MEDITERRANEAN AND BLACK SEAS HYDROGRAPHIC COMMISSION XXI CONFERENCE

CONTRIBUTION BY MONTENEGRO

INSTITUTE OF HYDROMETEOROLOGY AND SEISMOLOGY

SECTOR FOR HYDROGRAPHY AND OCEANOGRAPHY

Spain, Cadiz
11 - 13 June 2019

Contents

1. NATIONAL HYDROGRAPHIC OFFICE

Montenegrin Hydrographic Office was initiated as the Sector for Hydrography and Oceanography (SHO) within the Institute for Hydrometeorology and Seismology (IHMS) in 2009. IHMS is under the Ministry of Sustainable development and Tourism and conducts hydrographic and topographic survey of the sea and internal navigation routes, gathering of hydrographic data, navigation, geology, and geophysics (changes in sea level, waves, sea currents etc.), production of charts and publications in line with recommendations of International Hydrographic Organisation (IHO) and International Maritime Organisation (IMO).

SHO comprise two departments: Department for hydrography and Department for oceanography. Department for hydrography performs activity of bathymetric survey, side scan sonar survey, magnetometry, geodesy and nautical cartography production. Department for oceanography is responsible for sea level observation, tidal analysis and prediction, sea current measurements and modeling, wave measurements and chemical oceanography (temperature, conductivity and salinity).

The precondition for the achievement of effectively management of the territorial waters of Montenegro implies the building and improvement a national infrastructure (premises, vessels, equipment, software). Sector for Hydrography and Oceanography has basic infrastructure (premises and ship), equipment, software and small number of staff (7 people) necessary for execution of the basic tasks.

The trained personnel are essential for good hydrographic services. SHO plans activities related to the further development of the Sector, which include improvement the knowledge of the staff through professional courses, seminars and trainings. All staff members will be included in the training program depending of type of work.

1.1. Surveying vessels

SHO posses one 9.5 m boat (Fig. 1). It is purposely designed for the conduct of hydrographic surveys and oceanographic measurements.

Figure 1. Hydrographic boat ČH-1

Main characteristics of the surveying vessel are:

- displacement: 6 t
- length: 9.5 m
- draft: 0.5 m
- accommodation capacities:
  - 2 crew members
  - 2 members of survey team

Figure 2. Hydrographic vessel GreatWhite Enterprise

Main characteristics of the surveying vessel are:

- length: 8.2 m
- draft: 0.8 m
- accommodation capacities:
  - 2 crew members
  - 2 members of survey team

Figure3. Hydrographic vessel WingCat

Main characteristics of the surveying vessel are:

- length: 5.5 m
- draft: 0.6 m
- accommodation capacities:
  - 1 crew members
  - 2 members of survey team

1.2. SHO equipment and software

SHO disposes of the following equipment and software:

- ✓ SBES: *Navisound 215* and *Simrad EA400*
- ✓ MBES: Norbit *(NORBIT Subsea AS, Norvay)*
- ✓ GPS receivers: *Leica GS09* and *Trimble Pathfinder ProXRS* (corrections from national GPS network MONTEPOS)
- ✓ CTD probes: *Monitor* and *Midas*
- ✓ Two permanent tide gauge stations and mobile tide gauge: *Tide Master*
- ✓ Side Scan Sonar: *Edgetech 4125*
- ✓ Currentmeter: *RDCP 600*

SHO is using following softwares in hydrographic surveys, tidal analysis, postprocessing and producing navigational charts:

- ✓ Hydrographic Software: *HydroPro* and *Hypack 2010, QPS Qinsy and Qimera*
- ✓ Tidal Analysis Software: *TASK*
- ✓ GIS software *Geomedia Professional, QGIS, ArcGis*
- ✓ Software for terrain modeling *Surfer 10*
- ✓ Caris S – 57 Composer
- ✓ Caris Paper Char Composer
- ✓ SevenCs ENC Designer
- ✓ SevenCs ENC Analyzer

1.3. Tidal stations

Institute of Hydrometeorology and seismology of Montenegro monitors vertical sea movement on two permanent tidal stations in port of Bar and port of Kotor. Data acquisition and transfer to the central computers have been performed by using HYDRAS III software. For harmonic analyze and prediction it is used TASK software. The same software was used for calculation of the LAT for each port.

