World Hydrography Day - 21 June 2015

Our seas and waterways - yet to be fully charted and explored

On 21st June each year the International Hydrographic Organization (IHO) celebrates World Hydrography Day. World Hydrography Day is the opportunity to increase public awareness of the vital role that hydrography plays in everyone's life.

The theme for this year's World Hydrography Day, which is also the 94th anniversary of the establishment of the IHO, is:

"Our seas and waterways - yet to be fully charted and explored"

The theme for World Hydrography Day 2015 concentrates on the fact that much of the world's seas, oceans and navigable waters remain unsurveyed and is intended to raise public awareness that, for example, there are higher resolution maps of the Moon and Mars than for many parts of our seas and coastal waters.

This year's theme also provides the opportunity to encourage innovative supplementary data gathering initiatives to help obtain more useful depth data. This includes crowd-sourcing using existing ships and ship's equipment, and developments in the analysis of satellite imagery in areas where the water is clear enough. These methods cannot replace highly accurate and thorough hydrographic surveys using specialist ships and equipment, but they can provide useful depth information where otherwise we have none.

Hydrography

Measuring the depth and shape of the seafloor and identifying any hazards that might exist on the seafloor, together with an understanding of the tides and the currents is the work of hydrographic surveyors, also known as hydrographers. Their work is the most fundamental of everything that enables the safe and efficient use of the seas, oceans, coastal areas, lakes and rivers. Their measurements underpin almost every human activity that takes place in, on or under the sea.

The most widely-known use of hydrographic data is to make navigational (nautical) charts. Nautical charts enable mariners to navigate their ships and boats avoiding all known dangers along their intended routes. However, hydrographic data has many, many other uses, too. They include, but are not limited to:

- Aquaculture
- Biomedicine
- Boats and shipbuilding
- Cables and pipelines
- Coastal zone management
- Defence and security
- Desalination and water treatment
- Marine recreation
- Ocean energy and minerals
- Ocean science and observation
- Port operations
- Robotics and submarines
- Shoreline development
- Telecommunications
- Tourism
- Very large floating platforms
- Weather and climate science

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Why knowing the depth of the sea is important?

Man is turning increasingly towards the sea and oceans for resources. The seas and oceans are now acknowledged as major contributors to the world economy and well-being. Over 90% of the world's trade travels by sea. In addition, the seas and oceans, including the seabed and the sub-seabed, represent a vast resource for food, mineral resources, energy, water, bio-medicines, and infrastructure. The oceans and the way the water moves and behaves are major influences on weather and climate. The shape and the depth of the seafloor have a significant impact on how sea level rise, storms and tsunamis affect the coastline.

The rapid growth and development of the so-called *blue economy* makes knowing the depth of the seas and oceans more important than ever before. But, less than 10% of the world's oceans have been systematically surveyed - the depth measurements that we do have are often tens or hundreds of kilometres apart. Recent searches for lost aircraft in the ocean have highlighted this situation. Along many coasts the state of affairs is little better. Ships cannot use new routes or visit new places. Trying to establish sustainable maritime activities in unsurveyed areas is unworkable.

IHO Publication C-55 – *Status of Hydrographic Surveying and Nautical Charting Worldwide* provides statistics on the proportion of sea areas in the world that are inadequately surveyed and charted.

