decade, but would have support of Dr. Cesar Toro, IOCARIBE Secretary.

Ms. Kathryn Ries of OCS/NOAA said that despite the pandemic ongoing situation MACHC continued to make progress towards the MACHC Seabed 2030 Strategy. She emphasized the importance of Members to provide any information to the MACHC-Seabed2030 WebApp and she registered that NOAA would providing technical support and any assistance needed for Members to create their polygons and put them on the WebApp.

Ms. Kathryn Ries proposed an action for the Commission to elaborate and submit a proposal to IRCC in order to establish a RHC Seabed2030/CSB Coordinators team to meet regularly and exchange experiences, lessons learned and provide mutual support in implementing their roles.

MACHC Chair supported her proposal.

Rear Admiral Rhett Hatcher of UKHO supported the MACHC Seabed 2030 Work Plan for 2022. He said that despite the UK not appearing in the Work Plan for 2021 status report, the UK has been working closely together and supporting the Seabed 2030 Project providing data that they hold and have permission to release and developing conversations with the countries from who UKHO has been their Primary Charting Authority so UK can manage their data appropriately. On crowdsourced bathymetry, UKHO has been working on the development of a national policy for CSB such that they can contribute with this initiative as soon as possible.

As there were no more comments, the Commission approved the action proposed by Ms. Kathryn Ries and the MACHC Seabed 2030 Work Plan for 2022.

Number	Reference	Action
22.6.1.1	Seabed 2030	MACHC to elaborate and submit a proposal to IRCC in order to establish a RHC Seabed2030/CSB Coordinators team to meet regularly and exchange experiences, lessons learned and provide mutual support in implementing their roles.

22.6.1.2	Decision: Approved the MACHC Seabed 2030 Work Plan for 2022.

MACHC Chair then moved to Agenda Item 6.2 'Global Maritime Traffic Density Service' and the 'World Port Index' and invited Mr. James Rogers of the NGA/USA to take the floor.

6.2 Global Maritime Traffic Density Service and World Port Index (Mr. Theodore Schindler and Mr. Theo Collins, United States National Geospatial-Intelligence Agency)

Mr. James Rogers made an opening about two NGA initiatives that would be available to support the MACHC Region and he wanted to make the Commission aware as they come online and the capabilities they offer to support the MACHC efforts in the Region.

He then said that Mr. Theodore Schindler would first introduce a demo of the 'Global Maritime Traffic Density Service' (GMTDS) and after Mr. Theo Collins would brief about the 'World Port Index' (WPI) effort that NGA has been working on.

Mr. Theodore Schindler of NGA showed the multi-year effort NGA and the private industry developed of an analytical and highly adaptable tool called the 'Global Maritime Traffic Density Service' (GMTDS). The platform uses a global base map to visualize the 'Automatic Identification Systems' (AIS) data that ships broadcast. This data was collected from commercial sources with the range of 10 years of historical data. The information illustrated represents cells with one-kilometer resolution. And each one-kilometer cell means the total number of vessel-hours long over the course of a month. It is possible to filter by type of ship. One use of this system that NGA was thinking about would be for survey and risk. NGA had in mind to make the tool accessible to its partners and collaborators in the maritime community.

Mr. Theo Collins of NGA said that the 'World Port Index' (WPI) used to be a pdf file and it is now online as a geospatial representation of the ports. It is available on the ArcGIS Online (AGOL) platform. The access to the AGOL platform can be in two ways: Maritime Safety Information (MSI) site; or Direct Link. He went over the data additions and enhancements of the modernized WPI and then he said that users could update a port's information or submit new ports, based on authoritative knowledge.

MACHC Chair thanked Mr. Theodore Schindler and Mr. Theo Collins, of NGA, and noted their presentations.

22.6.2	Decision: Noted the presentations on 'Global Maritime Traffic Density Service' (GMTDS) and 'World Port Index' (WPI).

He said that those were very interesting tools presented for our community and for other purposes and he hoped that the Members of the Commission would be able to take advantage of these systems.