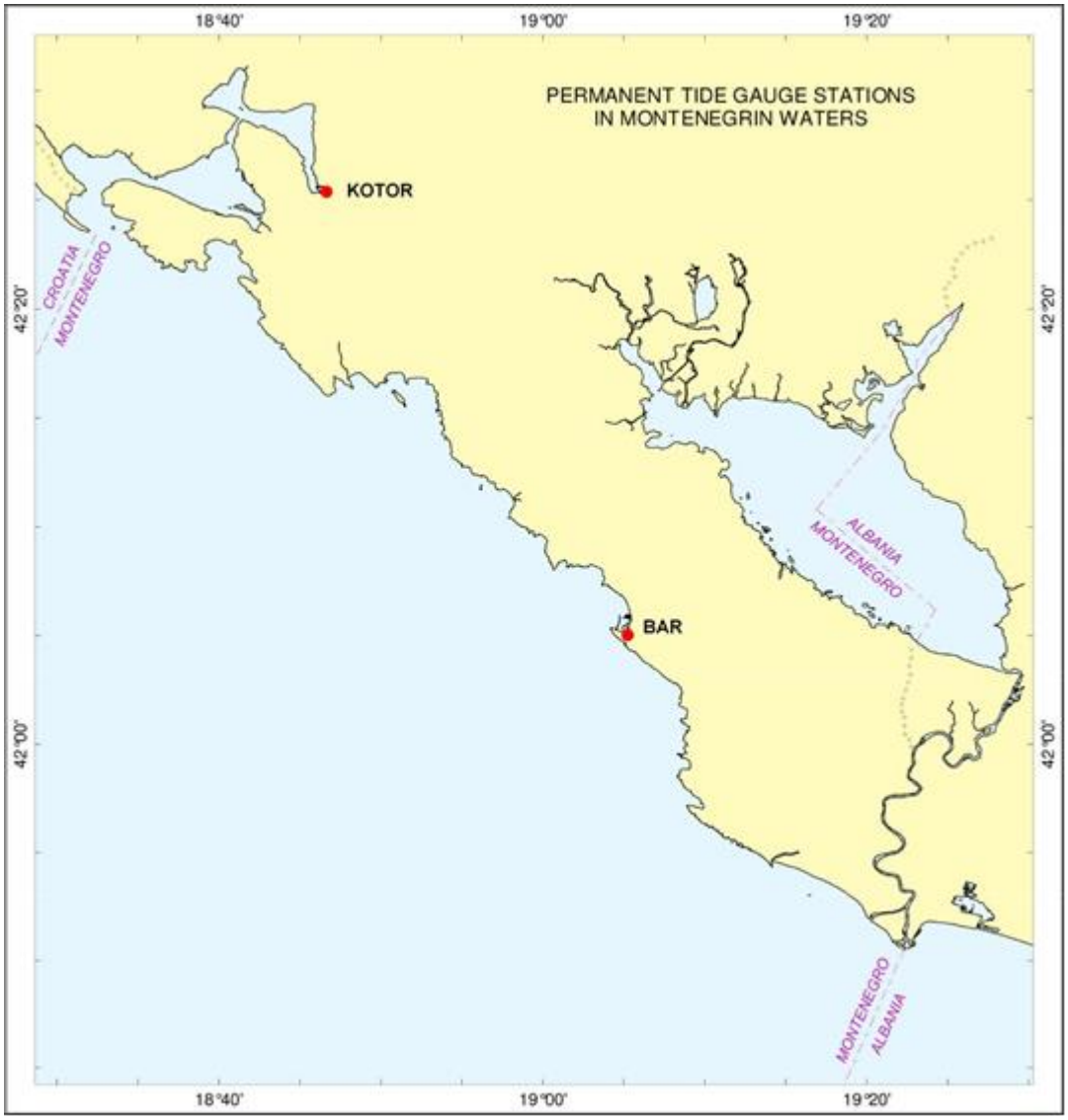

Figure 4. Permanent tidal stations in Montenegrin waters

1.4. Nautical publications

SHO nautical publications includes the following documents:

- Notices to Mariners
- Sailing Directions (issued in national language - edition in English language is in preparation)
- Pilot: 2013 (Montenegrin and English language)
- Lists of Lights: 2012.

Publications are delivered in paper form only.

