



SPAIN

NATIONAL REPORT

**TO THE 18th MEETING OF THE EASTERN ATLANTIC
HYDROGRAPHIC COMMISSION**

(EAtHC)

Casablanca, Morocco

1 – 3 May 2024

1 HYDROGRAPHIC SERVICE:

Instituto Hidrográfico de la Marina, Spanish Hydrography Office (IHM), did not have significant organization changes since last EAHC meeting.

IHM Website <http://www.armada.mde.es/ihm> presents more detailed information about our mission, organization structure and assets.

The following report covers the period starting September 2022 up to April 2024.

2 SURVEYS:

2.1 Coverage of new surveys.

Since last report and for updating the bathymetry of our national nautical chart scheme in the Atlantic Ocean, IHM conducted two surveys in Galicia (Atlantic Peninsular Coast) and one in Canarias Islands.

Besides, two surveys were carried out (Cantabrian Sea and bay of Cádiz) with the new unmanned surface vehicles (USV) available in the IHM. Additionally, one survey was conducted in Mauritanian waters (Nouadhibou) as a result of a request of national authorities.



Figure 1. Malaspina class Hydrographic Vessel.

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) 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.



Figure 2. LHT Escandallo



Figure 3. Very shallow water bathymetry system operated from a small rubber boat

IHM surveys were conducted in accordance with the current IHO standards (IHO S-44 6.1.0th 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.

During the period of this report, IHM continued to acquire new equipment and develop new procedures.

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 7000 meters.
- *BH Malaspina* is fitted with *Kongsberg* EM302 and EM 2040 MKII MBES acquired in December 2020 with *Seapath 380* (RTK positioning capable).
- *BH Tofiño* has the MBES EM304 fitted in May 2022 and EM 2040 with *Seapath 380* (RTK capability).
- For very shallow water surveys, both vessels are provided with *Kongsberg Geoswath+ PDBSS*, EM 2040 *Portable* with *Seapath 130* (RTK positioning capable) and *RESON T20P* with *Applanix* (RTK positioning capable) to be fitted on their small launches.
- Coastal Hydrographic Vessel *BH Antares* is fitted with a *Kongsberg* EM3002. 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, EM 2040 Portable and RESON T20P to be fitted on her small launches.

- *All the Kongsberg Geoswath+ PDBSS, EM 2040 Portable and RESON T20P mentioned are shared among the vessels of the Hydrographic Flotilla. IHM has a total of two Geoswath+ 500, one Geoswath+ 250, and two EM 2040P for waters and one RESON T20P.*
- *LHT Astrolabio is fitted with a Kongsberg EM2040 Compact MBES with Seapath 330 (RTK positioning capable).*
- *LHT Escandallo was fitted with a Kongsberg EM2040 Compact MKII MBES in May 2019 with a Seapath 330 (RTK positioning capable).*
- *LHT Sondaleza has no permanent echosounder installed and can be fitted either with a Kongsberg Geoswath+ PDBSS, EM 2040P or a RESON T20P when deployed.*

2.2.2 Autonomous vehicles.

- *In 2021, the IHM acquired an Unmanned Surface Vehicle (USV), Maritime Robotics model "Otter Pro" equipped with an EM 2040 portable and Seapath 130 OEM.*

With this vehicle the IHM has the capability of working in shallow waters (under 20 meters) and in closed places such as harbors, basins and channels where other vessels cannot accede due to its limited maneuver capability. Two more units have been acquired during the period of this report.

Its small dimensions (200 x 105 x 85 cm) and weight (95 kg full equipped) allow its transport in a van and deployment of an efficiently way.

- *In 2023, the IHM acquired another Unmanned Surface Vehicle (USV), Maritime Robotics model "Mariner" equipped with an EM 2040 portable and Seapath 380 5+ OEM, LIDAR and RADAR.*

It could be deployed from a Malaspina Class vessel.



Figure 4. USV VERIL 01¹ and SONDA01.

