



IHO Data Centre for Digital Bathymetry

Jennifer Jencks

jennifer.jencks@noaa.gov

Director, IHO DCDB

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IHO Data Centre for Digital Bathymetry

The recognized international repository for all deep ocean bathymetric data (> 100 m) collected by hydrographic, oceanographic and other vessels.

Since 1990, NOAA's NCEI (formally NGDC) has hosted the DCDB on behalf of the IHO Member States.

Raw sonar data, processed data, crowdsourced bathymetry

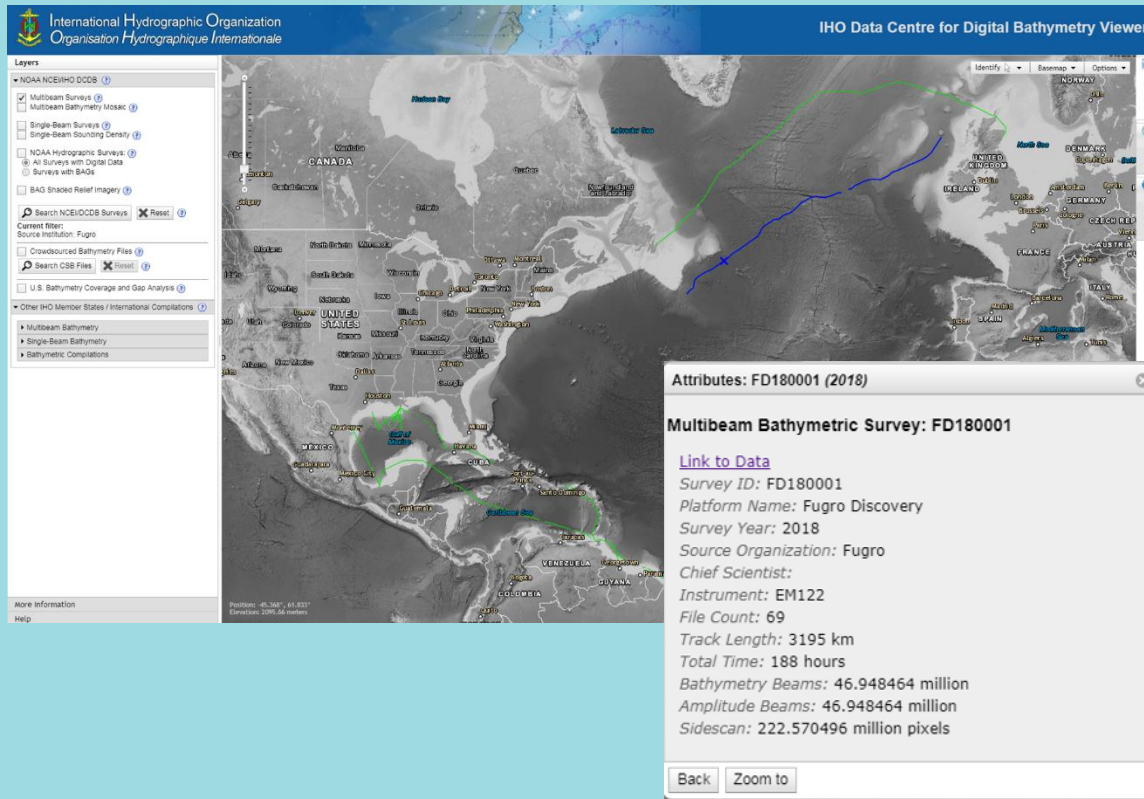
Utilizes standard web services for promoting data access - both the discovery and delivery of data and metadata.

The screenshot shows the IHO Data Centre for Digital Bathymetry (DCDB) website. The header features the IHO logo and the text "International Hydrographic Organization" and "Organisation Hydrographique Internationale". Below the header is a navigation bar with links: Home, Letters & Documents, Standards & Publications, Committees & WG, Capacity Building, ENCs & ECDIS, Meetings, External Liaisons, IHO Membership, and World Bathymetry. The main content area has a sub-header "IHO Home / IHO DCDB" and a title "IHO Data Centre for Digital Bathymetry (DCDB)". A paragraph describes the DCDB's mission: "The International Hydrographic Organization Data Centre for Digital Bathymetry (IHO DCDB) 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. The IHO DCDB is hosted by the U.S. National Oceanographic and Atmospheric Administration (NOAA) on behalf of the IHO Member States." A "Contribute Data" button is visible. Below this is a navigation bar with links: Home, Crowdsourced Bathymetry, Data Uses, and Resources. A section titled "IHO Membership" features a world map with colored regions and a "View IHO Membership Details" link. To the right of the map is an "Access Data" button. Below the map, a paragraph states: "The DCDB contains oceanic soundings acquired by hydrographic, oceanographic and other vessels during surveys or while on passage. Data are publicly available and used for the production of improved and more comprehensive bathymetric maps and grids, particularly in support of the GEBCO Ocean Mapping Programme." Another paragraph follows: "IHO Member States and others can contribute bathymetric data and metadata via File Transfer Protocol (FTP), email, or mail (CD, DVD, and hard drive) in the formats below. Other formats will be considered on a case-by-case basis." A list of supported formats is provided: "Raw sonar data: MGD77T or the original manufacturer's format", "Processed data: BAG, NetCDF, tif, xyz, sd, asc, etc.", and "Metadata: XML or text". At the bottom, a section titled "Do You Know?" contains three bullet points: "Detailed knowledge of global bathymetry is critical for understanding how Earth's systems interact and to support coastal zone management, environmental protection, tsunami modelling, inundation forecasting, and charting.", "The shape of the ocean basins, ridges and mountains influence the flow of sea water carrying heat, salt, nutrients, and pollutants. These features also influence the propagation of energy from undersea seismic events that result in potential disasters such as tsunamis.", and "Less than 15% of our oceans are mapped with in situ soundings, making it critical to preserve and share the data already collected and to identify and work together to fill high priority data gaps to support these important uses."

ngdc.noaa.gov/iho/

Industry Contributing Data

Fugro Marine GeoServices



NOAA/DCDB worked with Fugro to identify metadata gaps and offer suggestions for improved data packaging to allow Fugro to provide a more complete product.

