



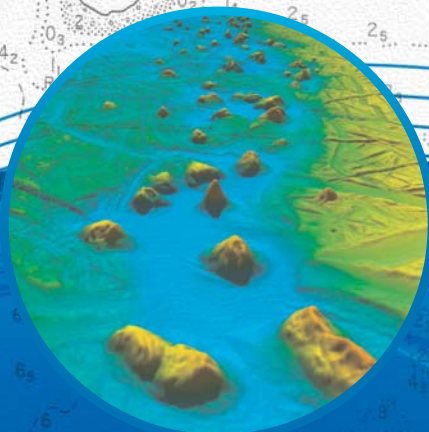
DEEP

UNDERSTANDING

CANADIAN HYDROGRAPHIC SERVICE



• www.chs-shc.gc.ca •



THE CANADIAN HYDROGRAPHIC SERVICE (CHS)

THE PILLARS OF OUR BUSINESS

COASTAL NATURAL HAZARDS

CHS monitors tides and water levels — essential information for detecting and predicting climate change and variability, and natural hazards.

OCEAN AND FRESHWATER MAPPING


CHS uses the latest technology to collect high-resolution data on the depth, shape and structure of Canada's oceans, lakes and rivers.

SOVEREIGNTY

CHS plays a vital role in determining Canada's maritime boundaries and sovereignty.

MARITIME TRANSPORTATION

CHS's exceptional nautical charts and navigational products help ensure the safe navigation of Canada's waterways.



Canada has the longest coastline of any country in the world. More than a third of its territory is under water. Its lakes, rivers and ocean waters are used by millions of craft every year—for recreation and tourism, fishing and industry, international shipping and national defence.

Since 1883, the Canadian Hydrographic Service has studied those waters to ensure their safe, sustainable and navigable use.

Today, taking advantage of technological advancements and more than a century of expertise, CHS is a recognized world leader in hydrography.

We **drive innovation**. We **share information**. We **work constantly** to deepen public knowledge of Canada's waters.

“

PEOPLE SOMETIMES ASSUME WE KNOW ALL THERE IS TO KNOW ABOUT OUR WATERWAYS. I LIKE TO REMIND THEM THAT WE HAVE MORE ACCURATE MAPS OF THE MOON THAN WE DO OF OUR OWN OCEAN FLOORS.

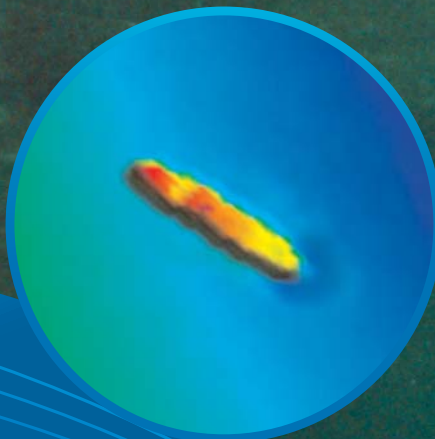
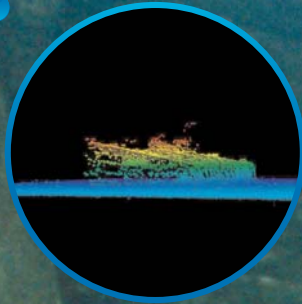
But that's changing. And that's what makes this work so exciting. You can spend 28 days on a ship with your eyes on a computer monitor and one day—there it is, something new. A good example is when we discover uncharted ship wrecks or find new areas of glass sponge reef off the BC Coast.

It's amazing what today's technology enables. An electronic navigational chart on a ship's bridge, for instance, can be integrated with other systems and indicate approaching dangers and hazards to the vessel. All of a sudden, we have so much knowledge at our disposal, and all of it can help improve navigational safety.”

