HYDRO INTERNATIONAL INTERVIEWS ANTTI CASTRÃ©N

Study the Basics and Ask for Support

Hydrographic mapping is all about collecting and processing data that leads to products such as nautical charts and other products contributing to safe navigation, a better environment and secure constructions offshore. The quality of the data is important and this is where the IHO steps in and facilitates standards for acquisition and presentation. Hydro International interviews Antti Castrén, project manager at the Finnish Transport Agency and chairman of the IHO Data Quality Working Group (DQWG). He touches international aspects of data quality in general, opportunities available for many Hydrographic Offices as well as hydrographic challenges in the Baltic.

Why did you join the specialized IHO Data Quality Working Group (DQWG)?

The concept of data quality has been one of my interests for a long time. I wrote my Master's thesis on spatial data analysis and during the research it became clear how important it is to have good data or at least to know how good (or bad) the data in question is. That knowledge also has to be transferred to the end user of the information in an understandable and logical way.
Back in 2010, Mr Juha Korhonen, an active IHO committee member from Finland, suggested that DQWG could be a good place to learn more and share knowledge. I was immediately hooked to international standardisation work after the first meeting that I attended.

Could you briefly tell our readers what the most important issues are regarding hydrographic data quality?

The single most important part of information on a nautical chart is bathymetry, because it shows the invisible form of nature's features to the mariner. Therefore, the quality of bathymetric data has to be the highlighted topic in hydrographic data quality.
It can be divided into three aspects, namely positional uncertainties, completeness and temporal variation. All of these have an impact on how the mariner should use the bathymetric data in various situations on different kinds of vessels with varying cargo. Mathematically speaking the decision making is always about risk calculation, and in navigation the mariner should weigh the above-mentioned three aspects on a case-to-case basis. In order to do that he must have the quality information readily available to him.
Many other types of hydrographic data features can have their own quality indicators as well. Tide predictions at given locations, ranges of radio transmissions and sectors of lights, to mention a few.
The crucial point in all forms of data quality is the communication to the end user. The portrayal of quality is not an easy task; it is even harder than portrayal of features themselves. For example, in current ECDIS systems the symbology for the most common quality indicator, the category of zone confidence (CATZOC), is somewhat misunderstood or not used at all in some cases.

The Finnish Transport Agency (FTA) focuses on R&D and innovations. Can you name examples that apply to hydrography and nautical charting?

Currently digitalisation is a big thing in Finland. FTA has been very active in enabling new services with its data. Hydrography plays a key role in the Intelligent Fairways project portfolio in which high-resolution bathymetry, observed and expected water level information, virtual aids to navigation and many other types of information are combined as services to provide the best available knowledge in digital form to commercial shipping. The goal is to promote safety and to make the most economical and most environmentally friendly cargo logistics possible.
Another example is our participation in research projects in which mathematical models of shoals and rocks in the Northern Baltic were studied and developed. Those models can be used to design better hull structures for oil tankers, for instance. A link to the published article on the study can be found at the end of this text.
FTA is very open-minded when it comes to pilot projects of developed technology. Recently FTA contracted Lidar surveys in waters where the performance of Lidar has previously been questionable. The results from the analysis are still pending, but soon we will know if the technology is mature enough to give us reliable data from difficult to survey shallow waters.

What aspects of hydrographic surveying are specific to Finland or more broadly, the Baltic?

The Baltic is generally a rather shallow body of water with long stretches of indented coastlines and scattered archipelagos of tens of thousands of islets, rocks and shoals. It means that coastal surveys are especially challenging projects.
In these hazardous, and in some places crowded waters, oil tankers and passenger ferries crisscross each other. Luckily there is very good international cooperation between coastal states around the Baltic. This is not limited to just HOs, there is also an intergovernmental Baltic Marine Environment Protection Commission (HELCOM), which has also given resurvey tasks and resources to ensure safe navigation in the Baltic. An example of cooperation is the Baltic Sea Bathymetry Database (link below).
In Finland, a unique aspect is our inland waters. There are dozens of lakes, large and small, with commercial shipping. The lakes are mostly very shallow with narrow sounds and countless rocks. Most of the hydrographic surveys have to be done with small or shallow draught vessels. Civilian authorities in Finland have outsourced all hydrographic surveys since 2010, which has had quite an effect on our work at the Finnish HO.

What is the importance of international cooperation regarding hydrographic data?