This has allowed Fugro to quickly identify a workflow and delivery method that promotes consistency across the fleet

Multibeam: 14 surveys, ~140 Gb

Water column sonar: 11 surveys, 350 Gb

Industry Contributing Data

Ocean Infinity

FILTERS

[BACK TO NEWSPAGE](#)



PERFORMANCE

OCEAN INFINITY DONATES 120,000 SQUARE KILOMETERS OF DATA FOR MISSING MALAYSIAN AIRLINER TO GEBCO SEABED 2030 PROJECT

21/06/2018

Ocean Infinity donated 120,000 square kilometers of data from the search for missing Malaysian airliner to The Nippon Foundation-GEBCO Seabed 2030 Project.

Ocean Infinity's data was collected by a fleet of eight Autonomous Underwater Vehicles (AUVs), enabling the surveying company to gather data much more quickly than traditional mapping missions during its recent Indian Ocean search for the missing Malaysian airliner, MH370.

"Our deep water search for MH370 demonstrated the most rapid collection of high-resolution sonar data in history, and we are thrilled on World Hydrography Day to announce our donation to such a pioneering initiative," announced Oliver Plunkett, CEO of Ocean Infinity.

[Read full article](#) Press Release – Ocean Infinity donates data from search to GEBCO

DCDB is currently working with OI to properly prepare and transfer their data to the archive.

IHO Crowdsourced Bathymetry Project

In 2014, the International Hydrographic Organization (IHO) initiated a collaborative project to enable mariners and professionally manned vessels to collect “crowdsourced bathymetry”.

Working to enhance the DCDB infrastructure to allow the public to upload, discover, display and download CSB data via a web-based interface

Enabling **ALL** mariners to *map the gaps*!



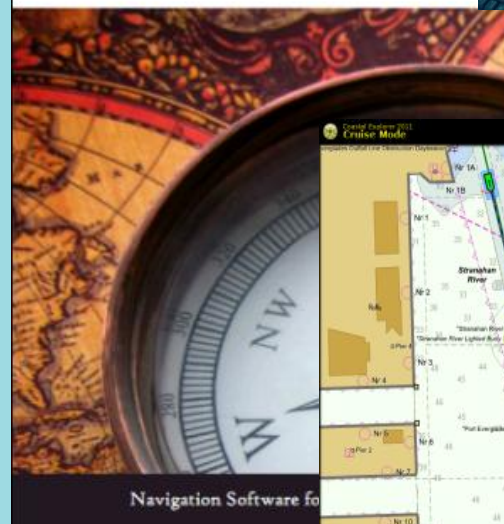
IHO DCDB Enhancements for CSB Data

PILOT PROJECT RECAP

- IHO DCDB and NOAA teamed up with Rose Point Navigation Systems
- Mariners using Rosepoint can enable a modified electronic charting system log file to record position, depth and time.
- Mariners can capture metadata about vessel and equipment.
- The software transmits the data to Rosepoint when the mariner updates the software or chart catalog.
- Rosepoint transmits the data to the DCDB via HTTPS post



www.pcmaritime.com

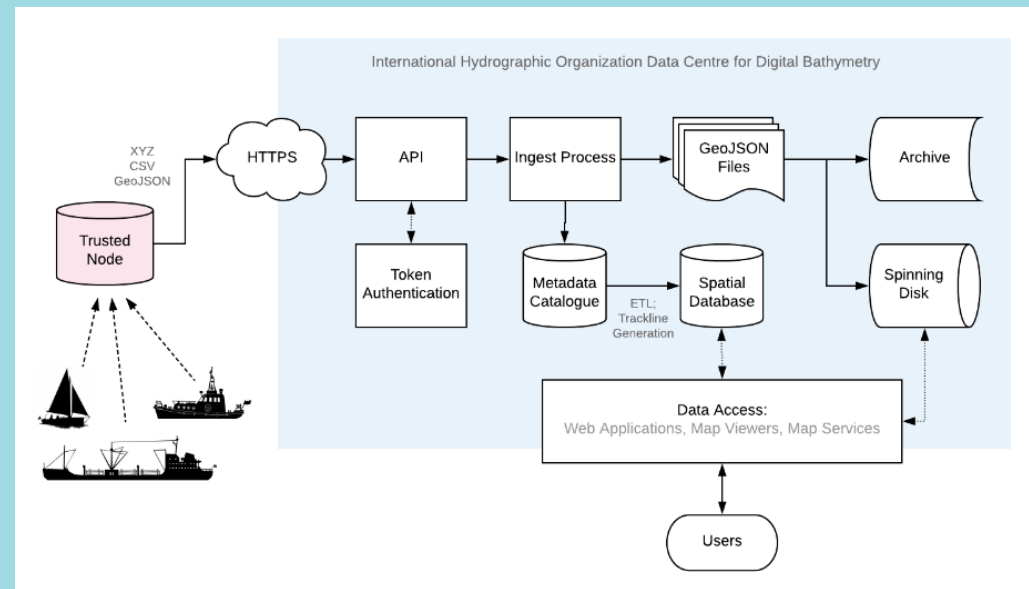


www.rosepointnav.com

IHO DCDB Enhancements for CSB Data

This Year:

- Hardened system to prepare for expansion to more data providers.
- Streamlined new contributor onboarding SOP.
- Implementing option for user to choose delivery format (CSV or GeoJson)
- Added ability to filter by “date added to database” in map viewer



The screenshot shows a search window titled 'Search Crowdsourced Bathymetry Files'. It contains several search criteria fields: 'Date of Data Collection' with 'Start' and 'End' date pickers; 'Date Added to Database' with 'Start' and 'End' date pickers; 'Provider' with a dropdown menu; 'Platform Name' with a dropdown menu; and 'Platform ID' with a dropdown menu. There is a 'Zoom to Results' checkbox and three buttons at the bottom: 'Reset', 'Cancel', and 'OK'.