Brian Port

Multidisciplinary Hydrographer
Fisheries and Oceans Canada

Bow of the wreck of the Sweepstakes sunk in 1885, Fathom Five National Marine Park of Canada (Photo: D. Pagé, Underwater Archaeology Service, Parks Canada)

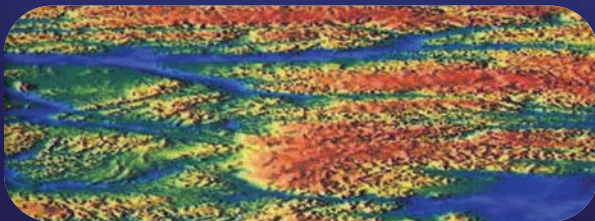


A DEEP COMMITMENT TO MARINE SAFETY

It was a tragedy on Georgian Bay that set in motion the process that led to the creation of the Canadian Hydrographic Service. One hundred and fifty people lost their lives when the steamship *Asia* went down in those dark Ontario waters in 1883, and calls went out almost immediately for a hydrographic survey of the Great Lakes to make navigation safer.

Six years later, the surveying organization that would eventually become the CHS was born. Its mission soon expanded beyond the Great Lakes to include all Canadian waterways.

In the more than 120 years since then, the CHS has channeled its in-depth knowledge and extensive expertise into the development of new technologies and scientific procedures—today offering everything from three-dimensional views of Canada's seabeds to real-time updates on water levels in the St. Lawrence River.



A thousand charts

Producing trusted and authoritative information of unparalleled accuracy, CHS answers the needs of individual boaters and international shippers, fishers, industry, government and non-governmental organizations that use, interact with and study this country's rivers, lakes and oceans. We publish and maintain nearly a thousand nautical charts. The quality of our work has been assessed and certified as meeting the requirements of the ISO 9001:2000 standard—the international gold standard for quality management systems.

- In 2007-08, CHS distributed **more than 124,000 charts and 73,000 publications** via some **800 authorized dealers** around the world.
- In 2007, CHS began distributing **electronic navigational charts** in S57 format as well as **raster (BSB) navigational charts**.
- CHS now **licenses access to its intellectual property (IP)** to more than 500 private- and public-sector clients, and is a partner in the development of ocean technology and applications. Our IP includes a host of information on waterways and their environs, and is used to design new marine infrastructures, plot shipping routes and much more.

WHAT WE DO

Hydrography is the science of measuring and describing the features of seas and coastal areas for the primary purpose of navigation.



TAKING THE MEASUREMENTS OF CANADA'S WATERWAYS

How do we gather nautical information? With about 300 employees and access to the Canadian Coast Guard ships, our relatively small organization is distributed across four regions: Atlantic, Quebec, Central and Arctic, and Pacific. We conduct regular field surveys—especially for higher-risk, higher-priority areas—with both shore parties and marine vessels including specialized hydrographic craft.

We get it all done in part through collaboration, which helps us get the maximum research value for our efforts. By sharing ship time that is often costly with other groups conducting marine research—such as Parks Canada, the Geological Survey of Canada and other parts of DFO as well as the Canadian Coast Guard—we take advantage of every opportunity to take hydrographic and oceanographic measurements.

Science that goes beneath the surface

Today's CHS is a division of the Science Branch of the Department of Fisheries and Oceans Canada. As such, the work of CHS supports

the overarching mandate of the Science Branch to:

- **Ensure safe and accessible waterways** by producing exceptional navigational products and services, and by supporting maritime safety and security.
- **Maintain sustainable fisheries and aquaculture operations** by monitoring and assessing resources, helping protect species at risk and more. Contributing actively to science management within Fisheries and Oceans Canada and other departments of the federal government and studying interactions between aquaculture and the environment and applying genomics and biotechnology to aquatic ecosystems is all part of this process.
- **Support healthy and productive aquatic ecosystems** by keeping an eye on the impact of human developments, assessing the vitality of aquatic ecosystems, and keeping watch over changes in ocean climates.

Canada on the water: A SNAPSHOT

Length of Canada's coastline:
nearly 250,000 kms

Highest tides in the world:
Canada's Bay of Fundy

Number of pleasure craft in Canada:
2 million

Number of commercial vessels
using Canadian waters:
22,000



photo: Paul Galipeau



photo: Paul Galipeau

“ **OUR ROLE HAS EVOLVED A GREAT DEAL OVER THE YEARS, AND WITH IT OUR CLIENT BASE.**

Where before we served almost exclusively the shipping and recreational boating communities, today we provide data products to scientists and engineers, offshore developers and coastal planners. We also play a part in national defence and security.

