SPAIN

NATIONAL REPORT

TO 19TH MEETING OF THE MESO AMERICA – CARIBBEAN SEA HYDROGRAPHIC COMMISSION (MACHC19)

Cartagena de Indias, Colombia, 28 November – 1 December 2018

Instituto Hidrográfico de la Marina
Cádiz - España

1. Hydrographic Service

Instituto Hidrográfico de la Marina - IHM (España), Spanish Navy Hydrography Office (IHM).

Our organization, mission and different kind of services offered can be found at:

http://www.armada.mde.es/ArmadaPortal/page/Portal/ArmadaEspannola/cienciaihm1/prefLang-es/

http://www.armada.mde.es/ArmadaPortal/page/Portal/ArmadaEspannola/cienciaihm1/prefLang-en/

In June 15, 2018 Captain José Daniel González-Aller Lacalle assumed a position as Commander-Director of the Spanish Hydrographic Office, relieving to Captain Juan Antonio Aguilar Cavanillas.

Submitted by: Captain José Daniel González-Aller Lacalle (Director)/ Commander José María Bustamante Calabuig (Head of Institutional relations)

2. SURVEYS

2.1. Coverage of new surveys

Nothing to Report (NTR) in MACHC Area.

General

Spanish coastal waters up to 200 m deep have already been surveyed. These data were updated considering multi beam surveys and single beam coastal surveys (<200 m) as complying adequately with S-44 standards. The current effort is focused on resurveying by multi beam the single beam coastal surveys (<200 m).

The IHM has conducted hydrographic surveys by using either Multibeam Echosounders (MBES) or Phase Differencing Bathymetric Sonar Systems (PDBSS).

Surveying the major ports of Spain and their approaches has been a priority for IHM. For this kind of works in shallow and very shallow waters where safety to navigation with heavy shipping traffic is a concern, IHM extensively used multibeam echosounders (MBES) and Phase Differencing Bathymetric Sonar Systems (PDBSS) to assure a complete exploration of the seafloor along with high precision positioning systems to minimize uncertainties in the soundings. This way the IHO standards for Special and 1a Order surveys were met. The same equipment and similar methodology were employed for IHO 1b and 2 Order surveys.

Furthermore, it is important to highlight that this office has continued with the goal of carrying out hydrographic surveys of Ports and their approaching channels (Special order surveys). For this purpose, IHM employed small transportable hydrographic vessels fitted with MBES as well as small boats fitted with PDBS.

Besides the mentioned hydrographic surveys, IHM participated in the Spanish Exclusive Economic Zone (EEZ) exploration, leading the seafloor surveys, and Antarctica area.

- ZEEE. This is a long term multidisplinary project developed by IHM in cooperation with other national institutions and universities and conducted on board the Oceanographic Research Vessel “Hespérides”. This platform is usually assigned one month a year for this mission.
- Antarctica: all the years from 1988, IHM conducted hydrographic surveys during the summer (December to February) in the Area onboard Spanish Oceanographic Research Vessel “Hespérides”, around Livingston and Decepción Islands, South Shetland, Bransfield Strait, Gerlache Strait and Moon Bay. A RHIB fitted with Geoswath 250+ interferometric echosounder was employed in shallow water areas.

Figure 1. "Malaspina" class oceanic hydrographic vessel (two vessels).

Figure 2. "Malaspina" class oceanic hydrographic vessel, A-32 "Tofiño" in Monaco.

Figure 3. "Antares" class coastal hydrographic vessel.