NOAA Bathymetry Module

For the Voluntary Observing Ships (VOS) Program

The current bathymetry pilot module is a set of two applications written in Python 2.7:

1. The first stores echosounder and GPS NMEA strings that a ship outputs
 - The program connects to the echosounder and GPS through serial ports, collects the strings using python threads, and logs each GPS and echosounder pair as well as time.
 2. The second parses and posts the data to the IHO DCDB
 - After the file is transferred to the VOS data center (through email etc.), the second application parses the raw strings, extracts the GPS, depth, and timestamp and formats the data to be posted to the DCDB.
- *The current version of the module is optimized to work with the metadata storage practices of the VOS Program.*
 - *With additional work, the process can be abstracted to any ship & organization*

Crowdsourced Bathymetry

Fishing, tug boats, sailboats, cruise ships



Other

- International (e.g., Ireland, Germany)
- Industry



Research & Exploration (not NOAA)

UNOLS Fleet (26 vessels)



NCEI - DCDB

Long Term Archiving
Data Discovery
RAW BATHY (+)



Public



Google
ESRI



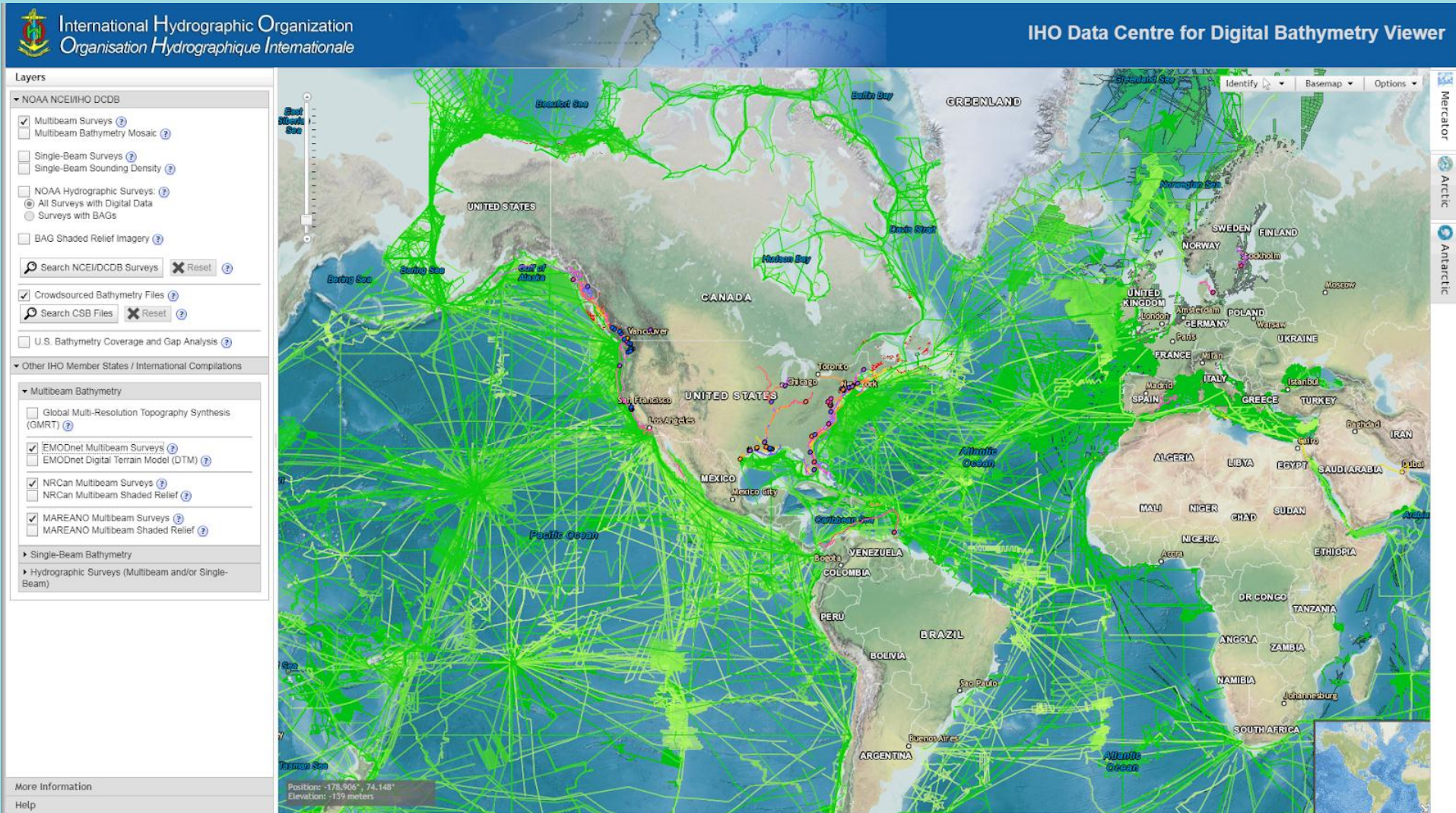
SB2030
RDACCs

NOAA Charting & Exploration

- NOS OCS
- OAR OER



DCDB = World Reference for Raw Bathymetry



Additional Activities

Guidelines & Templates

2.

