

Report of the IHO Data Centre for Digital Bathymetry

<i>Submitted by:</i>	Director of the DCDB
<i>Related documents:</i>	IHO CL23-1990 on Establishment of the DCDB
<i>Related Projects</i>	IHO CSB Initiative, GEBCO, Nippon Foundation-GEBCO Seabed 2030 Project

1. Meetings Held During Reporting Period

N/A

2. Work Programme

The IHO Data Centre for Digital Bathymetry was established in 1990 to steward the worldwide collection of bathymetric data. The Centre archives and shares, freely and without restrictions, depth data contributed by mariners. Data can be discovered and accessed from the IHO DCDB Data Viewer: ncei.noaa.gov/maps/iho_dcdb/

The IHO DCDB is hosted by the U.S. National Oceanic and Atmospheric Administration (NOAA) on behalf of the IHO Member States.

DCDB Data Holdings

Since establishment, the quantity of data archived in the DCDB has grown considerably both in area coverage and size, particularly in the last decade with the addition of multibeam echo sounder (MBES) data. Today, the DCDB archives over 60 terabytes (TB) of uncompressed oceanic soundings acquired by hydrographic, oceanographic and other vessels during surveys or while on passage.

DCDB data holdings are routinely used for the production of improved and more comprehensive bathymetric maps and grids, particularly in support of the GEBCO Ocean Mapping Programme and the Nippon Foundation-GEBCO Seabed 2030 project. The Seabed 2030 project has created a global drive to search out new datasets to be added to the currently available bathymetry and the IHO DCDB has been identified as the preferred archive. For the 2021 release of the GEBCO grid, it is estimated that 20.6% of seafloor has been mapped, compared with 19% in 2020.

The largest data providers to the DCDB continue to be the U.S. Academic Research Fleet (ARF) with 47 archived in 2021. Additional significant data contributions to the DCDB in 2021 include:

- NOAA - 17 surveys
- Fugro - 26 surveys
- US Geological Survey - 1 survey
- LDEO MGDS - 29 surveys (58 still in backlog)
- Caladan/Five Deeps - 73 surveys

Over the last year, the DCDB continued to bring in crowdsourced bathymetry data from Rosepoint Navigation System, FarSounder Inc, PGS and MacGregor Germany. New pipeline establishments are currently underway with Navico C-Map, M2Ocean, Great Lakes Observing System (GLOS), and

Aquamap.

It is worth noting that the estimated seafloor mapped for the DCDB Archive holdings was calculated to be ~12%.

DCDB Map Viewer

Once the contributed bathymetric data have been archived, they are made discoverable and accessible through the DCDB web map viewer.

Improvements and updates to the viewer over the last year include:

- New url: ncei.noaa.gov/maps/iho_dcdb/
- Web Services - Updates:
 - Added several new and updated AusSeabed compilations layers (Australia).
 - Point to new WMS endpoints for Netherlands Caribbean grids
 - Added new GEBCO_2021 Type Identifier (TID) grid (Bathymetric Coverage Maps).
- Web Services - New:
 - Sailandrone Multibeam Coverage Polygons
 - Land Information New Zealand (LINZ) bathymetric data layers
 - UKHO Bathymetric Survey Coverage (view only)
 - IFREMER raw Multibeam layer (view only)
 - Alfred Wegener Institute processed multibeam data coverage
 - PANGEA processed and raw bathymetry data and footprints
 - Global Maritime Traffic Density Service
- “Grid Extract” added to the viewer:
 - Grid Extract is a web application which accepts the user’s area of interest, cell size, and grid format and then asynchronously produces a custom data grid (GeoTIFF) from either the "Multibeam Mosaic" or "Multibeam Mosaic Hillshade."

CSB-specific Enhancements

Software developers at the DCDB spent several months in 2021 performing a major overhaul of the CSB data ingest-extract-archive pipeline. The work took into account the lessons learnt over the past few years with the intent to provide a better service, improved functionalities and an enhanced user experience. This new infrastructure will be deployed in summer, 2022.