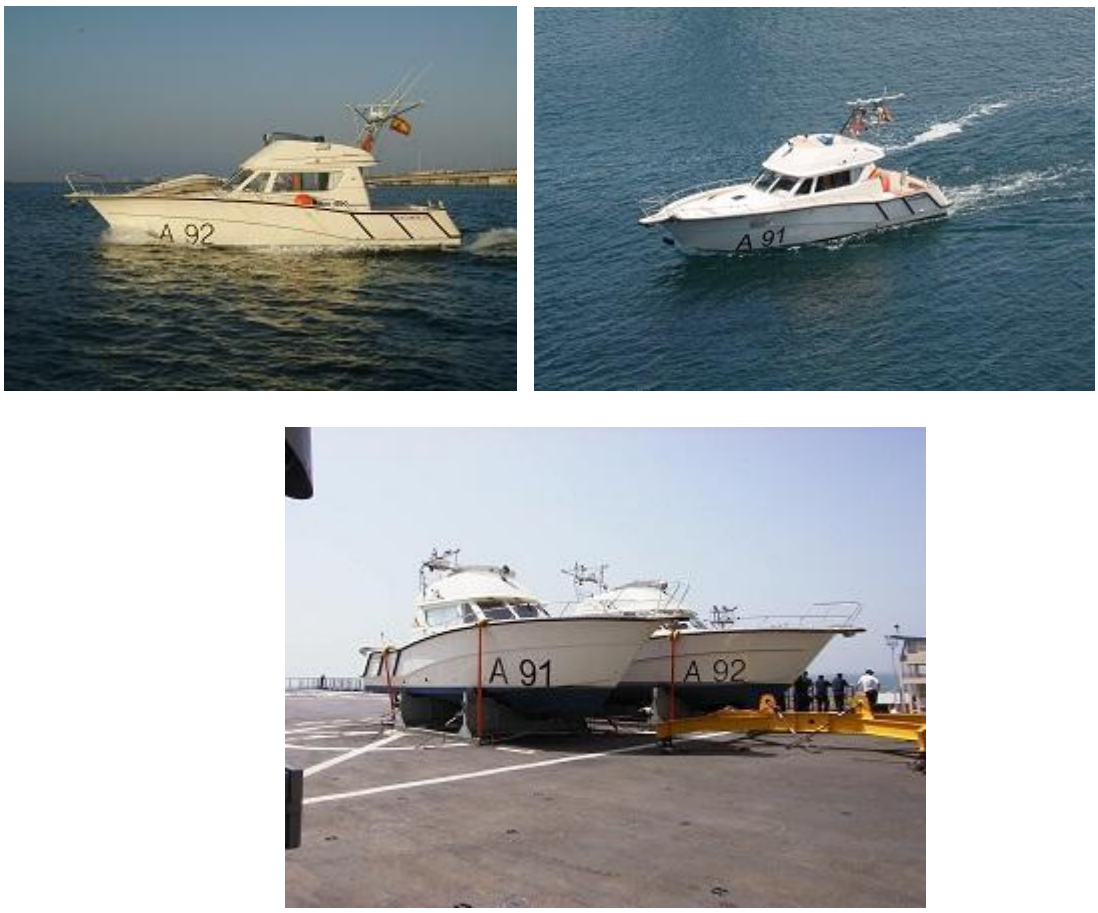


Figure 4. Small transportable hydrographic vessels.

Figure 5. New Small transportable hydrographic boat "Sondaleza".

Figure 6. "Sondaleza" towed by a car

Figure 7. Very shallow water bathymetry system operated from a small rubber boat in Antarctic area

Figure 8. Spanish Navy Oceanographic Research Vessel "Hespérides"

Survey planning

IHM surveys were conducted in accordance with the current IHO standards (IHO S-44 5th edition) for the corresponding Order type and purpose of each navigational area. Detailing these general indications, specific instructions were regularly promulgated by the Hydrographic Division as a set of “Manuals” and “Hydrographic Permanent Instructions”. These directions help IHM hydrographers use the equipment, increase efficiency and reduce the time required to complete the workflow from the planning of a survey, the at-sea works and the following processing and validation of data.

2.2. New technologies and / or equipment

The main acquisition and technical procedural effort was in RTK positioning. Transportable Hydrographic Launches *LHT Escandallo* and *LHT Astrolabio* were fitted with GPS RTK positioning equipment and the corresponding user's procedures were prepared. The Guadalquivir River surveys were executed with this positioning technique.

2.2.1. Echosounders

- Both Hydrographic Vessels *Tofiño* and *Malaspina* are currently fitted with two MBES each in full operation. This allows them to perform surveys in shallow and deep waters from 20 up to 5000 meters.

- *BH Malaspina* is fitted with *Kongsberg* EM302 and EM 3002 MBES.

- *BH Tofiño* has the MBES EM300 and EM 3002.

- For very shallow water surveys, both vessels are provided with *Kongsberg Geoswath+* PDBSS to be fitted on their small launches.

- Coastal Hydrographic Vessel *BH Antares* was fitted in 2012 with a *Kongsberg* EM2040. This allows her to achieve Full Sea floor Search from very shallow to shallow waters up to 300 meters. For very shallow water surveys, she is provided with *Kongsberg Geoswath+* PDBSS to be fitted on her small launches.

- All the *Kongsberg Geoswath+* PDBSS mentioned are shared among the vessels of the Hydrographic Flotilla. IHM has a total of two *Geoswath+ 500* for shallow waters up to 50 meters and one *Geoswath+ 250* for waters up to 80 meters.