Data File Structure:

The data may be delivered in one archived file (e.g., tar or zip) or in a well-defined directory structure. Please include an MD5 checksum with the delivery so NCEI can verify the integrity of the files and the completeness of the data transfer. For questions regarding MD5 checksums, contact mb.info@noaa.gov.

A preferred data structure would be the following:

```
<ship name>
  <cruise ID>
    cruise/
      o metadata – cruise level
      o cruise report/documentation
    multibeam/
      o version1/
        ▪ data/ – include raw (as collected) data files
        ▪ metadata/ – dataset level
        ▪ ancillary/ – include SSP, nav, tracklines, etc.
      o version2/
        ▪ data/ – include processed data files
        ▪ metadata/ – metadata to include processing steps
        ▪ ancillary/ – include SSP, nav, tracklines, etc.
        ▪ products/ – include grids, images or other derived products
    subbottom/
      o data/ – include all segy files
      o metadata/ – dataset level
    wcsd/
      o data/ – include all raw files
      o metadata/ – dataset level
```

Data Submission:

Email mb.info@noaa.gov to alert the multibeam data manager of incoming data (multibeam, [subbottom](#), [wcsd](#)), set up your data submission, or ask any questions.

Data can be delivered to NCEI via (1) shipping external hard drives, (2) uploading to NCEI's FTP server, or (3) data copy using [rsync](#) through a secure shell login ([linux](#)).

1. External hard drives containing a data submission can be shipped to the following address
Evan Robertson
NOAA NCEI
325 Broadway E/NE42
Boulder, CO 80305
2. NCEI maintains a number of public FTP servers. All the FTP servers allow anonymous ftp

Data collection and management guidelines and metadata templates to encourage data collectors into becoming data providers.

- Metadata fields spreadsheet
- Requested directory structure

Additional Activities

CruisePack

One tool to pack it all...

- Stand-alone packager for cruise-based data.
- Additional data types and instruments can be added with little or no modifications to code.
- Simple user interface with pulldown menus and controlled vocabularies
- Creates consistent BagIt format data packages complete with md5 checksum manifest files.
- Generates cruise-level and series level metadata files
- Alpha version undergoing testing.

NCEI CruisePack v.a1

Package | People / Organizations | Cruise Information | Data

+ Add Additional Dataset

Bathymetry | Kongsberg EM122 (.all files only) | Public Release Date 4/12/18

Instrument Files Path /data/FA12006/Bathy/EM122 | Select Directory

Water-column sonar | Simrad EK60 | Public Release Date 4/12/18

Instrument Files Path /data/FA12006/wcsd/EK60 | Select Directory

Calibration State Calibrated w/o calibration data | Calibration Date 4/4/17

Calibration Files Path /data/FA12006/wcsd/EK60/calibration | Select Directory

Gravity | Graf-Askania GSS2-22 | Public Release Date 4/12/18

Instrument Files Path /data/FA12006/gravity | Select Directory

Hide Records | Clear Form | Save For Later | Package Data

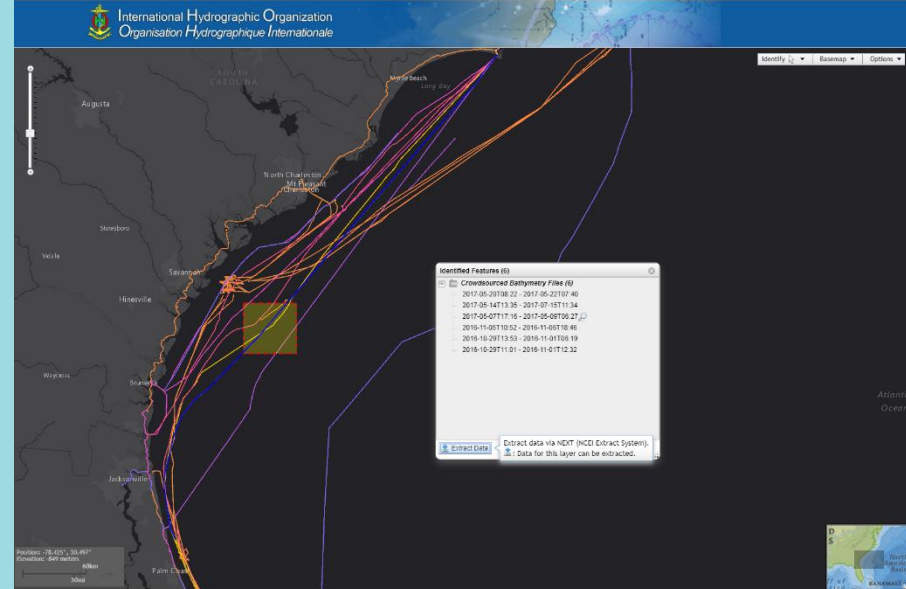
Aims to meet a growing need from the community to submit geophysical data to the archive efficiently, easily, and in a consistent format

IHO DCDB next steps:

- Include more trusted data providers in CSB project
- Continue to ingest map services to provide a more accurate representation of where data exists
- Continue to ingest, archive, create tracklines of where data was collected to visualize on map, and provide individual file-based delivery of data.