The benefits of hydrography

- Hydrography contributes directly to the efficiency of maritime transport by allowing voyages to be shorter if new routes are surveyed, and allows the optimum loading of ships if the least depth is known for critical areas. Reliable hydrographic information also impacts on the development of the cruise ship industry and that of recreational boating.
- Hydrography allows fishermen not only to navigate safely but also to avoid the loss of fishing gear on uncharted obstructions, to identify fishing areas and to avoid areas where fishing is limited or prohibited.
- Hydrography is a critical element in the characterization and delineation of fish habitats, as well as of the proper location of aquaculture areas.
- Hydrography supports maritime defence and security by allowing freedom of manoeuvre for search and rescue operations and naval operations - surface, submarine, anti-submarine, amphibious, mine-hunting and naval aviation.
- Hydrography provides the primary data essential for coastal zone management and development, including the construction or development of ports and other coastal infrastructures, dredging operations for the maintenance of access to ports, and the monitoring and controlling of coastal erosion.
- Hydrography is a direct contributor to the identification and discovery of mineral resources at sea. It is also critical to the selection of routes for submarine pipelines and cables, to the selection of sites for wind-farms and for offshore oil and gas platforms and for any underwater construction and development.
- Hydrography supports the delimitation of the maritime boundaries defined in the United Nations Convention on the Law of the Sea (UNCLOS).
- Hydrography is a major controlling parameter in ocean dynamics and underpins the models for predicting the natural phenomena such as tides, sea level rise, ocean currents and tsunami inundation as well as for meteo-oceanographic forecasts. Hydrography underpins the forecasting of the likely spread and track of oil slicks as part of oil spill response plans.

The role of the world's hydrographers

Hydrographers work in both the public and private sector. Government hydrographers are usually involved in surveying to improve nautical charts and for defence and security purposes as well as to provide qualified base data for maritime geospatial information systems (GIS). Commercial hydrographers are more often involved in specialized tasks including high resolution surveys for undersea pipelines and cables, the installation of offshore structures including wind farms, oil and gas platforms and surveys for new ports and harbours. They also do surveys under contract to governments to improve nautical charts.

Hydrographic Sensors Hydrographers use echo sounders, high definition sonars in boats and ships, lasers from aircraft and sometimes satellite images to obtain precise and accurate measurements of depth. They also need to be experts in precise positioning and in the measurement of currents and tides.

Nautical Charts Nautical cartographers take information from hydrographic surveys and from other sources and turn it into nautical charts and other marine geospatial products and services. Traditionally, the charts are printed on paper but increasingly they are now made in the form of digital electronic charts, as well. The nautical charts follow international standards set by the IHO to ensure that they can be used and understood by all mariners - anywhere in the world.

Marine Spatial Data Infrastructures To make the best use of hydrographic information, it is important to make it easily available through interconnected digital geo-referenced databases accessible via web-based interfaces.

The role of the IHO

The principal role of the IHO, as the inter-governmental organization for hydrography, nautical charting and associated matters, is, through the collective efforts of its 85 Member States, to ensure that all the world's seas, oceans and navigable waters are adequately surveyed and charted. The role of the IHO includes the maintenance of international standards that ensure mariners and other users of hydrographic data can use and understand the data easily.

Government Hydrographic Offices or similar Authorities are responsible for hydrography in each country with a coastline. These national services are responsible for ensuring that appropriate nautical charting services are in place. In many coastal countries this is a struggle because of competing priorities and in many cases a lack of resources and data.

Standards IHO standards cover a wide range, from defining the training and experience required by hydrographers and nautical cartographers, through the minimum standards for the collection of data and its depiction on charts, to the rapid delivery of Maritime Safety Information to ships at sea. References related to non-navigational applications of hydrographic information, such as Guidance on establishing Maritime Spatial Data Infrastructures and the Manual on Technical Aspects of the UN Convention on the Law of the Sea, are also published and maintained by the IHO.

As part of its aims to make hydrographic data as widely used as possible, the IHO has a number of data standards. The latest is known as S-100 - *The IHO Universal Hydrographic Data Model*. S-100 is based on and compatible with the ISO 19100 geographic data standards and enables hydrographic data to be easily merged and used with other non-hydrographic geographic data - especially in geospatial information systems. As well as the IHO, a growing number of international organizations with diverse maritime interests are taking up S-100 as their data exchange standard, such as the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), and the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) of the World Meteorological Organization (WMO) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

The IHO provides other references related to hydrography such as the Hydrographic Dictionary in three languages and an international reference Manual on Hydrography.