- *LHT Astrolabio* is fitted with a *Kongsberg EM2040 Compact* MBES with *Seapath 330* (RTK positioning capable).

- *LHT Escandallo* is fitted with a *Kongsberg EM3002D* MBES. In September 2016 she has been fitted with a *Seapath 330* (RTK positioning capable).

- *LHT Sondaleza* has no permanent echosounder installed and can be fitted either with a *Kongsberg Geoswath+* PDBSS or a RESON T20P when deployed.

2.2.2. Bottom mapping sonars

- IHM's bottom mapping capability is based on several Side Scan Sonar (SSS) systems.

- A *Klein 3900* Side Scan Sonar, with the capability of being fitted with a magnetometer, was acquired in 2012 and is in operation ever since. This equipment is shared among the vessels of the Hydrographic Flotilla.

- For shallow waters, all three *Geoswath+* PDBSS available for the Hydrographic Flotilla small boats, have side scan imaging capability. Both bathymetry and side scan image is acquired during surveys with this equipment. This allows for precise georeferenced bottom images.

- Small boats are also fitted with pole-mounted *Starfish* SSS for very shallow water surveys.

2.3. New Ships

There are no new units in the Hydrographic Flotilla.

On July 23, 2018, the BECP "INTERMARES" was registered in the Official Ship List of the Navy. The ship has been delivered by the General Secretary of Fisheries (SEGEPESCA).

The Fishing Cooperation Ship (BECP) "Intermares" was built with the aim of disseminating knowledge and providing fishing training. Conceived as a school ship, it has a modern design, with equipment, classrooms, workshops and laboratories oriented to teaching and instruction. In its mission as a fishing cooperation vessel, it has developed its training activity in countries of Iberoamerica and Africa.

In the agreed common exploitation formula, in general, the ship's annual activity plan will contemplate a period of two months in the base port for maintenance of the ship and two periods of five months, the first for the benefit of the Navy and the second for the benefit of SEGEPESCA.

In the period corresponding to the Navy, its hydrographic and oceanographic use is contemplated in Spanish waters and other countries of America and Africa.

Figure 9. Spanish Navy Vessel "Intermares"

Figure 10. Spanish Navy Vessel "Intermares"

3. NEW CHARTS & UPDATES

3.1. ENCs

3.1.1. Production

NTR in MACHC Area.

In Mediterranean and Black Seas Hydrographic Commission (MSBHC), Eastern Atlantic Hydrographic Commission (EAtHC) and Hydrographic Commission on Antarctica (HCA)

290 ENC. Table 1 and 2 shows the distribution according to their navigational purpose:

Purpose 2	Purpose 3	Purpose 4	Purpose 5	Purpose 6
General	Coastal	Approach	Harbour	Berthing
4	21	82	181	2

Table 1. Distribution of ENC production

The objectives that we will face are to complete the project finishing Purpose 5 cells left, and continue with the Purpose 6 cells project to cover major Spanish ports.

3.1.2. Cooperation

Under the cooperation with the IC-ENC and PRIMAR RENCs, IHM continues to exchange all the ENC information needed with Portugal (IHPT), France (SHOM), Italy (IIM) and United Kingdom (UKHO) in order to accomplish with the IHO recommendations regarding horizontal and vertical consistency on the adjacent ENC.

3.2. ENC Distribution method

IHM is a member of the IC-ENC RENC, which carries out ENC validation and consistency checking before distribution, and distributes the ENCs via its chain of Value Added Resellers (VARs).

3.3 RNCs

NTR.

3.4 INT paper charts

NTR in MACHC Area

3.5 National paper charts

NTR in MACHC Area

In MSBHC, EAtHC and HCA: 345 paper charts

3.6. Leisure charts

14 Portfolios in MBSHC and EAtHC area.

4. NEW PUBLICATIONS AND UPDATES

4.1. New publications

NTR in MACHC Area

4.2. Updated publications

Edition in Spanish of the IHO S4 Publication, “Regulations of the IHO for International (INT) Charts and Chart Specifications of the IHO”, Edition, 4.8.0 (October 2018).

Edition of the Spanish Catalog of Nautical Charts and other publications, 2018 editions.

Figure 11. Catalogue of Nautical Charts and other Publications

Edition in Spanish of the IHO publication INT 1 “Symbols, abbreviations and terms used on charts, 6th edition, 2018”.

