IHO DATA CENTRE FOR DIGITAL BATHYMETRY REPORT

Submitted by Director IHO DCDB

SUMMARY

Executive Summary: This document provides details of the work of the IHO DCDB, new/significant data contributors, an update on the ongoing development programme to enhance the interfaces and digital data management capabilities of the DCDB as well as a general update on the work being undertaken by the CSBWG and relevant activities of the AORA.

Action to be taken: See paragraph 8

Related documents: GGC34/2/5, GGC35/2/5 – IHO DCDB Report

1. Introduction

The IHO's Data Centre for Digital Bathymetry, which is hosted by NOAA, was established in 1990 to ensure that an international repository existed that would accept, manage, archive and share, freely and without restrictions, depth data contributed by hydrographic, oceanographic, and other vessels. The DCDB strongly encourages IHO Member States and other organizations to contribute their bathymetric data and metadata in a variety of standard formats and to work with DCDB data managers to determine the best way to get data to the repository.

2. Data Contributors

The largest data providers to the DCDB continue to be the U.S. University-National Oceanographic Laboratory System (UNOLS) and NOAA fleet. Fugro is now considered a routine data provider with 19 surveys that are currently accessible and 16 new surveys waiting processing through the data ingest pipeline.

There were several new data contributors this year, they include:

- Five Deeps Expedition - Puerto Rican Trench expedition (data delivered by IHO Secretary General)
- Brazilian Navy - 10 surveys (data corresponding to Brazilian undersea features accepted at SCUFN 32)
- China Undersea Name Authority - multibeam data corresponding to SCUFN 32 features
- Swiss Polar Institute - 2016 Antarctic survey
- Geological Survey of Ireland - 23 surveys
- Hydrographic Institute of Italian Navy - Arctic missions High North 2017 - 2018

Over the last several months the DCDB has also been working to establish FarSounder Inc, CIDCO, MacGregor, and James Cook University as the next CSB data contributors, or "trusted nodes".

3. IHO DCDB Enhancements

CSB-related Enhancements:
In response to the IHO CSB initiative, starting 2014, the DCDB commenced a program to enhance its infrastructure and interface to provide data ingest, archiving, discovery, display and retrieval of global CSB data contributed from mariners around the world. As the CSB initiative continues to grow, the DCDB intends to develop beyond its current basic file management capabilities to a continuous point store. Moving to the cloud will allow for CSB data (and theoretically all bathymetric data sources) to be stored as a seamless collection of points. It is anticipated that the DCDB could then provide a variety of enhanced services along with the data itself, such as the ability for users to generate bathymetric grids of a given area using user-specified resolution, to retrieve data density information, and better support the guiding of future data collection efforts. In addition to the above developments, the DCDB plans to work with Member States to archive and make publically available shallow water bathymetry extracted by Member States from their ENC Usage Bands 2 and 3 coverage.

Over the last two months, the DCDB has been working to implement a geographic filter for all incoming data taking in to account Member States positions on the collection of CSB data in a country's area of jurisdiction. The result will be that data from only 13 CSB-supporting countries will be made discoverable and accessible via the DCDB Viewer.

Improved Map Viewer:
Once the contributed bathymetric data have been archived, they are made discoverable and accessible through the DCDB web map viewer (maps.ngdc.noaa.gov/viewers/iho_dcdb/). Improvements to the viewer over the last year include the restructuring of the viewer layout to highlight the map services of other Member States and organizations and adding new bathymetric visualization services from the Netherlands and France.

Web Page Enhancements:
An effort is currently under way to improve the layout and content of the current DCDB Webpages (https://www.ngdc.noaa.gov/iho/). The main goal of the update is to provide a clear resource to those interested in contributing data to the DCDB. A pdf of the DCDB's Data Collection and Management Guidelines, metadata templates, and access to Cruise Pack, a stand-alone packager for all cruise-based data, will be available to data providers. The still-in-process updated website can be accessed here: https://www.ngdc.noaa.gov/iho/test/. Feedback is requested.

Future DCDB Enhancements:
Over the next year, additional enhancements will focus on:

- The addition of more trusted data providers in the CSB project
- Continuing to refine and improve the DCDB data upload and download pipelines
- Continuing to test point storage technology (ie: cloud) to better handle the large volumes of points that are expected to be received.
- Enhancing the current data ingest pipeline to accept ENC point data
- Improving the granularity and precision of the CSB geographic mask.
    - Will involve masking only the subset of a given submission which intersects with restricted areas.

    - May also include ability to take different actions with the embargoed data depending on the member state's requirements.
- Migrating the current (outdated, inflexible) database to a new schema to enable a better system for:
    - Versioning of processed swath files
    - Discovery of backscatter and ancillary files
    - Indicating polygons of extent of coverage

4. CSB Working Group Update

The Crowdsourced Bathymetry Working Group (CSBWG), chaired by the Director of the IHO DCDB, is tasked by the Inter-Regional Coordination Committee (IRCC) to develop a draft IHO publication on policy for trusted crowdsourced bathymetry (CSB). B-12 (IHO Guidance on Crowdsourced Bathymetry) will provide guidelines on the collection and assessment of CSB data for inclusion in the global bathymetric data set maintained by the IHO Data Centre for Digital Bathymetry (DCDB).

