ARHC5-B2.3

UPDATES ARCTIC HYDROGRAPHY NORWAY

Summery

This report gives an update of the activities that have taken place within the Norwegian Hydrographic Service (NHS) since the former report in January 2013. Some main issues are:

- *OD project launched*
- *Moved to new premises*
- *New multibeam data processing software implemented*
- *New survey launches have increased efficiency*
- *The final report of the LiDAR pilot project (Topobaty) delivered*
- *Continued high activity in the Mareano project*
- *Involved in the BarentsWatch project*
- *Cooperation project with Albania*

1. Hydrographic Office

NHS moved to new premises outside Stavanger city center in June 2015. We are now co-located with the Petroleum Directorate and the Petroleum Safety Authority. A part of the University of Stavanger (UiS), and some research institutions affiliated to UiS, are located in the same area.

The Norwegian Mapping Authority (NMA) has over the last year discussed goals and strategy based on international trends, expectations from our "owner" and internal goals. A project called *Destination 2025* involved all divisions of NMA. Related to the outcome of the project NHS has initiated an Organizational Development (OD) activity, aiming at adjusting the organization to underpin the main strategic goals.

2. Hydrographic Surveys

2.1. Surveying 2014/2015

Svalbard

Two survey launches equipped with EM2040 dual RX have been operating for 10 weeks in Svalbard in the period July-September both in 2014 and 2015. The operations were organized as 24 hours per day, 7 days a week. Due to limited personnel resources, only one vessel was actually used during the survey.

Totally 651 km^2 and 603 km^2 was surveyed in 2014 and 2015, respectively. All the surveyed areas are shallow coastal waters. The replacement of the old EM3002D echo sounders with the more modern EM2040D has improved the efficiency to a considerable extent. The quality of the data have improved and the surveying take be done with higher speed. The surveyed areas are shown in Figure 1.

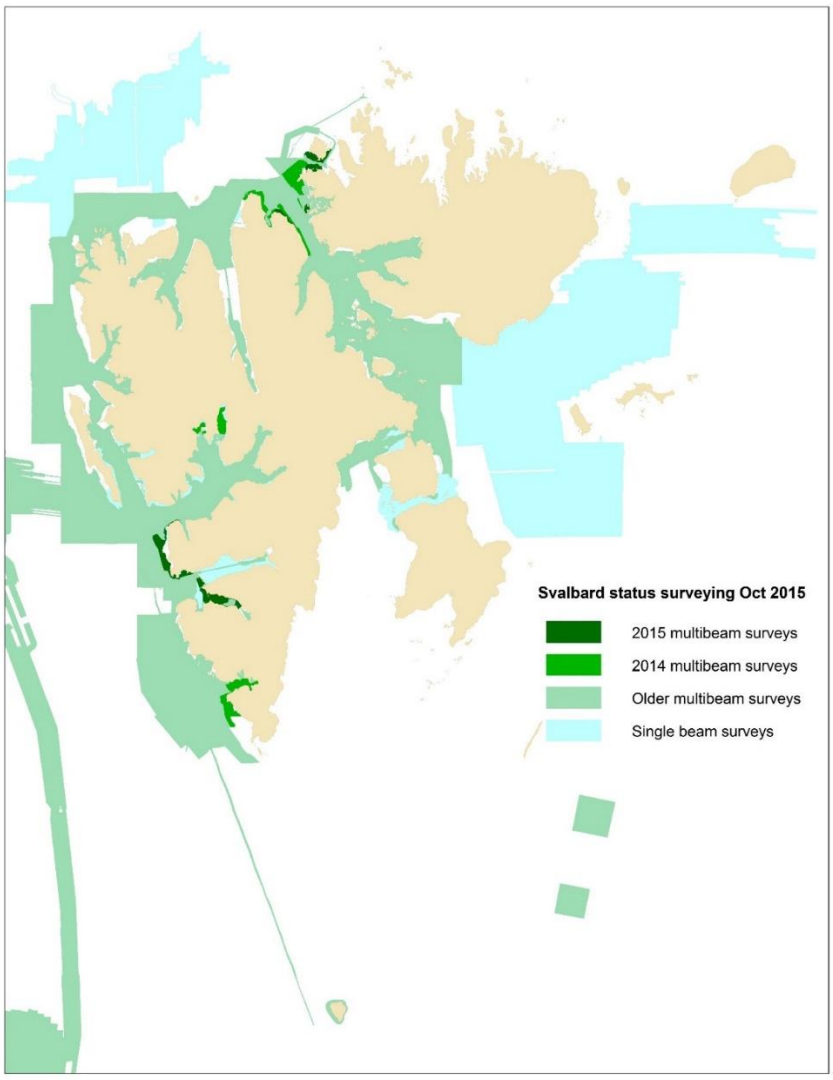


Figure 1. Surveyed areas around Svalbard. Note that in this figure, two Mareano survey areas from 2015 appear as "older multibeam surveys" (two boxes to the south-east of the figure).