As the CSB initiative grows, the DCDB has also been working to develop beyond its current basic file management capabilities to a continuous point store hosted in the cloud. The CSB data are currently available either through the [NOAA Big Data Program](#) or through the DCDB viewer. Moving to the cloud now allows for CSB data to be stored as a seamless collection of points. The end user can now query this point store to extract just the data of interest and request that a grid be created from the results.

Planned DCDB Enhancements

In response to the growing data demands from the Seabed 2030 project and IHO CSB initiative, the DCDB commenced a program last year to rebuild its infrastructure and enhance its interface to provide data ingest, archiving, discovery, display and retrieval of global multibeam bathymetric data. The new ingest-to-archive data pipelines will allow for improved reliability, greater ease in ingesting new data, greater flexibility in allowed data formats and simplified data delivery.

Over the next year, additional enhancements will focus on:

- Finalizing the migration of the current (outdated, inflexible) database to the 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
- Deploying the new multibeam ingest pipeline which will result in improved automation and flexibility.
- Adding more trusted data providers in the CSB project.
- 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.
- Update [AutoGrid](#)
 - The current version of AutoGrid is a web application which accepts the user's area of interest, cell size, and grid format and then asynchronously produces a custom data grid from the multibeam archive.
 - AutoGrid 2.0 will run in the cloud (AWS) and include multibeam and CSB data (eventually singlebeam and possibly lidar).

Data Submission Agreements

After much discussion, it was agreed that the IHO would now serve as the signatory for the IHO Crowdsourced Bathymetry Trusted Node Agreement Forms and non-CSB data submission agreement forms when determined necessary (e.g.: with the International Seabed Authority). This was decided in part to reassure potential data contributors that it was the IHO that they were partnering with.

GEBCO Gazetteer

The DCDB developed and hosts, on behalf of the IHO, the GEBCO Gazetteer, a web tool that allows the public to search for, view, and download information (eg: geographic location, feature dimensions, the discoverer, and the origin of the name) on more than 3800 undersea features. Gazetteer v4.3.6 is live at ngdc.noaa.gov/gazetteer. The GEBCO Subcommittee on Undersea Feature Names (SCUFN) is the primary stakeholder for the Gazetteer.

Work in 2021 included (1) resolving reported issues or enhancement requests, bringing the number of outstanding issues to zero, (2) providing maintenance releases and (3) beginning development on Gazetteer v5.0 which will provide interoperability with the Beta-Gazetteer developed by the Korean Hydrographic and Oceanographic Agency.

Significant changes are needed in the current GEBCO Gazetteer in order to support the KHOA Beta-Gazetteer integration and simplify future development. Face-to-face meetings between GEBCO Gazetteer developers and KHOA Beta-Gazetteer developers took place at SCUFN 35.1 (March 2022). The agreed-upon goals for 2022 work include:

- Supporting KHOA's developers as they develop and test the Beta-Gazetteer integration using well known authentication and integration standards (OAuth, REST APIs)
- Updating the API, fixing reported bugs and adding requested enhancements
- In-depth testing
- Updating the user interface to use a modern and more maintainable framework, Vue.js

3. Progress on IRCC Action Items

N/A

4. Problems Encountered

N/A

5. Any Other Items of Note

After providing annual data contribution metrics to several RHCs on an ad hoc basis, the DCDB intends to produce regional breakdowns of data holdings using RHC limits as part of SPI reporting.

6. Conclusions and Recommended Actions

It is highlighted that the DCDB is an IHO Member States' resource that requires additional data to increase the coverage and move towards a comprehensive global bathymetric dataset. Therefore IHO Member States and stakeholders are invited to contribute and encourage the provision of bathymetric data regardless of its origin or reason for gathering.

7. Justification and Impacts

N/A

8. Actions Required of IRCC

The IRCC is invited to:

- a. Note the contents of this report;
- b. Encourage Member State and stakeholder bathymetric data contributions to the DCDB, regardless of origin; and
- c. Take any other action it considers appropriate.