With that, the MACHC Chair recognized the next speaker of the presentation on Airborne Lidar Bathymetry services using the CZMIL SuperNova and invited Mr. Charles de Jongh of Terratec AS to take the floor.

6.3 Industry Support for Survey and Risk

6.3B Airborne Lidar Bathymetry services using the CZMIL SuperNova (Mr. Charles de Jongh, Terratec AS)

Mr. Charles de Jongh said that he had been working with Airborne Lidar Bathymetry (ALB) at the Terratec AS company in Norway. He added that Terratec AS is the biggest geospatial survey company in Scandinavia and that Terratec AS had many years of experience with airborne Lidar surveys including ALB.

He explained the advantages by using ALB: fast and reliable bathymetric survey method; ability to reach very shallow areas; seamless mapping of land and water in the coastal zone; and ability to reach up to 3 times the visible water depth. The ability to measure the depth depends on the strength of the laser, the local water transparency, and the bottom reflection. ALB would be appropriate for coastal areas and could be used in a complementary way to multi-beam echosounder surveys.

Mr. Charles de Jongh lastly introduced the 'Coastal Zone Mapping and Imaging Lidar' (CZMIL) SuperNova that has many improvements: double point density compared with previous version; best penetration of deep and turbid waters; improved accuracy-shallow channels within IHO Special Order; compatible with CARIS processing software.

MACHC Chair thanked Mr. Charles de Jongh for his presentation and ended the first session of the fourth day of the conference.

Break

MACHC Chair opened the second session of the fourth day of the conference.

He then moved to Agenda Item 7 Disaster response and Agenda Item 7.1 with the presentation title "Caribbean Disaster Emergency Management Agency Responses in 2021 and IHO Collaboration Opportunities" and invited Ms. Elizabeth Riley of CDEMA to take the floor.

7. Disaster Response

7.1 Caribbean Disaster Emergency Management Agency Responses in 2021 and IHO Collaboration Opportunities (Ms. Elizabeth Riley, Executive Director of CDEMA)

CDEMA Executive Director introduced the 'Caribbean Disaster Emergency Management Agency' with its 20 Participating States of the Caribbean Community that addresses matters related to disaster management.

CDEMA is involved with the coordination of responses to events as requested by the Participating States, mobilization and coordination of disaster relief, mitigation of the consequences of disasters, provision of comprehensive information on disasters, encouragement of disaster loss reduction and cooperative arrangements and mechanisms, and establishment, enhancement and maintenance of adequate emergency disaster response capabilities among the Participating States.

CDEMA Executive Director said that CDEMA operates in a multi-hazard context which includes natural hazard and technological hazards, and the issue of climate change is of major concern as the majority of their States are small islands and developing States. She added that on the response side it was established the 'Regional Response Mechanism' (RRM) to provide effective and efficient coordinated disaster response support to CDEMA Participating States requiring regional and/or international assistance for their response to the consequences of an event based on regionally agreed Principles, Concepts and Realities.

She then announced that CDEMA responded in 2021 to three events: the volcanic activity of La Soufrière in Saint Vincent and the Grenadines that started in December 2020; the significant flooding in Guyana in June/July 2021; and the earthquake in Haiti in August 2021.

CDEMA Executive Director recognized that some CDEMA Participating States and Partners (IOCARIBE, Caribe EWS, UWI, OECS) were common with some MACHC Members and Contributing Organizations.

She said that, with regards to possible engagements, they would be interesting to discuss the following matters with MACHC: safety of navigation; protection and management of the marine environment; search and rescue; and tsunami and inundation modeling.

Lastly, CDEMA Executive Director would qualify CDEMA as a MACHC Observer that could seek to be a Contributing Organization and she proposed potential collaboration to support for decision-making in the form of data sharing, facilitating connections, exchange of ideas/knowledge through trainings/exercises/consultations.

MACHC Chair thanked Ms. Elizabeth Riley and took note of her presentation.