Barents Sea

As part of the Mareano project, some surveying has taken place along the agreed delimitation line between Norway and the Russian Federation and in the central/western Barents Sea during 2015.

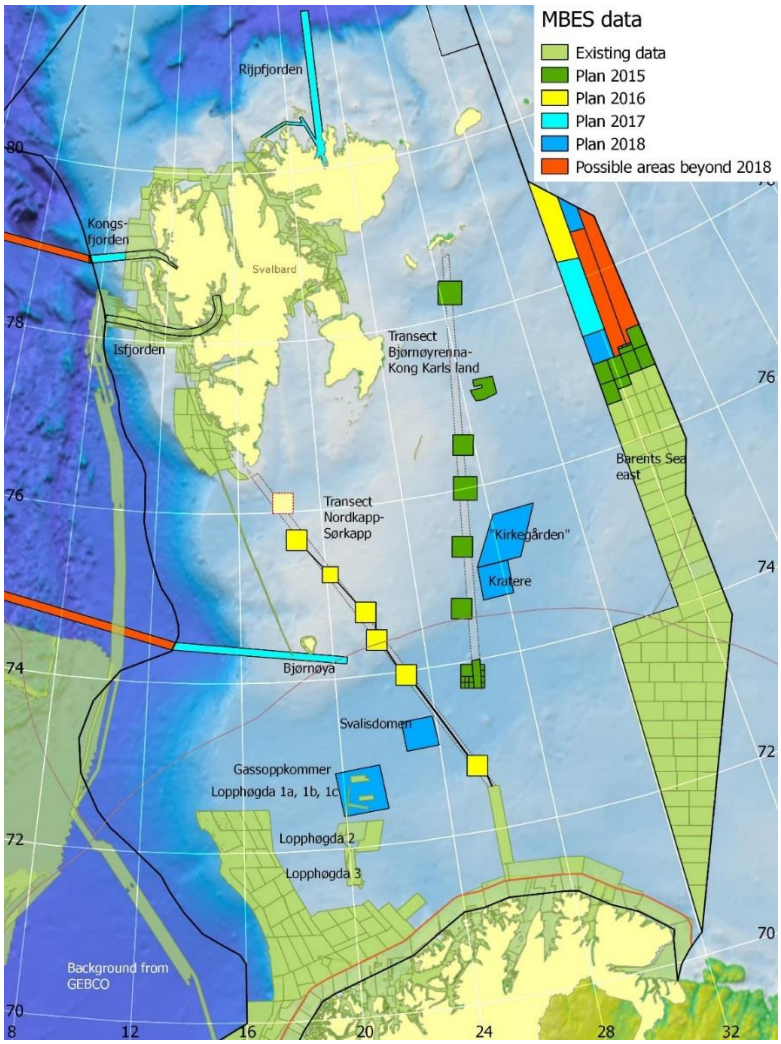


Fig. 2: An overview of the existing multibeam surveying in the Norwegian Arctic waters. The figure also include the planned surveying for the Mareano project for 2016 and beyond.

The part of the surveying in the Mareano project took place to the south of the area shown in the figure above. Totally, 40.000km2 has been survey during 2014 and 2015. Contracted private companies do the greater part of the surveying.

More information about the Mareano program is available at www.mareano.no.

Norwegian coast

Two survey launches, equipped with EM2040D, have been operating 12-hour daily, when available. Our R/V Hydrograf has contributed with the EM710 multibeam echo sounder in some fjords in addition to the surveying off the coast (Mareano project). All the surveyed coastal areas are outside the region of interest to ARHC.

2.2. New survey launches

Three similar survey launches were delivered by Swede Ship Marine, Sweden, during the period December 2013 - May 2014. Two of the launches have been in full time operation as part of ordinary survey capacity. The third one has served the needs for the Coastal Administration (contracted surveying). The launches have proved to be of good quality and have had only minor operational interruptions. A small modification to the hulls was implemented to reduce air bubbles (disturbing the data quality) at low speed. Under favourable conditions, surveying has been done at a maximum of 12 knots.