Navigation as a trade has always been truly international in nature. Therefore, cooperation in the field of hydrography has to be international. The development of international standards on nautical charts and hydrographic surveys started decades ago, and its importance has grown tremendously along ENCs.
One could argue that international cooperation in nautical charting is essential to world trade. If the charts or data from each coastal state lacks enough standardisation and harmonisation there would be tremendous extra costs and risks for shipping companies.
I think this is the best place to express my gratitude to all of my international colleagues at DQWG, the IHO and its Member States and in industry. The achievements are the results of work around the world for a common cause.

How can organisations improve their data quality? Are there quick wins?

The first step is to start collecting and managing metadata in addition to the data itself. The next step is to define the quality standards for the data in a structured way. The quick win is already there once the organisation knows more about its own key data, and it is therefore capable of giving the data user much more value.
The rest is just taking quality into account in all data-related processes from data gathering to information sharing. Eventually a quality management system helps the organisation to understand its level and to continuously improve it.

How will mariners, in particular, benefit from the efforts of the DQWG?

Our end user, the mariner, benefits from our work through hydrographic products. A good use case is passage planning with nautical chart products. Through our work and the work of various hydrographic offices the mariner has the information available to make decisions: Which one is better for my passage, deeper water with more depth uncertainty or shallower water with less uncertainty?
An expert data user could even have tools to show him where to deviate from the planned course in a sudden emergency. The information could, for example, be just a traffic light coloured layer on a chart display showing the calculated risk of grounding.

How does the DQWG help HOs?

The DQWG and the IHO can, in general, provide standards, guidelines and other forms of guidance and support for HOs. Any Member State can raise a topic for us to study and to give our recommendations on. We do actively look around and try to determine what new opportunities and challenges evolving technology brings. Hopefully we will be able to share our knowledge and best practices with HOs on topics like crowdsourced bathymetry or satellite derived bathymetry.
We are currently finishing our work on bathymetric data quality within the S-101 standard. There are still some other data quality issues within S-101, but we also look ahead to a few other evolving S-10x standards.

What advice would you give to organisations looking to start implementing a data quality policy?

The best way to start is to learn from others. Study the basics and ask for support. As mentioned earlier, a quality management system is not a bad idea, but I guess it’s good to start with just defining and formalising data processes. That helps the organisation to locate the risks within the system.
Almost all organisations have legacy data and they also need quality information, otherwise its huge potential is partially lost. This aspect is not always realised early enough.

Is crowdsourced bathymetry a potentially good addition to collect more data? What would be needed to improve the data quality?

Crowdsourcing will be part of mainstream bathymetric data collection in the near future. There are schemes already in progress to gather and centrally manage the data. The impact of crowdsourcing to nautical charting and hydrographic offices is hard to foretell. The data could at least be used in planning of professional surveys, if not applied to charts.
There are obvious challenges regarding quality assessment of individual data sources, but geostatistical analysis can potentially help determine the quality attributes of big data. The more metadata recorded about the data collection, the easier it is to evaluate in terms of quality.

How do you feel environmental data and habitat mapping should be included in

hydrographic charting?

The intended use of a nautical chart is navigation, and the information on the chart should serve that purpose. When environmental data and habitat mapping information gives added value to navigation and at the same time does not clutter the chart product, I could personally see that type of information being included on the chart. Added value has to be understood broadly including safety and sustainability aspects.

Should hydrographic data acquired by commercial companies be made available for public use?

Personally I think that if there is public funding involved the data should be available for public benefit. How that is achieved is another matter. It could mean completely free, open access survey file database or depth models or just contours.
If the survey is completely funded by private companies, they probably should have the possibility to decide how much and when they want to share the data. But if they find previously uncharted shoals or other hazards to navigation they should have an obligation to inform the local authority to share the knowledge with mariners. Of course, national legislation and international treaties could require a certain level of data sharing in the future.

More information

- Baltic Sea Bathymetry Database
- Sormunen et al. Estimating sea bottom shapes for grounding damage calculations. Marine Structures, 45 (January 2016), pp 86-109

Mr **Antti Castrén** has been working at the Finnish Hydrographic Office with hydrographic data management since 2009. He joined the IHO Data Quality Working Group in 2010 and became its chairman in 2015. In addition to data management projects, Mr Castrén is responsible for maritime boundaries and horizontal geodesy within the Finnish Transport Agency. He holds an MSc in Geoinformatics from Helsinki University of Technology.
Email: Antti.Castren@liikennevirasto.fi