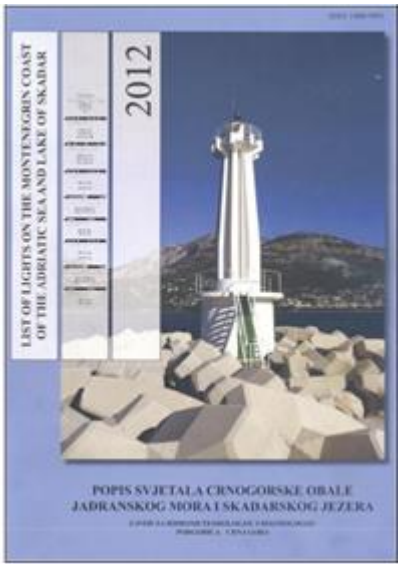

Figure 5. List of Lights issued by Montenegrin SHO

1.5. Maritime Safety Information (MSI)

Promulgation of navigational information and the GMDSS implementation is the responsibility of another governmental agency - Maritime safety department of Montenegro.

NAVIGATIONAL INFORMATION

SERVICE	YES	NO	Partial	NOTES
LOCAL WARNINGS	x			
COASTAL WARNINGS	x			
NAVAREA WARNINGS	x			
INFORMATION ON PORTS AND HARBOROUS			x	

GMDSS IMPLEMENTATION

SERVICE	YES	NO	Partial	NOTES
Master Plan		x		
A1 Area	x			
A2 Area	x			
A3 Area		x		
NAVTEX		x		
SafetyNet		x		

2. PAPER CHART AND ENC STATUS

2.1. Chart production process and status of produces charts

SHO produces official paper and electronic navigational charts (ENCs) covering the waters within the national responsibility. Hydrographic surveys conducted along the Montenegrin coast in recent years were limited to the marinas and small ports. This selective parts of the coast were surveyed and nautical plans were produced. Based on these surveys, for marinas and some ports, new ENCs were released.

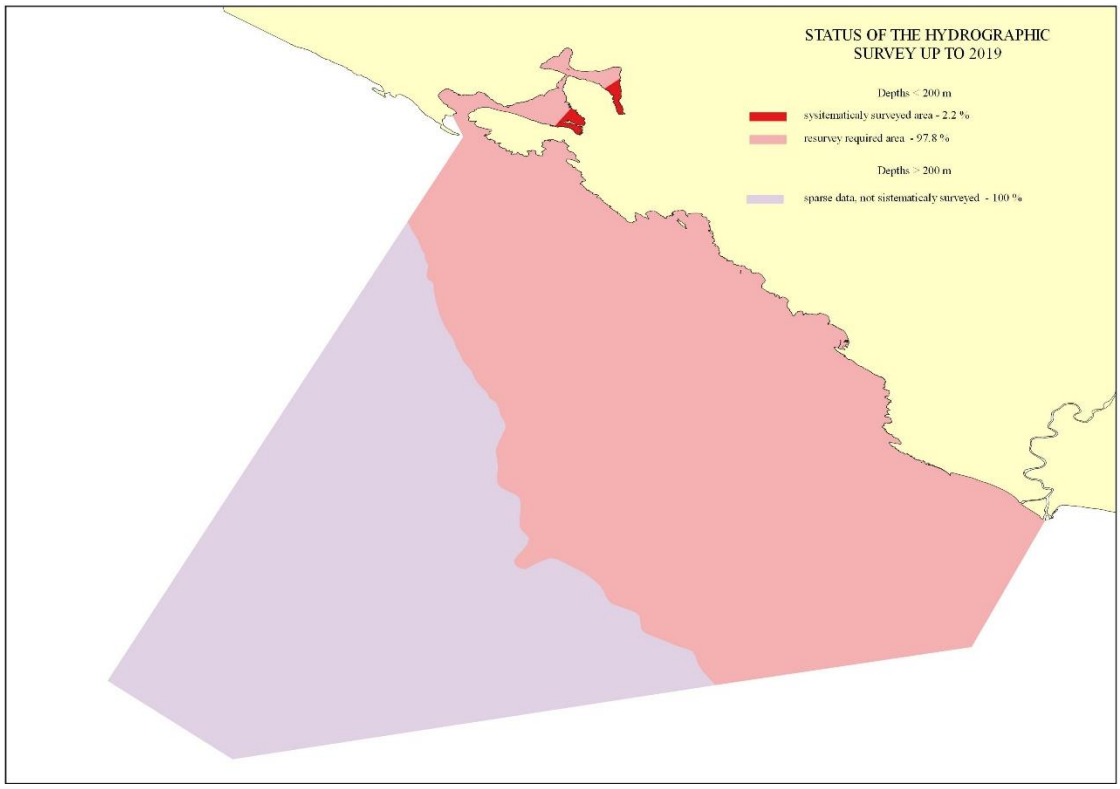

Figure 6. Status of hydrographic survey of Montenegrin waters

SHO has produced 11 navigational ENC cells of different usage band. Depending on the navigation purpose, SHO has released following ENC cells:

- ✓ 1 coastal (ME3MNE01);
- ✓ 1 approach (ME4BOK01);
- ✓ 4 harbour (ME5KOT01, ME5BAR01, ME5ZEL01, ME5BUD01);
- ✓ 5 berthing (ME6BON01, ME6PON01, ME6MOG01, ME6LUS01, ME6HNV01).

The last systematic survey of Montenegrin near shore waters was performed in the period from 1951 to 1954. The strong earthquake in 1979 partially changed pattern of the coast-line and topography of the sea bottom, especially within Boka Bay and in proximity of the coastline.

It is necessary to resurvey almost complete area of the responsibility in accordance with IHO Standards for Hydrographic Surveys (S-44).

2.2.Charting software (paper chart and ENC)

SHO is using Caris S-57 Composer and Caris Paper Chart Composer for production of Electronic Navigational Charts and paper charts. Also, we are using SevenCs ENC Designer for production of ENC cells.

In the portfolio SHO posses some charts which are inherited from former Yugoslavia: one general chart in the scale 1:300 000, two coastal charts in the scale 1:100 000 issued in 2002 year (Fig. 5).

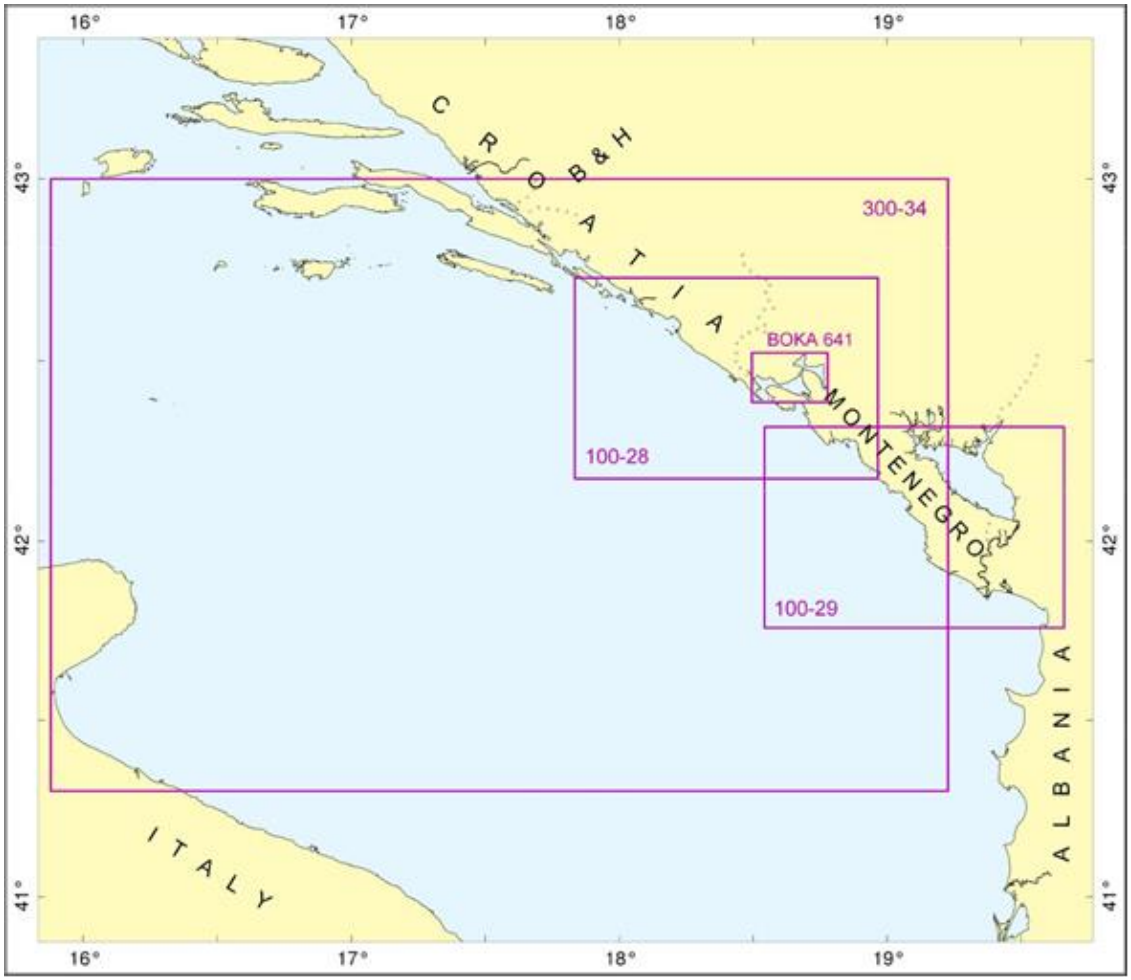

Figure 7. National paper charts

Chart of Boka Bay in the scale 1:25 000 was issued in 2010 and new edition in 2018. Coastal navigation charts 100-28 and 100-29, were replaced with new coastal Electronic Navigation Chart, produced in 90 000 scale, ME3MNE01, which covers all Montenegrin coast. It has been created using available data from already existing nautical chart, partly updated with new survey in shallow waters, and using topographic data, provided from national Cadastre.