Fig. 3. The launches delivered in March and May 201

The main technical specifications for the launches are as follows:

Length: 11,15 m, breadth: 3,4 m, draught: 0,8 m, service speed: 25 knots, max speed: 28 knots, displacement: 12,5 tonnes, range (nautical miles): 300, main engines (2x): Iveco 350 HP, waterjets (2x): Ultrajet 340 HT, building materials: aluminium, Ice-strengthen reinforcements (bow and waterline), designed in accordance with the Nordic Boat Standard

All the launches have identical survey equipment that includes:

Multi-beam echo sounder: EM2040D,
Seapath 330+ motion sensor with MRU5+
SIS software
SAIV CTD SD204 velocity profile

3. New charts and updates

A chart plan comprising both surveying and ENC/ paper chart production for the Norwegian coast and the Svalbard area for the period 2014 – 2017 was published as a revised version September 2014.

3.1. Paper charts

The Main chart series at Svalbard is in scale 1:100.000. Since Jan-2013 (previous ARHC report) the following has been done with Arctic Charts:

- New Editions of 513, 524, 523 and 525 due to new surveys and new data for coastlines and changes is the extension of glaciers into the sea.
- New Editions of 534, 535, 539 and 540 (Eastern and Northern Svalbard), reconstructions of analogue charts, datum WGS84.
- Coastal and General Charts belonging to Region N (Arctic) published as New Editions with new INT-numbers and updated Isogons. 8 charts.
- Coastal charts in Northern Norway reconstructed and published as New Editions in datum WGS84.

3.2. ENC

- Some important areas in Svalbard and Northern Norway are updated with new surveys and are published as New Editions of the existing ENC's.
- Coastlines and ice-fronts are updated as New Editions of the existing ENC's for Isfjorden.
- 11 new approach ENC's are produced for areas in which we previously had data coverage in harbour and coastal usage bands only.

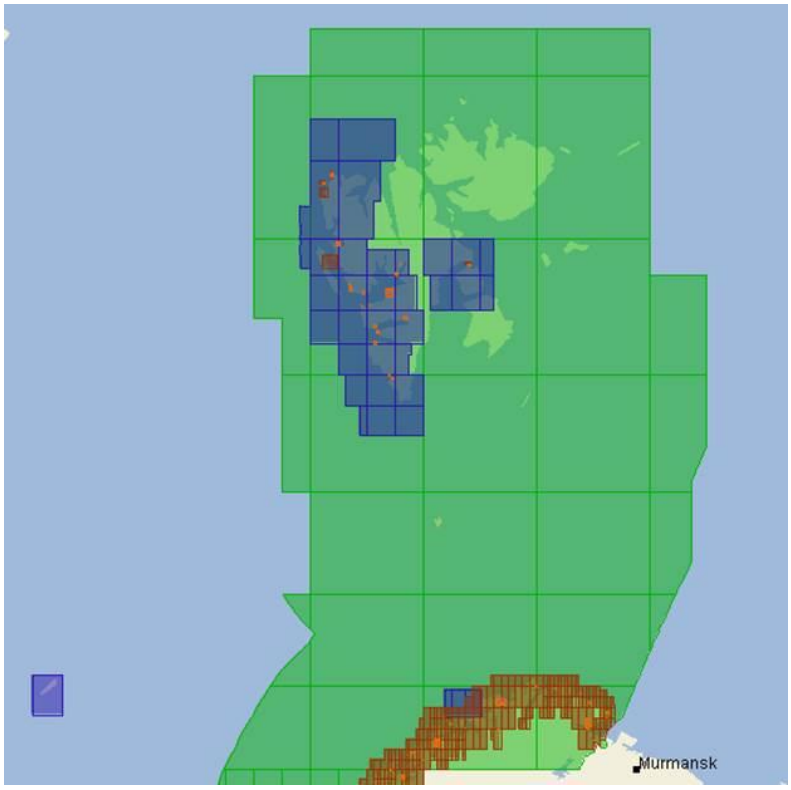


Fig 4. Present ENC coverage Northern Norway and Svalbard

3.3. Print On Demand (POD)

At present 227 charts are offered as POD.
This is the entire Norwegian chart portfolio except three Coastal Charts. These three charts will be included per 1 December 2015. We have a network of distributors that are able to do their own chart plotting production. NHS does not print charts any longer.