22.7.1	Decision: Noted the presentation on CDEMA Responses 2021 & IHO Collaboration Opportunities.

MACHC Chair commended Ms. Elizabeth Riley about the impressive work done by CDEMA and said that MACHC was looking forward for potential collaboration with CDEMA and that would be important to exchange contact information.

Ms. Elizabeth Riley offered her e-mail posted at the end of her presentation (elizabeth.riley@cdema.org).

Questions and Answers

MACHC Chair opened the floor for comments.

IHO Director Luigi Sinapi mentioned that when La Soufrière volcano entered in eruption in 2021 the IHO Secretariat and the MACHC Chair where in contact just after this disaster to follow the evolution of the situation in line with IHO Resolution 1/2005 (Response to Disasters). He then asked whether if CDEMA's work could envision common areas of interest in line with the IHO Resolution 1/2005 to support MACHC

in dealing with this disaster relief or if they focused more on individual connection/link with a single Participating State rather than the region as a whole covered by CDEMA.

CDEMA Executive Director answered that CDEMA's arrangement has been on regional basis. So, in terms of logistics, they would have assets moving from one or more States to the assisted State. And, if no Participating State could give support, CDEMA would seek support from their Partners. Nearshore bathymetry would be important information for Participating States that are lacking, but it would be necessary to discuss the resolution available.

IHO Director Luigi Sinapi agreed that would be important to resolve these technical aspects.

MMSDIWG Chair explained the work of MMSDIWG, the interaction that the Working Group has been having with MapAction, that they developed bathymetric protocols that could support many initiatives in the Region and invited CDEMA to participate on the next MSDIWG meeting.

CDEMA Executive Director thanked the invitation and said that she would assign the GIS specialist of CDEMA to attend this meeting. She added that CDEMA has been working collaboratively with MapAction.

As there were no more comments, it was considered approved the following action by the Commission:

Number	Reference	Action
22.7.1.1	Disaster Response MSDI	Invite CDEMA Executive Director for CDEMA to participate in the next MMSDIWG Meeting.

MACHC Chair moved to Agenda Item 10 Closing Activities.

10. Closing Activities

10.1 Any Other Business

MACHC Chair, on behalf of the Commission, wanted to recognize the work that Ms. Kathryn 'Katie' Ries had done for the MACHC over the past twenty years, her dynamism, enthusiasm and energy she had brought to the Commission and the IHO at large. MACHC22 Conference was the last MACHC meeting Katie would be in her capacity as Acting Director and Deputy Director of NOAA's Office of Coast Survey. He reminded that Katie joined NOAA in 1986 and then NOAA's Office of Coast Survey in 2001 as Deputy Director. MACHC Chair added that it was very appreciated the responsibility she had in leading one of the world's largest Hydrographic Offices and over the past two decades, during a time of major transition. Then he said that MACHC spans one of the largest regions and perhaps the most members and participants among the Regional Hydrographic Commissions; that it is a large and diverse group of Hydrographic Offices, countries, languages, and capacities. MACHC Chair also reminded that, from 2003 to 2012, Katie has chaired the Meso American - Caribbean Sea Hydrographic Commission's Electronic Chart Committee, where she led the development and execution of regional charting plans in Caribbean and Central America. And from 2017, she assumed Vice Chair then Chair of MACHC where she had helped position the new regional charting schemes, capacity building, strategic planning, and the contribution to the global Seabed 2030 initiative. He expressed that the Commission would deeply miss Katie's energy and enthusiasm, given that she had brought not only a passionate commitment to spurring collaboration in hydrography and cartography making navigation safe, protecting the marine environment, and spurring healthy sustainable ocean development. Finally, he expressed, on behalf of the Commission, the sincere

gratitude to Katie for all she had done and presented that small token of the appreciation of the Commission.