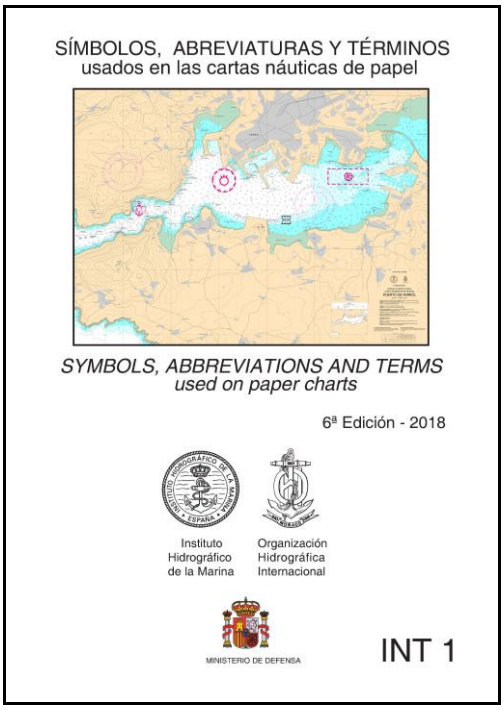


Figure 12. Publication INT 1

7 Sailing Directions in 2018 (MBSHC and EAtHC):

2 List of Lights in 2018 (MBSHC and EAtHC)

Radiosignals, 2018 edition.

4.3. Means of delivery.

Charts and other nautical publications produced by the Instituto Hidrográfico de la Marina can be purchased through the net of authorized sales agents. Contact information with these sales agents is available in the following internet address:
IHM sales agents
http://www.armada.mde.es/ihm/Aplicaciones/Agentes/Index_Agencias_xml.htm

A digital version of the publication List of Lights and Fog Signals is available online in the following internet address**:**

http://www.armada.mde.es/ihm/Aplicaciones/LibroFaros/V3/index.html

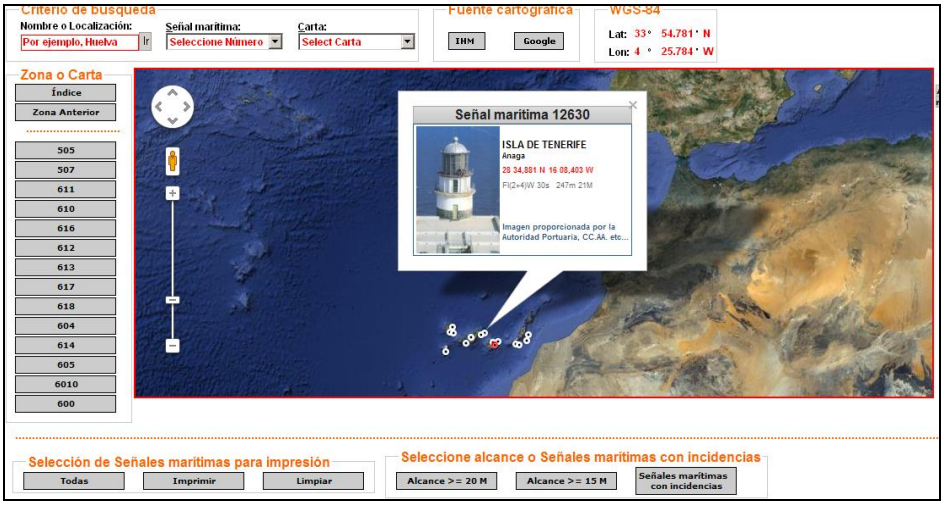


Figure 13. Screenshot of the List of Lights and Fog Signals interactive tool

5. MSI

5.1 Existing Infrastructures for transmission.

NTR in MACHC Area.

National Coordinator and NAVTEX Coordinator: Spanish Maritime Safety Agency (SASEMAR).

NAVTEX Stations:
Las Palmas [I] English, [A] Spanish

La Coruña [D] English, [W] Spanish
Tarifa [G] English, [T] Spanish.
Valencia [X] English, [M] Spanish.

NAVAREA III Coordinator: Spanish Hydrographic Institute (IHM).

There is a fluid exchange of NAVAREA warnings between NAVAREA III Coordinator and NAVAREA II Coordinators.

5.2. New infrastructure in accordance with GMDSS Master Plan

NTR.