VISION

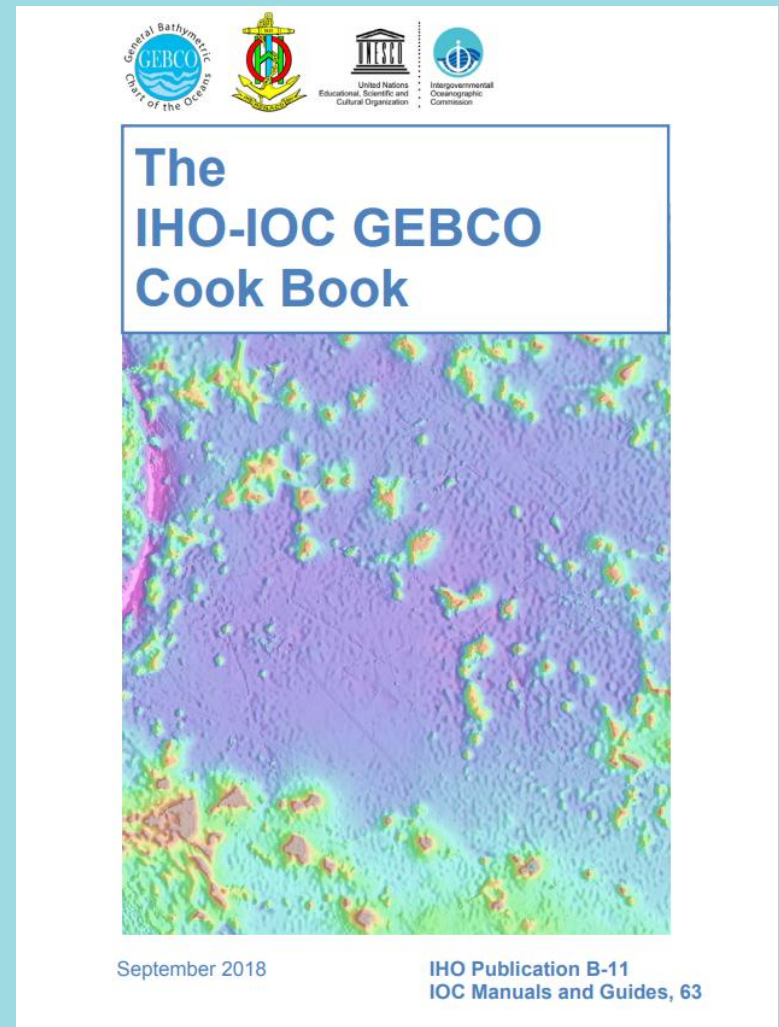
- Develop bathymetric sounding point store in cloud.
- Provide a variety of services, for ex:
 - Users can generate bathy grids of a given area using user-specified resolution
 - Show data density, guiding future data collection efforts





Chapter 16.0 Finding Gaps to Map

- Assessing Gaps via Bathymetric Sounding Density
 - Technical Paper from CHC 2018: *Assessing Sounding Density for a Seabed 2030 Initiative*
- A GIS Approach to Prioritizing the Gaps to Map.
 - The Journal of Ocean Technology winter 2018 issue: *Hitting the Target*
 - Hydro International Sept/Oct 2018 issue: *Where do we Map Next?*



Assessing Gaps via Bathymetric Sounding Density

Identify US waters that have been “mapped”

- Use Seabed 2030 100-m resolution goal
- Use all soundings since 1960 archived at NCEI/DCDB
 - Irrespective of source or perceived quality
- Basic criterion: At least 1 sounding in the cell
- Enhanced criterion: 3 or more soundings in the cell

U.S. Gap Analysis for Seabed 2030 Mapping

Bathymetric Data Layers:



NOAA NCEI/IHO DCDB



NOAA's Digital Coast

Multibeam bathymetry



Paths to raw data files

NOS Hydrography (BAGs)



8 m coverage footprints (SHP)

Single beam bathymetry



XYZ (>1960)

Extended continental shelf grids



100 m coverage footprints (SHP)