With all that change, our top priority is still the same: to produce accurate navigational charts that contribute to marine safety. We see a future in which all commercial vessels will have a full suite of electronic navigational products that receive real-time updates, giving crews constant access to the latest information. And we see a time when recreational boaters will use hand-held devices to download up-to-date charts and related navigational information—wherever they are, whenever they need them. ”

Savithri (Savi) Narayanan

Dominion Hydrographer

Director General, Ocean Science—Canadian Hydrographic Service



ACTIVE AROUND THE WORLD

Since 1951, Canada has been an active member of the International Hydrographic Organization (IHO), working with countries around the world to develop international charting standards as well as new technologies for surveying and mapping the sea floor.

Marine transportation is a global activity and consistency among products and services from one region to another contributes greatly to better comprehension of information

important to safe navigation. In addition, uniform standards allow for integration of hydrographic information across scientific and international boundaries which contribute to better overall understanding of the coastal and offshore environment. CHS' close association with IHO ensures that Canadian navigational products and hydrographic data adhere well to international standards.

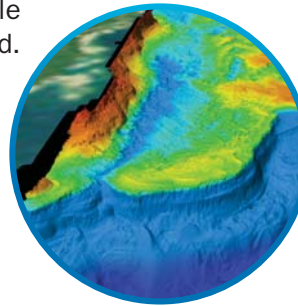


DEEP EXPERTISE IN HYDROGRAPHY

The critical importance of hydrography is summed up in the motto of CHS: “Nautical charts protect lives, property and the marine environment.”

As Canada’s hydrographic authority, CHS surveys the country’s navigable inland and marine waters—to the edge of the continental shelf and beyond. Our charts are the ‘road maps’ that guide mariners safely from port to port. They provide an incredible wealth of detail: depths, buoys, lighthouses, hazards and more.

Hydrography has changed, of course, over the past 120 years. Traditional leadlines and triangulation methods are used only infrequently: innovations such as multibeam sounders and the satellite-based Global Positioning Systems (GPS) make the work done today more comprehensive and accurate than ever before.



Techniques and technologies: from then to now

THEN

Traditional approaches to hydrography include:

- the use of *lead lines*, which are weighted lines lowered into the water to measure depth; and
- *triangulation*, which uses mathematics based on the points of a triangle to establish coordinates and the distances between points.

NOW

These have been displaced by:

- *multibeam sounding*, which uses highly advanced SONAR technology to provide high-resolution digital views of the ocean environment.





AN UNYIELDING COMMITMENT TO QUALITY

The charts of Canadian waters produced by CHS are the most authoritative and complete available—renowned the world over for their quality. Every time we receive notice that a buoy has moved, a wharf has been built or an undersea cable laid, we update our charts promptly. These corrections were once made exclusively by hand, but with the help of on-demand printing technology, we're able to add changes via computer and generate fresh copies with all the latest updates included. In 2007, CHS received more than 55,000 print-on-demand orders.



Navigation in the digital era

With the addition of Electronic Navigational Charts (ENCs) and raster electronic charts to its library, CHS has tripled the size of its traditional product line. Burned to CD-ROMs, these ENCs run on onboard computers and allow for onscreen navigation. A pioneer in this area, Canada has one of the largest ENC portfolios in the world.



Electronic charts have the potential to provide more information than their paper cousins. For example, they can reveal multi-dimensional views of waterways, showing the shape and the depth of the lake or sea floor and revealing alternative points of view. They can even capture relatively small-scale attributes such as the height, length, age and ownership of a specific wharf—at the click of a computer mouse.