6. C-55

6.1. SPAIN. CHARTING REGION G and F

6.1.1. Hydrographic Surveying Status

G	Adequate	Resurvey	No survey
Dephts < 200 m	70	30	0
Dephts > 200 m	95	0	5

F	Adequate	Resurvey	No survey
Dephts < 200 m	44	56	0
Dephts > 200 m	90	0	10

6.1.2. Nautical Charting status

Purpose/ scale	**A(Paper)**	**B (RNC)**	**C(ENC)**
Offshore passage/ Small	100	0	100
Landfall and Coastal passage/ Medium	100	0	100
Approches and Ports/ Large	100	0	86

6.1.3. Maritime Safety Information (MSI).

NAVIGATIONAL INFORMATION (S-53)

SERVICE	**Yes**	**No**	**Partial**	**Notes**

Local Warnings	X			Via SASEMAR
Coastal Warnings	X			Via SASEMAR
NAVAREA Warnings	X			Via NAVAREA II Coordinator
Port Information	X			Port Authorities

GMDSS IMPLEMENTATION (IMO Publication 970–GMDSS Manual)

SERVICE	Yes	No	Partial	Notes
Master Plan	X			
Area A1	X			
Area A2	X			
Area A3	X			
NAVTEX	X			
SafetyNET	X			

7. Capacity Building

7.1. Offer of and/or demand for Capacity Building

The Spanish Hydrographic School, located within the premises of the IHM, offers both hydrographic surveyor Category A and B courses. These courses are 10-month long and are taught in Spanish. Minimum academic enrolling requirements should be fulfilled.

On April 2013 the Specialization Programs in Hydrography & Oceanography for Naval Officers (Cat A) and for Petty Officers (Cat B) were revalidated and recognized by the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers. In the year 2019 the specialization programs in hydrography and cartography will be renewed.

The following is a list of the students who have attended these courses in the last four academic years:

Cat A:

Academic year 2018-2019: 2 Officers from the Spanish Navy, 1 Officer from Mauritania, 1 Officer from Tunisia, 1 Officer from Cabo Verde

Academic year 2017-2018: 2 Officers from the Spanish Navy, 1 Officer from Argentina

Academic year 2016-2017: 2 Officers from the Spanish Navy, 1 Officer from Mauritania, 1 Officer from Morocco, 1 Officer from Argentina, 1 Officer from Uruguay

Academic year 2015-2016: 2 Officers from the Spanish Navy, 1 Officer from Algeria, 1 Officer from Morocco

Cat B:

Academic year 2018-2019: 3 Petty Officers from the Spanish Navy

Academic year 2017-2018: 4 Petty Officers from the Spanish Navy

Academic year 2016-2017: 3 Petty Officers from the Spanish Navy

Academic year 2015-2016: 3 Petty Officers from the Spanish Navy, 1 Petty Officer from Morocco