Ms. Kathryn Ries wanted to announce at the conference that she would be retiring soon and thanked for the kind words. She recognized that it was time to retire and at the same time it was hard to say goodbye. She hoped to be seeing the people of MACHC in the future and look forward for that, but it would be in different capacity. She recalled the long period she had been involved in MACHC with other participants and recognized how they were deeply committed, providing degree of continuity, perspective and contributions, being very useful for the Commission evolve and grown over the years. She was impressed how the Commission had changed over the years, positioned itself to meet the challenges. She said she deeply admires what MACHC does and how MACHC does, that MACHC has been collaborating well among MACHC Members and collaborating well with regional and international partners. Besides that, she was pleased so see how MACHC was forging partnerships, such as CDEMA, IALA, COCATRAM, IOCARIBE, Caribe EWS, Seabed 2030 and other RHCs, not only exchanging information but also achieving common goals. She recognized the many good friends she made and enjoyed the work and the achievements they made and said she had enjoyed the countries, all the cultures and all the venues where the MACHC meetings were generously hosted. She then announced the new Director of the NOAA's Office of Coast Survey, Rear Admiral Benjamin Evans. Lastly, she wished MACHC "Fair Winds and Following Seas".

Rear Admiral Rhett Hatcher from United Kingdom took that opportunity to thank Vice Admiral Edgar for his contribution and also for him and his support staff for preparing a briefing and running very successful meeting in that week. He said that had been a pleasure to be as MACHC Vice Chair working with Vice Admiral Edgar in 2021 and he would do his best to support his successor. He then wished Vice Admiral Edgar very best of luck in his new Command.

Vice Admiral Renato Garcia Arruda from Brazil made a speech accepting his new role as MACHC Chair starting after the conference. He said that it was his pleasure to join the MACHC community. He added that it would be an honor to work with Rear Admiral Rhett Hatcher from United Kingdom, MACHC Vice Chair, in favor of the Commission to fulfil the aims of the Commission. He expressed his sincere gratitude to Vice Admiral Edgar for the valuable knowledge imparted and for all his hard work in bringing the Commission forward. Vice Admiral Arruda recognized that he had a great responsibility and that he would do his best to meet the Commission's wishes.

10.2 Review of Actions and Decisions

Lieutenant Rafaela Castro from Brazil read the draft actions and decisions approved during MACHC22.

Ms. Kathryn Ries missed the action that came out during the Seabed 2030 discussion about the MACHC Coordinator for Seabed 2030 Project/CSB working with United States to develop a proposal to IRCC to establish a RHC Seabed2030/CSB Coordinators team to meet regularly and exchange experiences, lessons learned and provide mutual support in implementing their roles.

MACHC Chair agreed that this action was missing and it would be included in the draft List of Actions.

IHO Director Luig Sinapi acknowledged at first view that the draft lists of actions and decisions were fully aligned with IHO Secretariat recommendations and the initiatives, specially of what concerns the new challenges awaiting the IHO community (IHO Strategic Plan, S-100 Implementation Strategy). He agreed with Ms. Kathryn Ries on her request and reminded that the appointment with the RHC Seabed2030/CSB

Coordinators could be at the next IHO Crowdsourced Bathymetry Working Group (CSBWG) meeting which would be held in Monaco in hybrid format.

IHO Director Luig Sinapi took that opportunity and congratulated Vice Admiral Edgar for the great job he has done for MACHC and for the hydrography in general. Additionally, he welcomed Vice Admiral Arruda to the international hydrographic community and said the IHO Secretariat could not wait to work with him and would be ready to cooperate.

Captain Marc van der Donck noted that at least two actions were concerning the Strategic Performance Indicators (SPIs) and suggested to amalgamate them into one action. He suggested that the action regarding IRCC CL 01/2021 would need some coordination for a common approach, offering guidance to the Members. He also suggested to put together three actions related to "gap analysis" into one action. Lastly, he reminded about the three actions that had been proposed during the presentation of the Group C Summary Report.