- *Remotely Pilot Aircraft System (RPAS).*

The IHM has also acquired in two RPAS MATRICE 300 RTK for surveying use and autonomous capabilities. It is a quadcopter weighing 8 kg and with a wingspan of 90 cm, equipped with a high-resolution camera, LIDAR laser scanner, multispectral sensor and positioning with centimeter precision. This RPAS has a range of up to 55 minutes per flight and will be used to quickly obtain digital terrain models, beach profiles and estimate the bathymetry of very shallow waters in locations that are difficult to access. It is planned to increase the acquisition capacity with other new sensors.

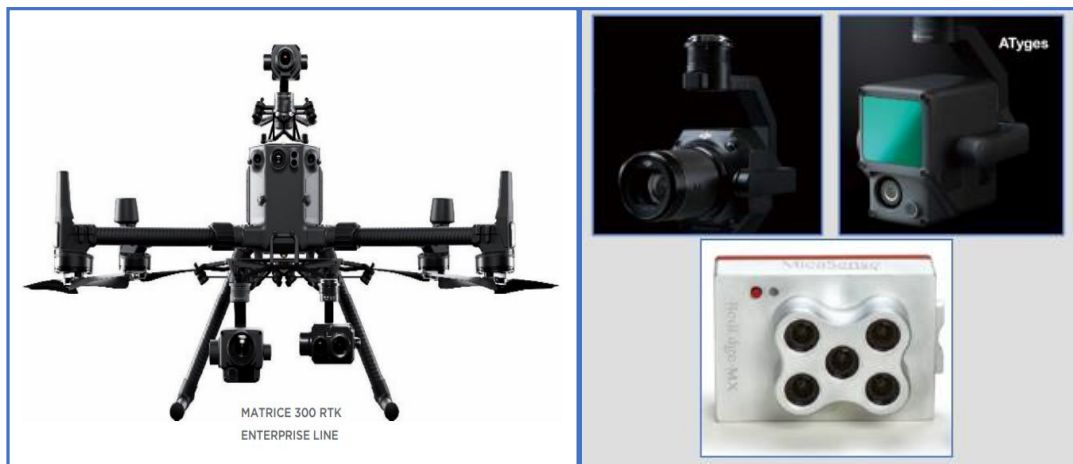


Figure 5. RPAS and devices.

¹ VERIL: Vehículo de Exploración Robótico Integrado Ligero; in Spanish language.



Figure 6. New coastline in La Palma Island, formed after a volcanic eruption. Data collected by RPAS.

2.2.2 Bottom mapping sonars

- IHM's bottom mapping capability is based on several Side Scan Sonar (SSS) systems.
- A Klein 3900, 4000 and 4900 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 are 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.
- Sub-bottom profiler "Innomar Compact", for shallow waters, with the ability to detect buried objects and classify the layers of the marine subsoil up to 200 m deep is obtained.
- The IHM has acquired two submarine cameras designed for the collection of high-definition still images for biological and geological mapping, By collecting stationary images, the system can collect precise measurements of seafloor features and biology.
The operational use of these new means is expected to begin in hydrographic surveys and expeditionary missions in the first quarter of 2023 after initial tests and the generation of employment procedures.

2.3 New Ships

IHM proposed to replace its hydrographic fleet with new survey vessels for modern, sophisticated and low-noisy vessels and boats by means of an operational

requirements document. Spanish Government approved the submitted proposal. The new hydrographic fleet will be made up of one oceanic vessel, two coastal hydrographic vessels, five survey boats and several autonomous surface vehicles to assure total coverage from the coastline to deep waters.

3. NEW CHARTS & UPDATES.

3.1. ENC's

3.1.1 Production

Up to 31 March 2024, IHM has produced 75 ENC's within the area of the EAthC (out of a total of 139 published for all areas). 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
1	1	12	61	0

Table 1. Distribution of ENC production in the EAthC area

EAthC ENC Production until March 31, 2024					
Purpose	Total	Published	Pending	% Published	% Pending
2	4	4	0	100%	0%
3	11	11	0	100%	0%
4	38	38	0	100%	0%
5	98	94	4	95,91%	4,09%
6	14	1	13	7%	93%
Total	165	148	17	89,69%	10,31%

Table 2. Distribution of ENC production and percentage in the EAthC area

Since last national report, 9 new ENC's and 66 new editions have been produced within the EAthC area. This shows the increasing workload associated with maintaining and updating the ENC catalog, which slows the production of new ENC's.