Others

a. In Spain and with student scholarships or CB funds

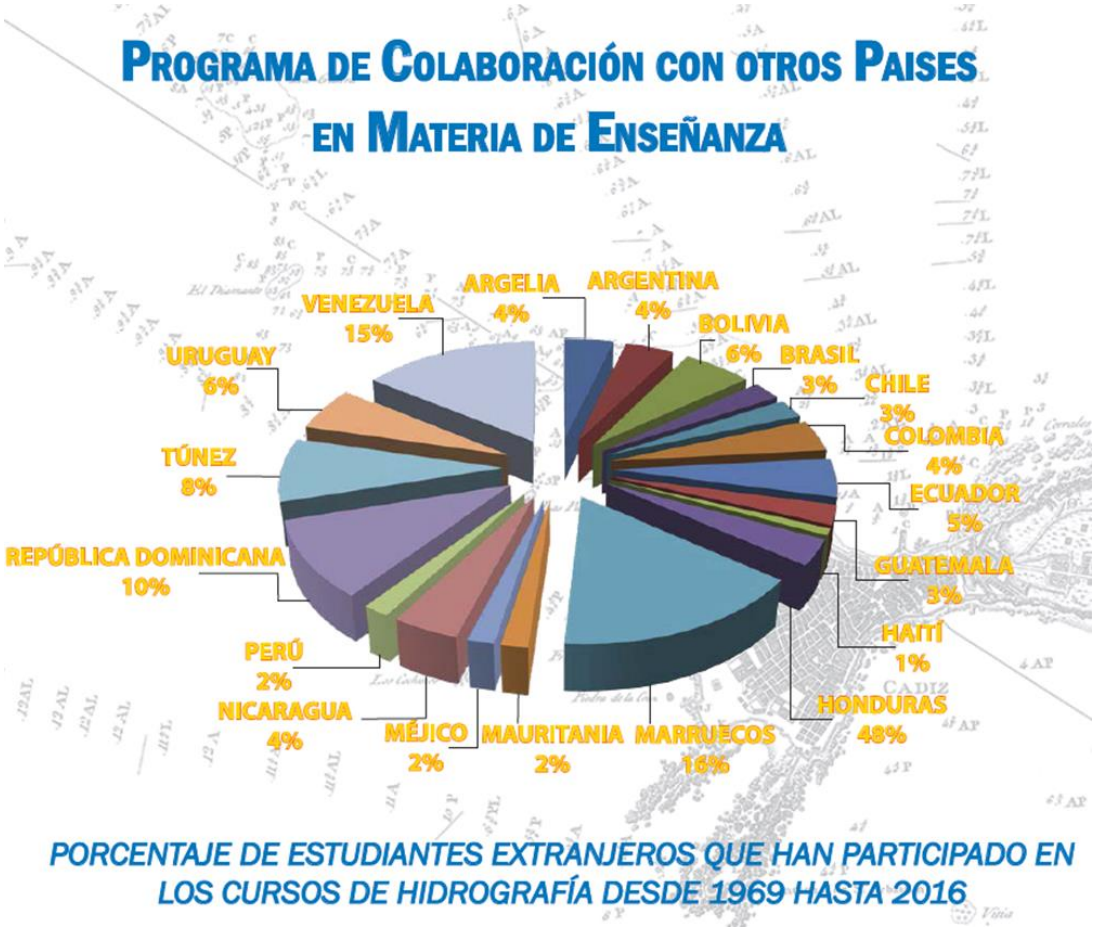
1. Geo-information Meteorological and Oceanography GEOMETOC (3,5 months)/ Geo-información Meteorológica y Oceanografía GEOMETOC (3,5 meses).
2. Hydrography and Cartography for petty officers (2 and 3 class) and seaman (3.5 months)/ Hidrografía y Cartografía para cabos primeros y cabos (3,5 meses).
3. Elemental Hydrography for seaman/ sailors (2 months)/ Hidrografía Elemental para marineros (2 meses).
4. Course acquisition and processing of bathymetric data for officers and non-commissioned officers (3.5 months)/ Curso adquisición y procesado de datos batimétricos para oficiales y suboficiales (3,5 meses).
5. Training course management of hydrographic equipment for petty officers (2 and 3 class) and seaman (1 month) / Curso adiestramiento manejo de equipos hidrográficos para cabos primeros y cabos (1 mes).
6. Photogrammetry (2 weeks)/ Fotogrametría (2 semanas).
7. Graphic Arts for sailors/seaman (4 weeks)/ Artes Gráficas para marineros (4 semanas).
8. AWNIS (Allied Worldwide Navigational Information System) for officers and non-commissioned officers (1 week)/ AWNIS (Allied Worldwide Navigational Information System) para oficiales y suboficiales (1 semana).

b. In MACHC countries:

1. Vertical reference systems and tides in hydrographic surveys: includes vertical reference, equipment and data management (3 weeks) in Spanish language.
2. Maritime Safety Information (MSI) in Spanish language (3 days).
3. Training course management of hydrographic equipment (2 weeks) / Basic Hydrographic Survey Course in Spanish language
4. Bathymetric data processing course (2 weeks)/ MBES Processing in Spanish language.
5. Seabed Classification Workshop (5 days) in Spanish language
6. Port and Shallow Water Survey Course (5 days) in Spanish language.

To date, all the students taking the fore mentioned courses are military personnel. The attendance of non-Spanish students is offered though a *Collaboration Agreement with regard to military training*, signed between the Spanish Ministry of Defense and other countries. This agreement provides grants for the attendance to the abovementioned courses.

The point of contact for these matters is generally the Defense Attaché to the corresponding Spanish Embassy, except CB Courses by MACHC/ IHM.