Long term plan is to create five more approach ENC cells and ENCs of small piers and marinas (usage band 5 and mostly 6) to raise quality of ENC coverage (Fig. 6). With this accomplished, whole aquatory of Montenegro would be covered.

Based on ENC cell ME3MNE01, SHO will create paper chart, using Caris Paper Chart Composer.

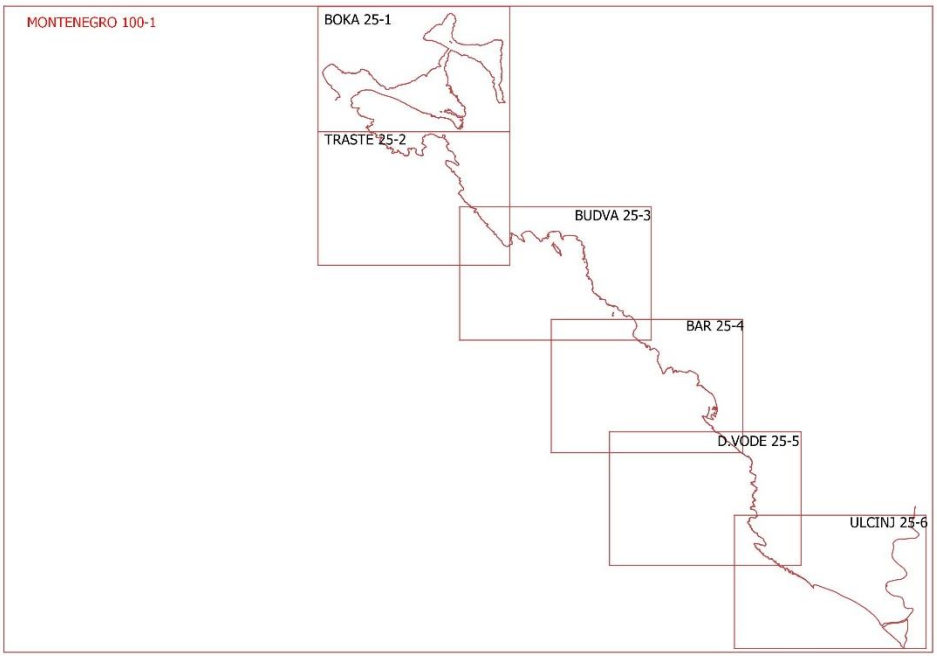

Figure 8. Planned approach ENCs

2.3.Staff in Charting Division

Currently, four people are employed for production of ENC cells. All of these employees also have other roles and responsibility in Sector for Hydrography and Oceanography.

2.4.Validation tool for ENC

SHO is using S-58 for ENC Validation Checks in CARIS Composer and SevenCs ENC Analyzer.

3. QA & QC for charts and ENC

The quality of service is identified primarily by supporting the high professional standards of the International Hydrographic Organization (IHO) and the International Maritime Organization (IMO).

Montenegro does not have regulation base which describe and regulate process of creation ENCs.

4. ENC SERVICE

SHO distributes its ENCs through the PRIMAR. We are members of PRIMAR since 2013. SHO produced 11 new ENCs (Fig. 7).