NOS Hydrography



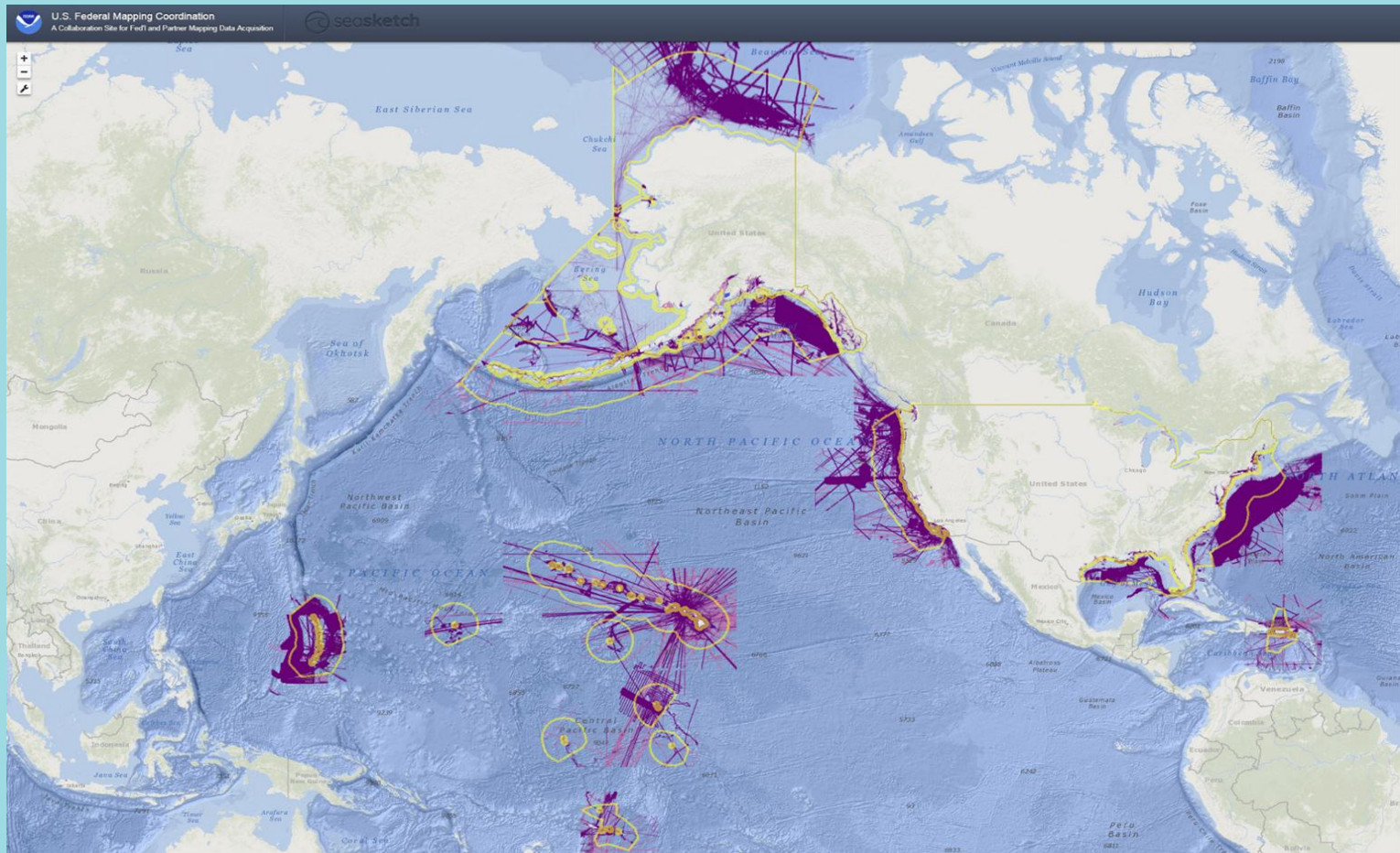
XYZ (>1960)

Bathymetric LiDAR



10 m coverage footprints (SHP)

U.S. Gap Analysis for Seabed 2030 Mapping



Geospatial Web Service developed and hosted by NOAA NCEI

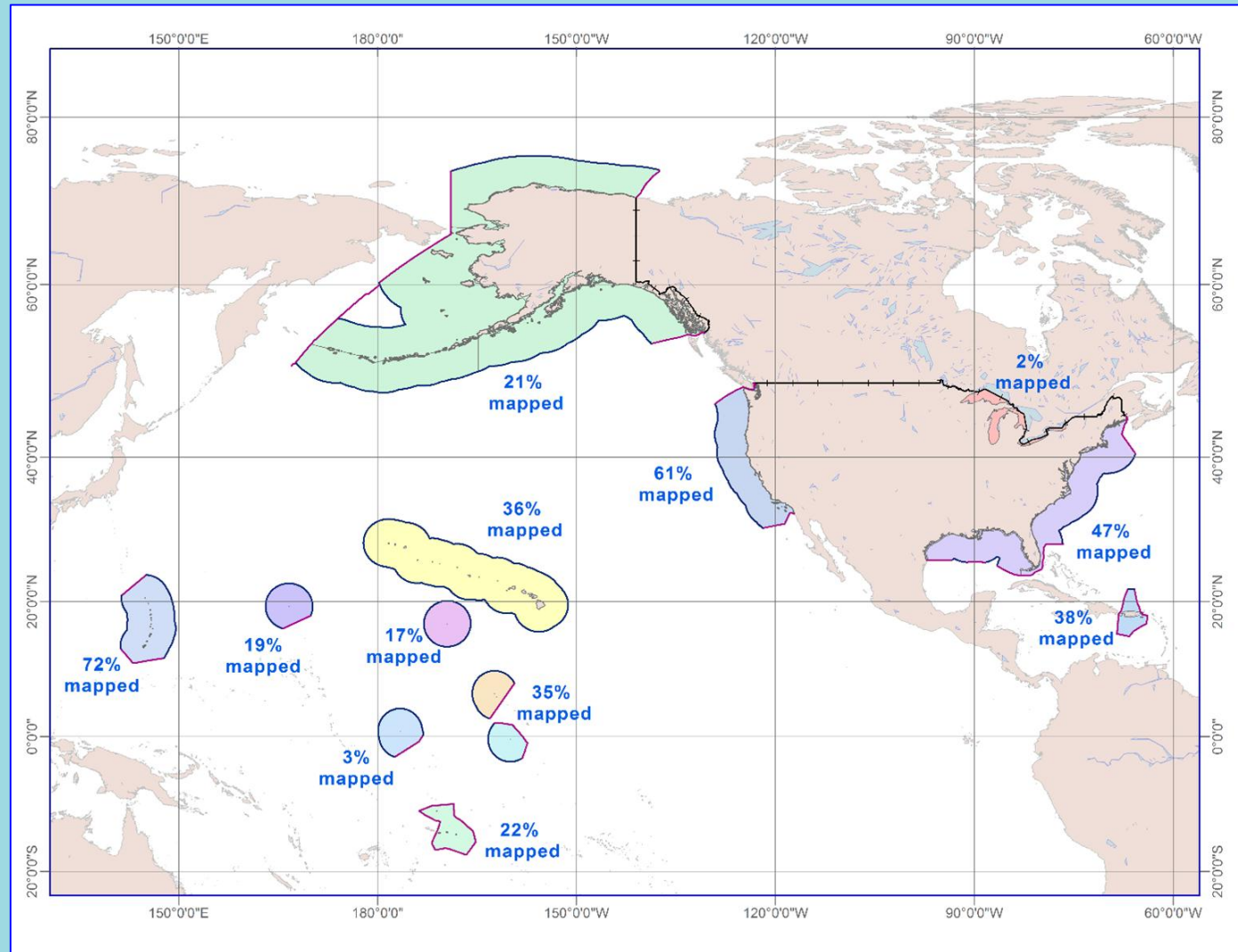
<http://noaa.maps.arcgis.com/home/item.html?id=4d7d925fc96d47d9ace970dd5040df0a>