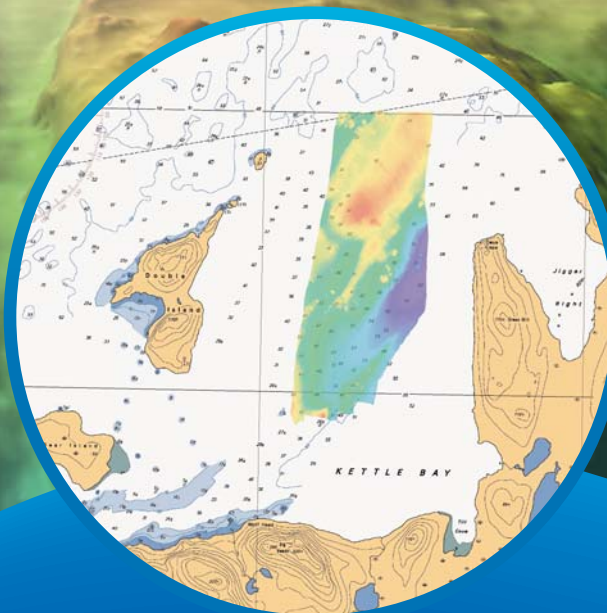
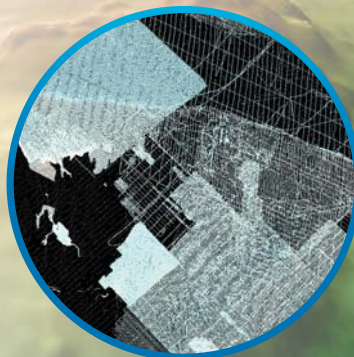
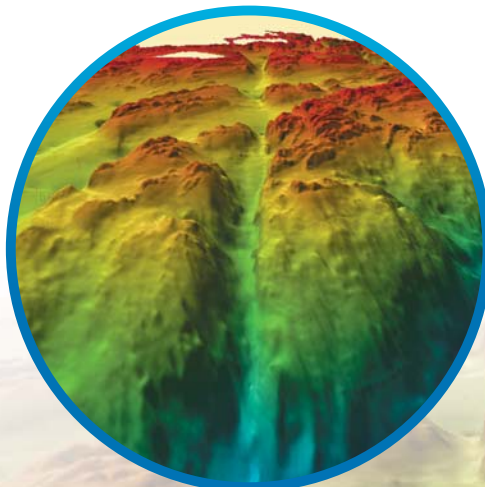
Electronic data are available in two forms: the full navigational chart with all the details and a simpler 'raster' version popular on pleasure craft. (Raster graphics are also called 'bitmaps', and basically use grids of pixels to render images onscreen.)

Sailing directions are the indispensable companions to charts, offering descriptions (including photographs) of the best approaches to harbours, harbour facilities, anchorages, local history, rules, regulations and tables of distances.

Navigational aid: Charts and publications from CHS

CHS receives orders by phone, e-mail and fax every year from some 800 chart dealers in Canada, the United States and as far away as Japan. CHS distributes a total of nearly 300,000 charts, tide tables, and other nautical publications every year including:

- **Sailing directions** featuring brief descriptions of main port and harbour facilities, diagrams showing marinas, fishing harbours and more.
- **Digital charts** on CD—with free technical support and easy access to updates.
- **Paper charts**—946 in all, covering all three of the country's coastlines plus major inland waterways.
- **Chart catalogues**—collections of nautical charts for planning and reference.
- **Canadian tide and current tables**—giving the predicted times and heights of high and low waters associated with the vertical movement of tides, slack water and current velocities, hourly tidal current atlases and more.
- **Tidal current atlases**—indicating the direction and velocity of surface currents at different periods of time.
- **Online water level bulletins** for the Great Lakes and Montreal, continually updated at www.waterlevels.gc.ca.



Keeping pace with change

A further challenge for CHS is to keep up with changes to Canada's waterscape. High-traffic areas such as the Great Lakes shipping lanes and popular recreational areas like the Trent-Severn Waterway are high priorities for resurveying. In the western Arctic, artificial islands no longer used for oil and gas development are changing shape due to ice scouring and currents—presenting a navigational hazard and earning a place on the priority list as well.