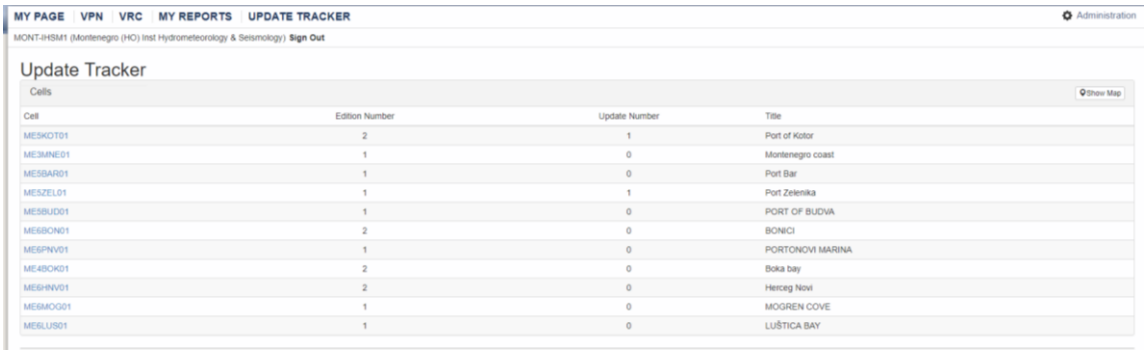

Figure 9. Released ENCs

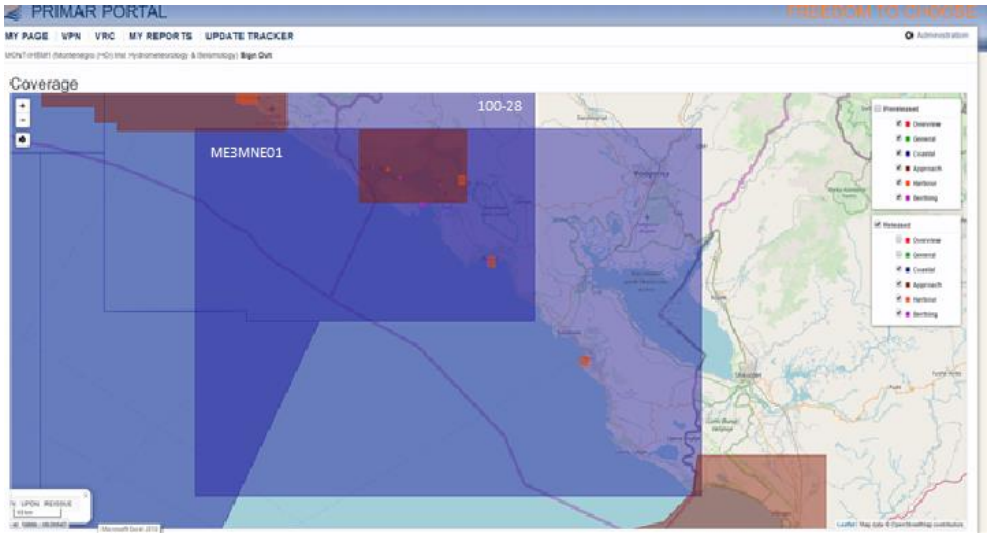

Figure 10. Coverage of released ENCs

5. PREVIOUS EXPERIENCE OF PARICIPATION IN NAUTICAL CARTOGRAPHY CAPACITY BUILDING PROGRAM

Previously, personnel of Sector for Hydrography and Oceanography has been participated in two nautical cartography capacity building program:

- *Category B course (IHO/FIG/ICA Standards of Competence for Nautical Cartographers)*
- *Training for Ocean Observation and Hydrographic Surveying (ENC Application)*

The main problem in the work of our SOH is the lack of trained personnel. For this reason we have a need for all types of training, especially for hydrographic courses and marine cartography courses.

5.1 Category B course (IHO/FIG/ICA Standards of Competence for Nautical Cartographers

In 2015 SHO applied for one candidate for the training at the UK Hydrographic Office for B Hydrographic Course, and we have been selected. During this course participant learned production of ENC cells.

5.2 Training for Ocean Observation and Hydrographic Surveying (ENC Application)

In September 2017 one employee from SHO participated in Training for Ocean Observation and Hydrographic Surveying (ENC Application), which was organized by KOICA. During this course participant learned recent technological developments in ENC and the S-10X standards.