4. Nautical Publications

The Norwegian Pilots Guide «Den norske los» is to be revised and more customized for the professional users. Until the revised editions are available, the current updated pdf versions of the Pilots can be download from The Norwegian Hydrographic Service's homepage: www.kartverket.no. The Pilots are updated twice per year (May and November). Important changes are reported in the Notice to Mariners.

Notices to Mariners (Etterretninger for sjøfarende)

Totally 24 editions were published in 2014. The publication was available both as printed version and in pdf-format for distribution by e-mail during the year. An official digital version of Notice to Mariners was launched 12 June 2014 kartverket.no/efs. The printed version is no longer available.

As a supplement to the NtM a digital tracings service is fully operationally on the same website.

5. MSI

The Norwegian Coastal Administration is the national authority responsible for MSI in Norway.

6. C-55

Last update of C-55 was sent to IHB in March 2013, but a revision is in progress for delivery in November 2015.

7. Capacity building

Norway participated in the annual meeting of the IHO Capacity Building Sub-Committee in May 2015. The IRCC and the CBSC encourage Member States from the most developed regions to be involved in capacity building by assisting CBSC activities or by other means.

NHS entered into a cooperation with Albania in September 2014. The project will last until the end of 2017. The main goals are related to building competence and capacity. Formal education and training in hydrography is ongoing for three persons and planned for one in marine cartography. A multibeam echo sounder system for shallow waters (max 400-500 meters) will be acquired next year. A chart production system was installed in September and training is ongoing. The Norwegian Ministry of Foreign Affairs finances the project. The budget is NOK 9.85 mil.

8. Oceanographic activities

New web-pages with tidal information were launched in 2012, http://sehavniva.no, and response from the users are important in improving the pages. Based on 24 permanent tide gauges and discrete tidal zoning the users can search for a location and get tidal predictions and water level from most of the Norwegian coast. A figure with different tidal levels relative to Chart Datum and levels with return periods up to 1000 years are also shown for each location. An English version was launched in March 2015 together with an API that makes it easier for frequent users to download data without going via the web-page.
A permanent gauge was established at the remote island Jan Mayen in 2014. Data are transmitted to the office normally once per day.

In addition to observed water level and predicted tides, we present a 5 days water level forecast from models run by the Norwegian Meteorological Institute (NMI). Near real time water level observations are transferred from NHS to NMI and are used to adjust the output from the model.

We have done several short term measurements, one month or more, of water level. The pressure gauges are spread around the coast and used for reduction of soundings, improving the tidal zones information and transferring land-levelling datum to islands. The data will also be important for establishing a CD-surface relative to a common reference surface (the ellipsoid). We are working on better methods to control the accuracy, and have started to use two pressure gauges at each site. One gauge is mounted around Mean Sea Level at a known height relative to TGBM. With such a system, we have better control of drift in the sensors and can correct for density variations.

With our new program for processing, storing and distributing water level measurements we are able to analyse more series than we used to when part of the process was manual.

9. Other activities

9.1. New research vessel for ice-covered areas

A new research is under construction and is scheduled for delivery last half of 2017. The vessel to be owned by the Norwegian Polar Institute but operated by the Institute of Marine Research. The area of operation will be Arctic and Antarctic.

The vessel is built for icebreaker class PC-3, equipped with moonpool, crew of 15-17 persons, 35 scientists, 65 days operation cruising speed, length 100m and width 21m.