“ **IN RECENT YEARS, WITH NEW TECHNOLOGIES AND NEW APPROACHES, THE WORK OF CHS HAS EVOLVED IN FASCINATING WAYS.** Multibeam technologies, for example, reveal more of the oceans. The information they provide is of value to a broad community of scientific, commercial and recreational users.

The emergence of ecosystem-based management has had an impact as well. Historically, fishers were the predominant users of the oceans; today we have oil and gas companies, tourism operators, the shipping industry and others all out on the waters, all having an impact. CHS and Ocean Science at Fisheries and Oceans Canada look at those various impacts and how they inter-relate, putting the pieces together so we can comprehend the full system.

Positively, this has increased cooperation and collaboration among all parties involved with Canada's waterways: we're seeing the knowledge of many disciplines come together, and that has the ultimate benefit of deepening our understanding. ”

Wendy Watson-Wright, Ph.D.
Assistant Deputy Minister for Science
Fisheries and Oceans Canada



GOING EVEN DEEPER

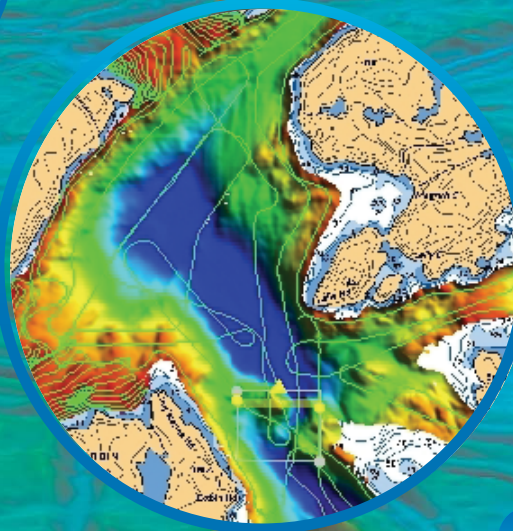
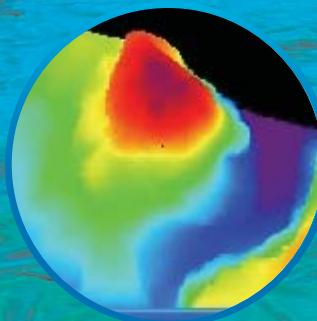
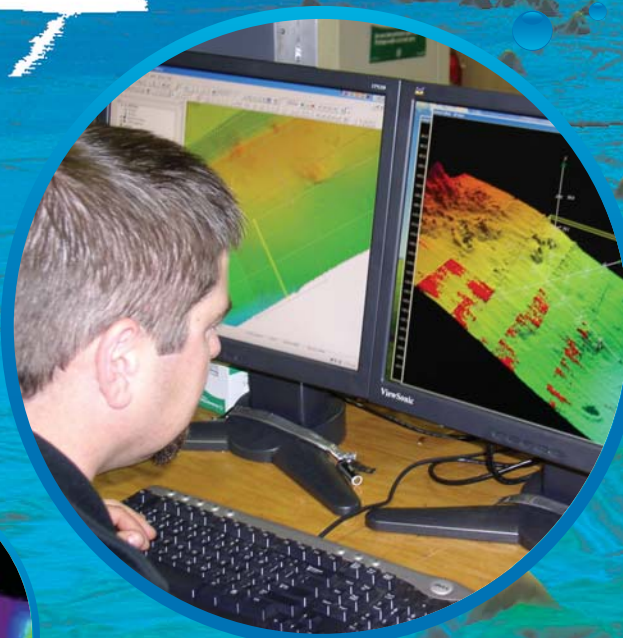
Ocean science expands the view of Canada's waterways to include all of what's known as the 'water column'—the entire extent of water between the surface and the floor. A whole range of important factors are measured and tracked—from climate and temperature to plankton densities (which are important both to ocean food chains and also to the seas' ability to process carbon).

'Seeing' into the oceans

Canada is a world-renowned leader in multibeam systems modeling technologies. Oceans modeling and remote sensing provide multidimensional, real-time information about water, sea floor, coastal and bank conditions in waterways such as the St. Lawrence River.