At the IHO Member States request, a new figure was added to the CSB Guidance Document before publication that acknowledged Member States positions on the collection of CSB in areas of jurisdiction. B-12 IHO Guidance on Crowdsourced Bathymetry, was published earlier this year and is available online (iho.int/iho_pubs/bathy/B_12_Ed2.0.2_2019.pdf).

CSB Industry Workshop:
The Canadian Hydrographic Service and the CSB Working Group hosted an Industry Workshop in Quebec City, on 12 and 13 February. Representatives from CIDCO, Da Gama Maritime, EGS Survey (representing ICPC), ECC, ESRI, FarSounder, Fugro, GMATEK, Hypack, Olex, Secunda, SevenCs/ChartWorld and Teledyne CARIS attended. The main goal of the Workshop was to showcase a variety of current industry participants and discuss the potential for future collaborations to advance the IHO Crowdsourced Bathymetry Initiative.

The invited industry representatives at the Workshop were given an overview of the IHO CSB initiative, which was followed by short presentations on current industry partner projects, examples of CSB data usage by hydrographic offices and habitat mapping projects and technology perspectives. AORA/ASMIWG, Sea-ID, NF-GEBCO Seabed 2030 and James Cook University gave presentations by remote link. There was much discussion among Workshop participants on how to expand the initiative into the various maritime sectors, what methodologies were appropriate to incentivize data gathering activities, how the data could be made available and what recognition strategies were desirable.

CSBWG7:
The working group held its 7th meeting in Québec City, Canada from 13 to 14 February 2019. The Chair of the CSBWG, Ms Jennifer Jencks (USA, Director of the DCDB), chaired the meeting which was attended by representatives from eight Member States (Canada, Denmark, India, Italy, New Zealand, Norway, UK and USA), and observers and expert contributors from the ONE Data Technology Co, Dongseo University, Farsounder INC, Da Gamma Maritime Ltd, GMATEK Inc, and Fugro. Assistant Director David Wyatt (Secretary) represented the IHO Secretariat.

At its 7th meeting, the CSBWG briefly reviewed the final draft version of the B-12 Guidelines which was presented to Member States for adoption via IHO Circular Letter

11/2019. A full explanation was provided on the background to the generation of Edition 2.0.0 within such a short timeframe. The WG decided to start considering ways of obtaining user community feedback and comments at its next meeting, which will allow some operational experience to be gained with the current version. The participants also considered the outreach and recognition strategies, which should be developed. The group decided to focus on Geophysical, the Research vessel, Cruise Liner, Submarine Cable, and Recreational Leisure sectors, including the Super Yacht community. It was agreed that representation at a number of events and meetings was essential to raise awareness and to progress the five headline topics (need, how, what, incentives and benefits) to increase contributions and participation. It was agreed that leading organizations and companies within each sector could be identified and approached to act as CSB ambassadors. It was proposed that the first three CSB ambassadors should be Carnival and MacGregor on behalf of the cruise industry, Fugro on behalf of the marine survey industry and PGS on behalf of the seismic survey industry. Additionally, it was agreed that closer liaison needed to be established with other IHO bodies as well as the Seabed 2030 project, in particular the Chairs of the Data Quality Working Group (DQWG) and Marine Spatial Data Infrastructure Working Group (MSDIWG) should be invited to future meetings. It was suggested that the Director and Deputy Director of the Seabed 2030 project should be invited to participate and that close harmonization of the outreach activities of both groups should be a priority.

CSBWG8:
The working group held its 8th meeting at the IHO Secretariat, Monaco from 23 to 25 October 2019. In the absence of the Chair of the CSBWG, Ms Jennifer Jencks (USA, Director of the DCDB), the Vice-Chair, Mr Serge Gosselin (Canada), chaired the meeting which was attended by representatives from eight Member States (Canada, Denmark, Italy, Japan, Netherlands, Norway, UK and USA) and observers and expert contributors from Fugro, Da Gama Maritime Ltd, FLIR Systems AB, SevenCs/ChartWorld, ECC AS, MY Gene Machine and Sea-ID. Assistant Director David Wyatt (Secretary) represented the IHO Secretariat.

The replies to the various IHO Circular Letters on CSB published during 2019 and the States on the positive list published on the IHO website were discussed. It was agreed that more engagement through Regional Hydrographic Commissions was required to articulate the increasing global societal and United Nations (UN) driven need to complete the picture of the seafloor as well as the potential benefits to individual coastal states. Two proposed clarifications to B-12 – *IHO Guidance on Crowdsourced Bathymetry* – were approved.