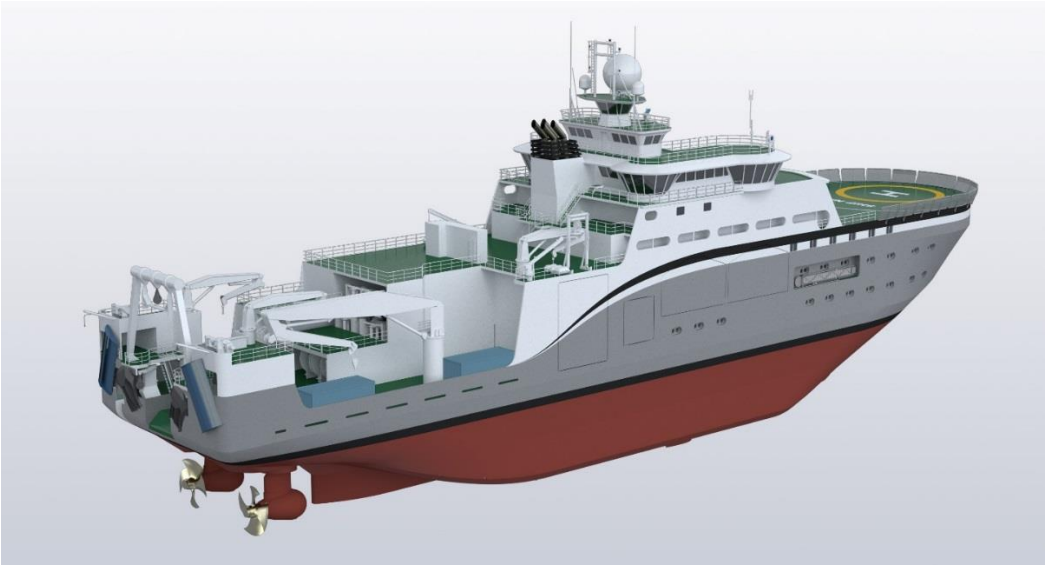


Fig. 5. A drawing of the research vessel under construction

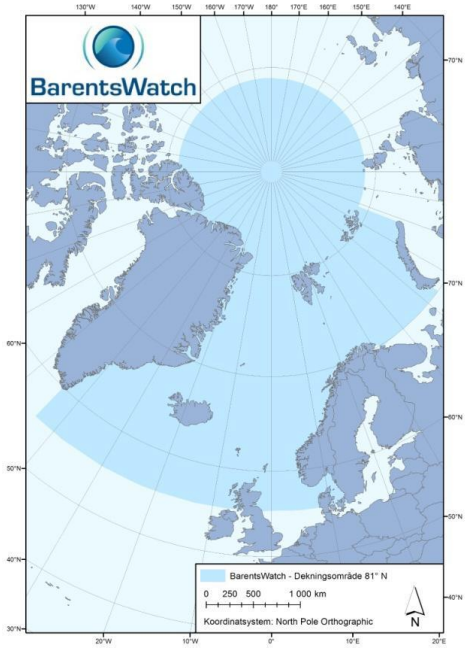
9.2. TopoBathy pilot project

The NHS conducted a pilot test in 2014 using the latest generation of a Riegl shallow water topo-bathy lidar system. The main goal was to verify that a topobathy lidar system is capable of performing a seamless data acquisition in the depth range from land down to approximately 5 meter depth. The final report was available in March 2015.

9.3. The PLECO Project

The NHS has effectuated a project to replace the multibeam data processing tool used for many years. NHS chose Caris as the developer and vendor of the system. The solution is an extension of the HIPS/SIPS solution already offered by Caris. The system was finalized and installed early 2014 with subsequent training taking place immediately afterwards.

9.4. BarentsWatch - a monitoring and information system for sea and coastal areas



Introduction

BarentsWatch (BW) aims to offer integrated knowledge and information services to the public, and will also support efficient coordination between governmental services through a common information picture. The area to be covered is shown on the figure. So far 10 Ministries and 25 companies/institutes are partners in the service available through the http://www.barentswatch.no/en/. Most of the content is currently available in Norwegian only. As the service is under development new functionalities are added gradually.

The service content
The portal include information on climate and environment, marine resources, fisheries and aquaculture oil and gas fields, maritime transport routes, harbours, news for maritime activities etc. A core part of the system consists of map services, based on geographic information services from official sources.
Involvement by the Norwegian Hydrographic Service
The NHS sees cooperation with BW as an excellent opportunity to breathe live into a marine spatial data infrastructure (MSDI). While the building of a Norwegian national data infrastructure is well under way, it has been lacking a distinct marine focus. BW has given the marine users a much clearer voice and as such is actively involved in defining the use cases. The NHS sees it as its role to support these initiatives in such a way that they can form reusable building blocks that can each contribute towards a functional MSDI for the BarentsWatch area.

A presentation will be given during the conference.

9.5. International activities
The NHS is involved in several Working Groups, Committees and Commissions related to IHO. Norway has representatives in the following Working Groups: S-100, DQ, ENC, NC, NIP, TWC, CSPC, IEN, MSDI and WEND. We have participated in the HSSC and the IRCC meetings in 2014. Norway is actively participating in 5 Hydrographic Commissions: ARHC, HCA, NHC, NSHC and SAIHC.

As operator of Primar we participate in all related meetings.

During the last few years, we have contributed with a substantial part of high resolution bathymetric data, obtained through the Mareano project, to the GEBCO (and IBCAO) database. We have delivered data with resolution 50x50 meter for a greater part of our coastal waters to the EU project EMODnet.