Multibeam imagery allows fishers to view the seabed and target specific species. This is important for environmental reasons—for example, scallop fishers can reduce the area of seabed they disturb with their rakes since they know which seabeds are most likely to contain scallops.

The ability of multibeam systems to produce an aerial photograph-like image of the seabed has led to a demand for multibeam mapping to support other applications such as mapping pipeline and cable routes, proposed marine protected areas, and fishing grounds.



INTEGRATED SCIENCE DATA MANAGEMENT

The role of Integrated Science Data Management (ISDM) is to collect, record and share data from ocean areas adjacent to Canada—on everything from tide and water levels to contaminants affecting marine life and their habitats. ISDM supports the development of databases and other tools used by CHS nationally to deliver products and services; contributes to national and international standards; and works with other programs to provide expert advice in designing and developing custom applications.

Across the oceans

ISDM is a member of the International Oceanographic Data and Information Exchange (IODE). IODE strives to enhance marine research and development by facilitating the exchange of oceanographic data and information among participating countries to meet user needs for data and information products.

One of ISDM's roles through IODE is to serve as the Responsible National Oceanographic Data Centre (RNODC), archiving data collected by drifting buoys—like those used in the Argo project—all over the globe. Canada, through ISDM, has been the world's RNODC since 1986.



photo: Paul Galipeau

Bobbing for data: Argo

ISDM is instrumental in managing the data collected through Canada's participation in Argo, an exceptional international project that measures ocean conditions literally all over the globe and shares the information in real-time via satellite technology. Over twenty countries participate in the project—cooperating to deploy, monitor and maintain a 'fleet' of some 3,000 sophisticated profiling floats (i.e., buoys). These drift around the world's oceans, sinking to pre-programmed depths of 2,000 metres for specific lengths of time, then rise to the surface, taking a variety of important measurements as they ascend.

Today, Argo data is used for weather forecasting, fishery planning and a whole range of other applications. Anyone with a computer can access Canadian Argo information at www.meds-sdmm.dfo-mpo.gc.ca. Argo data from around the globe can be accessed at www.coriolis.eu.org/cdc/ or www.usgodae.org/cgi-bin/argo_select.pl.



Information Canadians count on

Among its many services and responsibilities, ISDM is looked to most often for its:

- **Tide and water-level data**—tracked, analyzed and distributed monthly based on input from remote stations, and stored in an extensive database that today contains over 30 million records going back more than 100 years. This information—the most popular offered by CHS—is crucial for marine safety and effective planning by commercial shippers, and is also used regularly by recreational boaters.
- **Wave data**—surface gravity observations (basically, wave height and frequency) gathered and recorded hourly from more than 500 locations around Canada. ISDM's databases contain information on more than six million wave spectra (spectra represent the distribution of wave energy as a function of frequency). This information is used increasingly to support new ventures such as wave-powered electricity-generation operations.



- **Atlantic zone monitoring data**—biological, chemical and physical information on the northwestern Atlantic Ocean gathered through the Atlantic Zone Monitoring Program (AZMP). AZMP provides an ever-expanding perspective on seasonal, annual and longer-term changes in ocean conditions including sea levels, climate and weather.
- **Contaminants information**—collected in the National Contaminants Information System (NCIS), a database on toxic chemicals found in fish, other aquatic life and marine habitats.



DEEPEN YOUR KNOWLEDGE

Visit CHS online today or stop in at one of our reseller locations across Canada and access the charts and information you need for your use of the country's waterways.



Canadian Hydrographic Service

615 Booth
Ottawa, ON

K1A 0E6

Ph: **(613) 998-4931**

Fax: **(613) 998-1217**

E-mail: chsinfo@dfo-mpo.gc.ca

www.chs-shc.gc.ca

Published by:

Communications Branch
Fisheries and Oceans Canada
Ottawa, Ontario
K1A 0E6

DFO/2008-1461

©Her Majesty the Queen in Right of Canada 2008

Cat. No. Fs72-41/2008

ISBN 978-0-662-05846-5 paper

ISBN 978-1-100-10178-1 PDF English

ISBN 978-0-662-04424-6 PDF French



Printed on recycled paper