Establishing the standards and getting them recognised and used requires extensive international cooperation and the involvement of many other organizations.

Inter-Regional Cooperation The IHO coordinates and enhances cooperation in hydrographic activities between countries on a regional basis, and between regions in order to provide consistent and reliable services to mariners and decision makers. This is done primarily through the IHO member countries operating 16 regionally-based Hydrographic Commissions that coordinate charting services within each major sea basin across the world.

Capacity Building The IHO has an active capacity building programme that assists countries to develop and improve their hydrographic capabilities. Capacity building projects are often conducted in collaboration with other international organizations and with increasing industry participation.

Crowd-sourcing for more depth data

IHO DCDB As part of helping to improve our knowledge of the sea, the IHO operates a Data Centre for Digital bathymetry (IHO DCDB). The IHO DCDB is the principal web-based data store that provides access to most of the existing depth measurements for the ocean. Some of this data can be downloaded directly from *http://www.ngdc.noaa.gov/mgg/bathymetry/iho.html* for use; other data and metadata can be identified and then obtained from other sources.

The IHO DCDB is currently undergoing an upgrade to make it the world portal for the upload and download of so-called Crowd-sourced Bathymetry (CSB). It will be a resource for everyone. CSB is depth data that is collected by ships and boats using their navigation echo sounders during their normal voyages across the sea and along the coastline. Harnessing the collecting power of all mariners is an efficient way of obtaining depth data where there is currently no data or the data is uncertain.

The IHO is also encouraging scientists and industry to look in their vaults and archives for depth data that has already been collected and could be added to the world collection in the DCDB.

CSB will be useful to all. It will enable governments and industry to better identify the key areas that need to be surveyed in much more detail.

GEBCO

The IHO in cooperation with the Intergovernmental Oceanographic Commission of UNESCO manages the General Bathymetric Chart of the Ocean (GEBCO) project. This GEBCO ocean mapping project is over 100-years old and has relied on crowd-sourced data from scientific cruises and some other ships to develop the most authoritative maps of the ocean. Because of the lack of measured depth data in many areas, the GEBCO project has used satellite gravity measurements to infer what the ocean depth might be. This can often be in error by hundreds or even thousands of metres and miss significant undersea features such as large seamounts and canyons, but at the moment, the GEBCO maps, which are used in Google Ocean, are among the most detailed maps of the ocean that we have.

IHO Member States
(March 2015)

Algeria	Greece	Poland
Argentina	Guatemala	Portugal
Australia	Iceland	Qatar
Bahrain	India	Republic of Korea
Bangladesh	Indonesia	Romania
Belgium	Iran (Islamic Republic of)	Russian Federation
Brazil	Ireland	Saudi Arabia
Brunei Darussalam	Italy	Serbia
Cameroon	Jamaica	Singapore
Canada	Japan	Slovenia
Chile	Kuwait	South Africa
China	Latvia	Spain
Colombia	Malaysia	Sri Lanka
Croatia	Mauritius	Suriname
Cuba	Mexico	Sweden
Cyprus	Monaco	Syrian Arab Republic
Democratic People ' s Republic of Korea	Montenegro	Thailand
	Morocco	Tonga
Democratic Republic of the Congo	Mozambique	Trinidad and Tobago
Denmark	Myanmar	Tunisia
Dominican Republic	Netherlands	Turkey
Ecuador	New Zealand	Ukraine
Egypt	Nigeria	United Arab Emirates
Estonia	Norway	United Kingdom of Great Britain and Northern Ireland
Fiji	Oman	
Finland	Pakistan	United States of America
France	Papua New Guinea	Uruguay
Georgia	Peru	Venezuela (Bolivarian Republic of)
Germany	Philippines	Viet Nam

Membership pending: Bulgaria, Haiti, Malta, Mauritania, Sierra Leone, Solomon Islands, Vanuatu