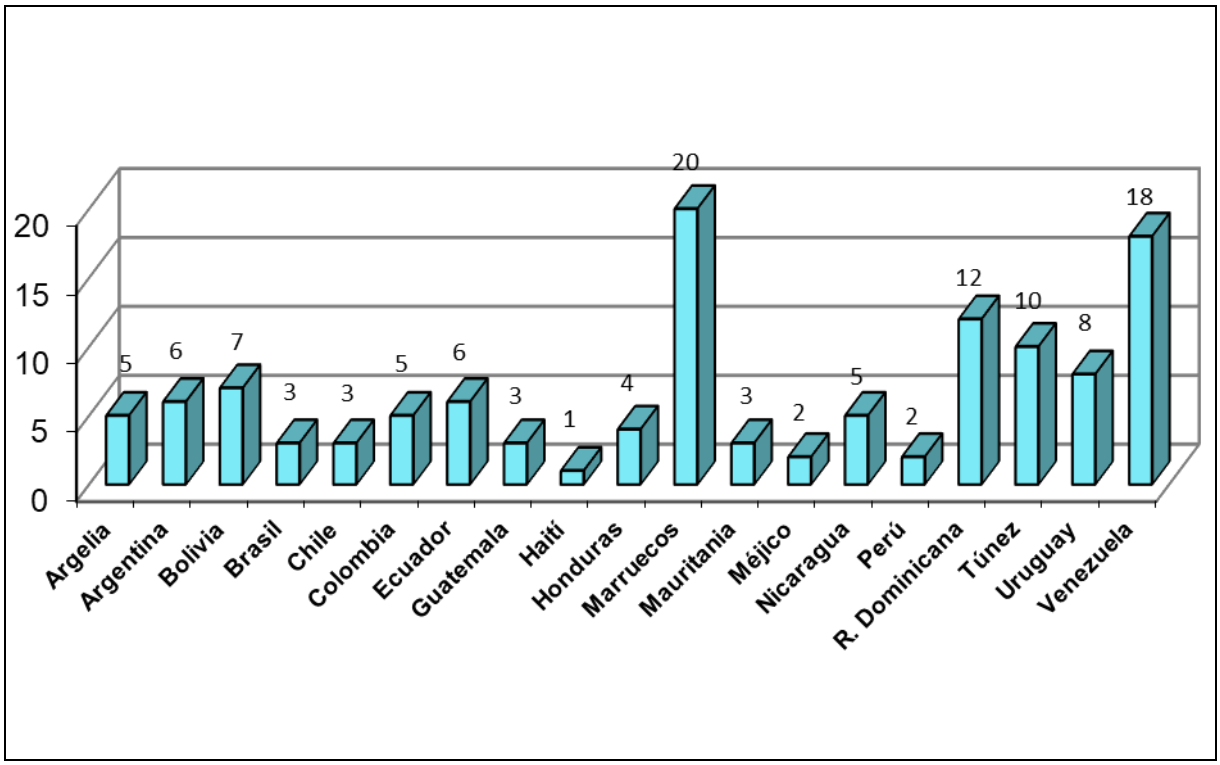


Figure 14. List of foreign students from 1969 to 2016

7.2. Training received, needed, offered

Currently there are several Spanish officers who are attending different master:

- Master in Geographical Information Quality Evaluation and Management. (University of Jaen) from September 25, 2017 to November 23, 2018

- Geospatial Information Course. From November 5, 2018 to July 26, 2019. Madrid.

- Master in Advanced Hydrography for Professionals Course, from May 2018 to July 2020. Plymouth.

7.3 Status of national, bilateral, multilateral or regional development projects with hydrographic component. (In progress, planned, under evaluation or study)

Bilateral agreement with Portugal, France, Germany, United of Kingdom, Italy and NGA (USA).

In October 2018, Spain and Portugal have presented the new edition of paper charts 440-A (ES) «Desembocadura río Guadiana y ría de Isla Cristina. Ayamonte, Vila Real de San Antonio, Isla Cristina y El Moral», and 26312 (POR) «Barra e Porto de Vila real de Santo Antonio», and all ENC correlated, to the mouth of the Guadiana River in the Spanish town of Ayamonte, on October 9, with the presence of the Ministers of Defense of both countries. The data of these charts come from the joint surveys of both countries, besides using the same vertical references.

8. Oceanographic activities

8.1. General

NTR in MACHC Area

A specific tool is being developed, in collaboration with the University of Cantabria, for the prediction of oceanographic conditions such as surf zone and wave parameters in the beach for a specific area. This tool is part of a development to support amphibious operations. With this university we are also working on the exploitation of data obtained from unmanned vehicles.

8.2. GEBCO/IBC's activities

NTR.

8.3. Tide gauge network

There is a tidal gauge network all around Spain with more than 40 sensors distributed along the coast. Three out of them belong to IHM, and there is a project to install more in the near future.