MACHC Chair recognized that these three actions from Group C summary report were missing and they would be included in the draft List of Actions. He said that they would analyze the other suggestions and they would issue to the participants the consolidated draft Lists of Actions and Decisions shortly asking for more suggestions and comments by December 17, 2021.

Mr. Rodrigo Obino from Brazil made some clarifications about the meaning of some draft actions and why they would be separated, and recognized that some draft actions could be joined with others.

IHO Director Luig Sinapi drew attention to the IRCC CL 01/2021 that gave directions on how to start the process for the measurements of the SPIs and that this process could become hard for the diversity of the Regional Hydrographic Commissions and their different realities, but that the IHO should move forward with this process.

22.10.2	Decision: Approved the draft Lists of Actions and Decisions with the amendments regarding RHC Seabed 2030 Coordinators and Group C Summary Report.

10.3 Next Conference

MACHC Chair opened the floor asking if any Member would be interested in hosting the next MACHC Conference. No Member came forward offering to host the next MACHC Conference.

MACHC Chair recognized that the world and the Region had a lot of concerns due to uncertainties regarding the evolution of the health situation. He then proposed to continue monitoring the situation and to decide on the format of the next conference by July 2022. He also said that it would be issued a letter to all Members asking for a volunteer to host the next MACHC Conference.

MACHC Chair next proposed the next Conference to be held from November 28 to December 2, 2022.

IH Director Luigi Sinapi agreed with this period that would not conflict with other IHO commitments and meetings. He added that the IHO Secretariat would issue a Circular Letter with guidelines on hybrid meetings held by the IHO Secretariat in Monaco.

22.10.3	Decision: Approved the next Conference of the MACHC to be held in the week of November 28 to December 2, 2022.

10.4 Conference Adjourns

MACHC Chair said that the Commission had covered all of the items on the agenda and therefore he realized there were no additional issues to discuss.

IHO Director Luigi Sinapi said that the IHO Secretariat has been very pleased to see how the work in the MACHC Region has been progressing. He recognized that MACHC is an example on how MACHC has been dealing with all challenges, demanding initiatives, and new commitments brought by the IHO Strategic Plan and due to the Decade of Ocean Science. He thanked, on behalf of the IHO Secretary-General, Vice Admiral Edgar for what he had done for the Commission during his chairmanship. He welcomed Vice Admiral Arruda confident that he would be fully committed not only at the national level, but also at the regional level for the benefit of the international hydrographic community. IHO Director Luigi Sinapi finally thanked all participants for their active participation in the MACHC22 Conference.

MACHC Chair thanked the IHO Director Luigi Sinapi for all his support during his chairmanship.

He then made a final speech. He hoped that the MACHC22 was beneficial to all of participants. Despite the fact that the meeting was held virtually, he hoped that all matters considered relevant to MACHC were discussed. MACHC Chair expressed his gratitude to the United States of America for their significant contribution to the event, which included the use of the Interactio Video Conferencing Platform, which enabled simultaneous translation. He recognized that a face-to-face meeting would be undoubtedly more productive, and he hoped the Commission could attend one soon. He thanked the translators for their outstanding work and Captain Marc van der Donck from Netherlands, Jefe Técnico (RA) Dagoberto Uriel David Viteri from Colombia, and Alférez de Navío Roger Valenzuela Jaimes from Guatemala, as the Breakout Groups Chairs, for their harmonious and serene leadership of the groups and their remarkable job. He then expressed his great appreciation with the MACHC Chairs / Coordinator of the MACHC Committees and Working Groups for their superb work for the benefit of the Region. He also said that he was grateful to MACHC Vice-Chair, Rear Admiral Rhett Hatcher, and his team who worked closely with Brazil and helped him so much in the decision-making process. He thanked all delegates from members, observer states, the IHO Council Chair, the IHO Secretariat, the representatives from international and regional organizations, academia, industry, and all other participants for their participation and contributions. And finally, he wished all the best to MACHC.

With that, the MACHC Chair declared the 22nd Conference of the Meso American - Caribbean Sea Hydrographic Commission closed.

End of the Conference