The participants discussed current use case examples by a number of Hydrographic Offices (HOs), after which the Chair of the Data Quality Working Group (DQWG) provided two comprehensive presentations on 'Data Quality Combining S-101 and S-102 and Definitions of depth' and 'Using data quality for safe navigation', which highlighted aspects in support of CSB and could overcome a number of HO's concerns to use the data or encourage its collection.

The participants devoted considerable time to the outreach and recognition strategies, which needed to be developed to increase data contributions and incentives to increase participation. During breakout sessions the participants considered three headline topics: actions to increase contributions; key messages; and a review of the mind map developed at CSBWG6. It was agreed that current engagements with commercial companies needed to be nurtured and maintained to ensure data is delivered and continues to be delivered. It was also noted that use of experiences and motivations of current lead contributors should be used to

communicate to other potential contributors. It was also recognized that the IHO Secretariat report and the national reports to RHCs provided the opportunity to highlight positive coastal states and actions to encourage participation. It was agreed that the Director of the Seabed 2030 project should be invited to participate in future CSBWG meetings and that close harmonization of the outreach activities of both groups should be a priority.

CSBWG9:
The ninth meeting of the CSBWG is scheduled for 29 June - 2 July 2020 in Stavanger, Norway. It is intended that it will coincide with a "CSB Stakeholder Workshop" – similar to the 2019 Industry Workshop but with invitations sent to a broader user community, including science and government. Specific goals and outcomes for the WG meeting include:

5. Seabed 2030-funded CSB Pilot Program

The Seabed 2030 Project Team activity budget allocated a crowdsourcing budget of US$40,000 for Year 2. Members of the CSB Working Group decided the best use of these funds would be to purchase and supply generic data loggers to two regional CSB mapping projects as a proof of concept. This would be a great way to (1) collect data in under served areas, (2) grow excitement about the CSB initiative, (3) develop a repeatable regional CSB mapping project strategy. The intent would be to replicate some version of Dr. Robin Beaman's Crowdsourced Bathymetry on the Great Barrier Reef Project.

Step 1: Identify potential pilot programs that would have interest and the necessary resources A potential program would have to guarantee they could provide the staff to hand loggers out, assist local mariners in set up, act as a data assembly center, and provide a copy of these data to the IHO DCDB. We are currently under discussion with two potential CSB mapping projects:

1. UKHO: The UKHO is the charting authority for many remote and data starved areas and is currently conducting surveys in a few remote areas over the next year. They have expressed interest in being provided ~100 data loggers.
2. South African Navy Hydrographic Office: SANHO has voiced their support of the CSB concept and have described a "study on CSB in the South African context" that was tasked to the Institute for Maritime Studies (IMT) which is a division of Armscor, South Africa. A similar offer to the UKHO was made to SANHO/IMT.

Both HO's have expressed interest in accepting our offer.

Step 2: Identify a variety of inexpensive data loggers that could be purchased en masse depending on the situation/need. CCOM/JHC, under the direction of Dr. Brian Calder, purchased and evaluated an assortment of generic data loggers.

Step 3: Confirm commitment of UKHO and SANHO, determine suitable logger(s) for each project, purchase en masse.

Step 4: Work with Dr. Beaman to document "Lessons Learned/How to implement" so local programs can be repeated elsewhere in the future.

Step 5: Identify new programs.

6. AORA Activities

The Atlantic Seabed Mapping International Working Group (ASMIWG) is one of four working groups (Aquaculture, Ocean Literacy, Seabed Mapping, Ecosystem Approach to Ocean Health and Stressors) focused on implementing the Galway Statement on Atlantic Ocean Cooperation, signed by the European Union, Canada, and the United States in May 2013. The intent of the Galway Statement is to foster cooperation and increase knowledge of the Atlantic Ocean through improved coordination and collaboration in ocean observation efforts.

ASMIWG10:

The working group held its tenth meeting 15 - 16 April 2019 at the NOAA National Centers for Environmental Information facilities in Boulder, Colorado, USA. The ASMIWG meeting and the meeting of the Seabed 2030 Atlantic and Indian Ocean Regional Coordinating Team overlapped, and were in joint session for the afternoon of 16 April.

Updates were given on Data Management and Sharing, Atlantic Transects, the IHO CSB Initiative. There was roundtable member update which included Ocean Business, EMODnet, Fugro, GMRT, Seabed 2030, US Data Gap Analysis, MAREANO, NOAA Okeanos Explorer plans, H2020 iAtlantic project, INFOMAR, and the Research Vessel Coordinator position.

A portion of the meeting involved breakout groups to brainstorm Communication ideas and Mapping strategies.

ASMIWG11:

The eleventh meeting of the working group has been scheduled for 3-4 February 2020 in Brussels.

7. Miscellaneous

There remains a need to develop data flow processes between data contributors, the Seabed 2030 RDACCs/GDACC and the DCDB.

8. Actions

The GGC is requested to note the contents of this report and take action as deemed necessary.