9. Other activities

9.1. Participation in IHO Working Groups

The IHM takes part in several committees and working groups of the IHO:

- Hydrographic Services and Standards Committee (HSSC)
- Nautical Information Provision Working Group (NIPWG)
- Nautical Cartography Working Group (NCWG)
- Tidal and Water Level Working Group (TWLWG)
- Marine Spatial Data Infrastructure Working Group (MSDIWG)
- World-Wide Navigational Warning Service Sub-Committee (WWNWS)
- Finance Committee (FC)

- Hydrographic Commission on Antarctica (HCA)
- East Atlantic Hydrographic Commission (EAtHC)
- Mediterranean and Black Sea Hydrographic Commission (MBSHC)
- Electronic Nautical Chart Working Group (ENCWG)
- S-100 Working Group (S-100 WG)
- Inter-Regional Coordination Committee (IRCC)
- Council (by EAtHC) and Assembly
- Strategic Plan Review Working Group (SPRWG)
- IHO-EU Network Working Group (IENWG)

IHM takes part in several working groups of the NATO:

- Geospatial Maritime Working Group (GMWG).
- Defense Maritime Geospatial Exchange Model (DMGEM).
- AML Co-Production Program (NACPP) (Additional Military Layers).
- Military Oceanography Working Group (MILOC).

IHM Spain is membership of the Council selected by EAtHC in 2017.

Spain presented the report of the Eastern Atlantic Hydrographic Commission during the I Assembly of the OHI in Monaco.

During the first Assembly, Spain presented the report of the Eastern Atlantic Hydrographic Commission.

9.2. Meteorological data collection

NTR in MACHC area.

9.3. Geospatial studies

IHM is beginning to develop a continuous Hydrographic Reference Surface (HRS), which is in its first steps waiting for adequate funding. This project attempts to present a vertical reference surface for hydrographic data, and correlate this reference surface with other vertical reference surfaces used for other purposes, such as terrestrial cartography. This project is being development between Portugal and Spain to the Peninsula Iberica.

9.4. Disaster prevention

NTR.

9.5. Environmental protection

NTR in MACHC area.

9.6 Astronomical observations

NTR in MACHC area

9.7 Magnetic/Gravity surveys

NTR in MACHC area

9.8 MSDI Progress

Within SDI´s, this IHM is a participant in the GT-IDEE (Working Group on Infrastructure of Spatial Data of Spain), tasked with the integration via internet of geographic data, metadata, services and information produced in Spain, to help users locate, identify, select and access such resources via the IDEE geoportal (http://www.idee.es). http://ideihm.covam.es/servicios.html.

Also, the Spanish Central Archive of Cartography (Instituto Geográfico Nacional, IGN)) has been provided with digital information produced by the IHM, including the Spanish coastline at scale 1:50000, straight territorial sea baseline and de Spanish Exclusive Economic Zone in the North-western Mediterranean. This information is available to free download in the following internet address: Centro de descargas del CNIG (IGN).

In addition, the IHM is also developing an own SDI (IDE-IHM), with the purpose to give an answer to the increasing demand of users to have access to nautical information. This IDE-IHM is intended to offer the following services:

- Nautical Chart WMS Service. These services will provide access to some geographical information, which is included in the Spanish IHM official nautical cartography. The data is selected from different proposal of navigation Electronical Nautical Chart (ENC) already produced by the Spanish IHM. The visual representation mimics the standard S52 of IHO, including information for the type standard, adding depths and obstructions.

- WMS/WFS for Spanish Coast line. This service will provide capabilities to display and download the Spanish coastline included in the official nautical cartography (scale 1:50.000).

- CSW Service of Metadata Catalog (Spanish IHM Nautical Chart). This service will provide capabilities of Catalog and searching of metadata files published in the IDE-IHM as WMS Service, WMS Layers, Electronic Nautical Chart (ENC) and Paper Nautical Chart (PNC).

- WMS/WFS for straight territorial sea baseline. This service will provide capabilities to display and download, the straight territorial sea baseline (LBR).

- WMS for Maritime borders. This service will provide capability to display the maritime limits as national territorial waters, contiguous zone, continental platform and exclusive economic zone.

- WMS for IHM cartographic production plan. This service will provide capability to display the Spanish IHM production plan for paper nautical chart and for Electronic Nautical Chart (ENC).

10 Conclusions

10.1 IHM and the Hydrography School "Alejandro Malaspina" offer a variety of courses and curricula in Spain, with the help of virtual teaching platforms, and with the support of scholarships for students.

Figure 15. Spanish Navy: e-learning web page

10.2. It also offers the possibility of holding courses, seminars or workshops in any country of the MACHC area in Spanish from the year 2020.

10.3. Through bilateral agreements, there is the possibility of carrying out joint campaigns in hydrographic surveys, expansion of the continental shelf, support for cartographic production or others that are established, with smaller vessels or vessels.