U.S. Gap Analysis for Seabed 2030 Mapping

Area Computation:

34% of total US waters are “mapped” with at least 3 soundings

3,438,000 sq nm of EEZ
+ 154,000 sq nm of coastal waters
3,592,000 sq nm of U.S. waters



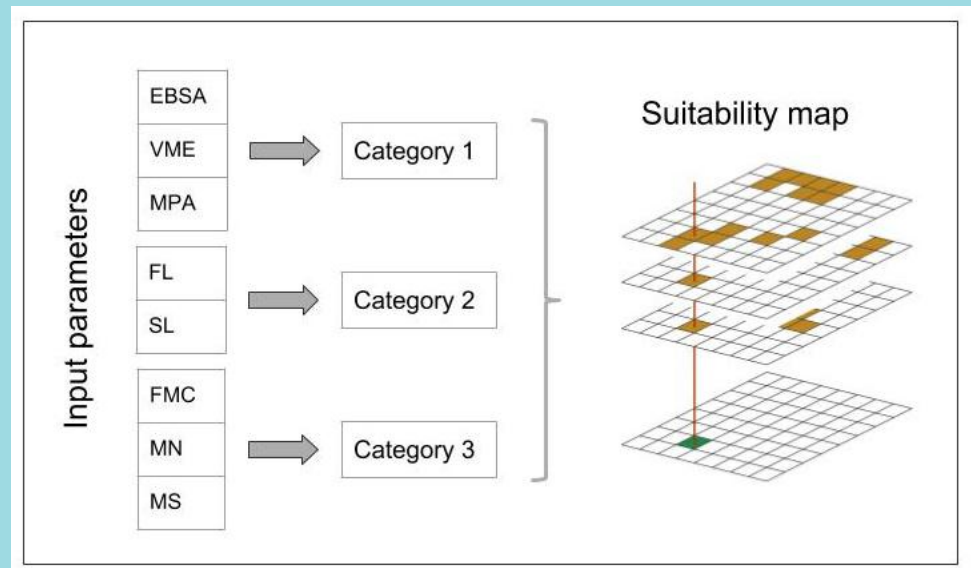
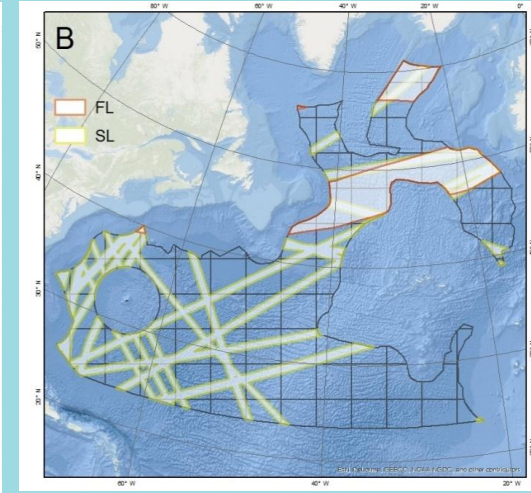
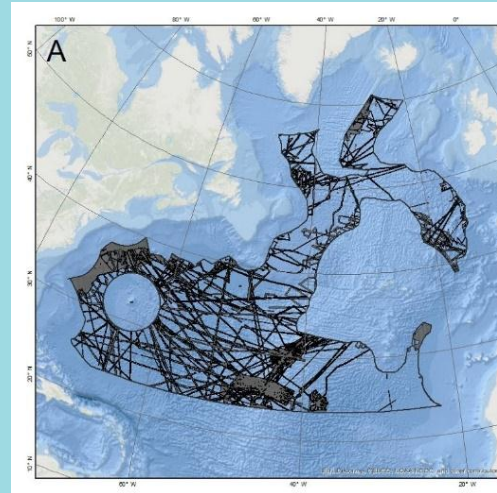
A GIS Approach to Prioritizing the Gaps to Map

AORA-ASMIWG Objective:

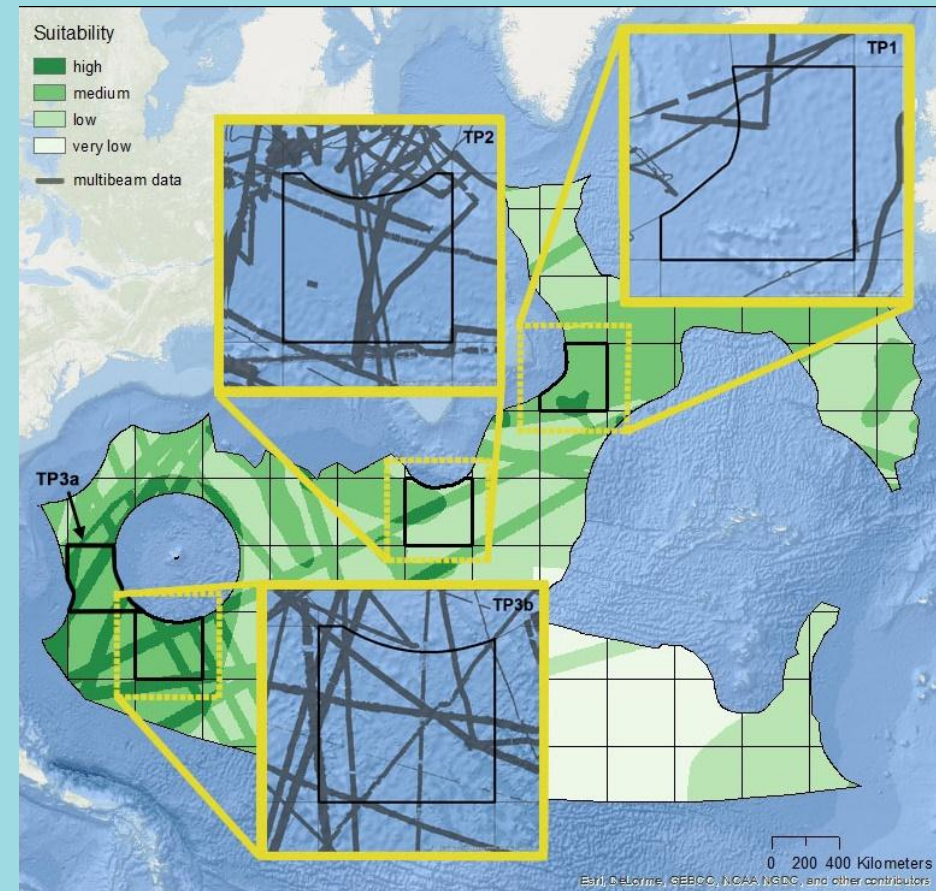
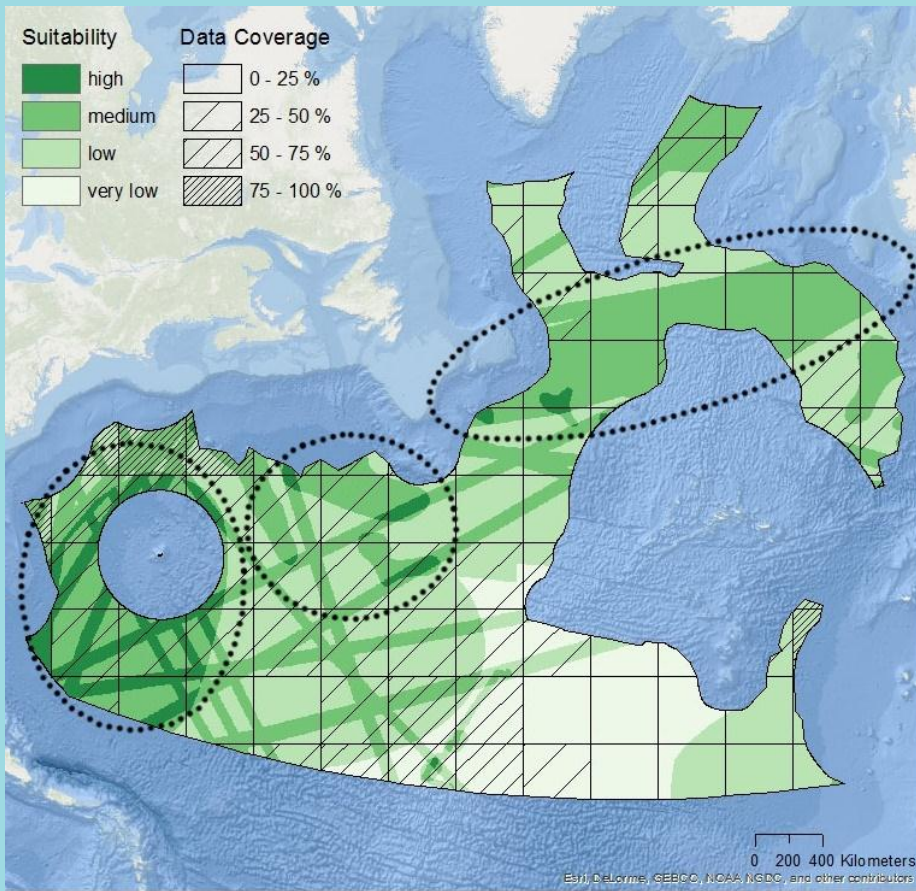
Identify potential pilot areas in the North Atlantic by using a GIS-based overlay technique based on selected attributes of the marine environment.

General Criteria:

- South of 66°N (Arctic Circle) and north of 23°N (Tropic of Cancer)
- International waters (outside EEZ and ECS)
- 400 km x 400 km pilot polygon
- Sparsely surveyed areas
- Area of interest for various stakeholders (e.g. science, industry)



A GIS Approach to Prioritizing the Gaps to Map



Results: A map that shows the suitability for every location as a potential survey area.

IHO Requirements to Consider

There is a need for GEBCO/Seabed 2030 to consider how these IHO resolutions (in place guidance) should be addressed and followed - some of which are long standing.

Publication S-4, Ed. 4.8.0

- Section **A-402.1** "...Any other IHO Member State receiving data which might give rise to a chart update should immediately pass it to the producer nation for action."
- Section **B-635.4** "...HOs which receive information relating to waters for which another HO has the primary responsibility, should forward a copy to that office by the quickest possible method..."

Publication M-3

- IHO Resolution 3/1929 as amended: Centralization of oceanic soundings
- IHO Resolution 3/1932 as amended: "...It is recommended that ships fitted with MBES or SBES be requested to collect bathymetric soundings and communicate the results of such soundings to the HO of their respective countries...."
- IHO Resolution 1/2017: Improving the availability of bathymetric data world-wide



Thank You!

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