Tables 3 and 4 shows the new editions/ENC within the EAthC published since the date of the last meeting.

NEW EDITIONS FROM 01/08/2022 TO 31/03/2024		
NUMBER	TITLE	ED.
ES503911	Puerto de Pasaia-Pasajes	2
ES504411	Puerto de Huelva	7
ES400392	Aproches de San Sebastián y Pasajes	3
ES503922	Puertos de Mutriku y Ondarroa	2
ES506100	Puerto de Las Palmas	6
ES400440	Aproches de Ayamonte	2

ES400394	Aproches de Bilbao	3
ES504437	Arsenal de la Carraca	4
ES400408	Aproches de Viveiro	2
ES400445	Aproches de Algeciras	11
ES540411	Puerto de Lastres	2
ES540412	Puertos de El Puntal y Tazones	2
ES30040B	De cabo de San Lorenzo a punta de Estaca de Bares	3
ES400392	Aproches de San Sebastián y Pasajes	6
ES540413	Puerto de San Esteban de Pravia	2
ES541421	Puerto de Fisterra	2
ES541422	Ría de Corcubión	2
ES539301	Puerto de Lekeitio	2
ES400610	Aproches de la isla de Gran Canaria. Zona norte	6
ES504012	Ria de Suances	2
ES504031	Puerto de Ribadesella	2
ES504126	Puerto de La Coruña	7
ES539302	Puerto de Elantxobe	2
ES540301	Puerto de Llanes	2
ES539401	Puerto de Castro Urdiales	2
ES200303	Mar de Alborán y mar Balear	8
ES400401	Aproches de Santander	3
ES504141	Ría de Camariñas	3
ES540401	Puerto de Candás	2
ES540501	Puerto de Cudillero	2
ES540702	Puerto de Foz	2
ES541101	Ría de Cedeira	2
ES541201	Puerto de Malpica	2
ES541301	Islas Sisargas	2
ES400601	Estrecho de La Bocayna	2
ES504082	Rías de Viveiro y O Barqueiro	2
ES540701	Puerto de Tapia	2
ES541511	Puerto de Muros	2
ES541513	Puerto de Portosin	2
ES541522	Puerto de A Pobra do Caramiñal	2
ES541601	Puerto de Piedras Negras	2
ES560101	Puerto de Corralejo	2
ES544301	Puerto de Gallineras	2
ES544401	Puerto de Conil	2
ES504042	Puerto de Gijón	7
ES504071	Puerto de Ribadeo	3
ES560302	Puerto de Gran Tarajal	3
ES560303	Puerto de Morro Jable	2
ES560501	Puerto Calero	2
ES560502	Puerto de Puerto del Carmen	2
ES506102	Puerto de Salinetas	2
ES561002	Puerto de Las Nieves	2
ES504437	Arsenal de La Carraca	5

ES561104	Puerto de Pasito Blanco	2
ES561101	Puerto de Mogán	2
ES504422	Río Guadalquivir. Del caño de Enríquez al caño de San Carlos	2
ES504423	Río Guadalquivir. Del caño de San Carlos al caño de la Lisa	2
ES561102	Puertos de Puerto Rico y Anfi del Mar	2
ES561103	Puerto de Arguineguín	2
ES504052	Ría de Avilés	5
ES504424	Río Guadalquivir. Del caño de la Lisa a la Huerta del Rincón.	3
ES561502	Puerto de San Sebastián de La Gomera	3
ES561503	Puerto de La Estaca	3
ES561501	Puerto de Santa Cruz de La Palma	3
ES400616	Isla de La Palma	3
ES400404	Aproches de Gijón	7
ES400392	Aproches de San Sebastián y Pasajes	4

Table 3. New ENC editions produced since last national report.

NEW ENC's FROM 01/08/2022 TO 31/03/2024		
NUMBER	TITLE	ED.
ES504412	Acceso al Río de las piedras	1
ES504413	Puerto El Rompido	1
ES504414	Puerto El Terrón	1
ES506101	Puerto de Taliarte	1
ES541514	Puerto de O Son	1
ES541524	Puertos de Cambados y O Grove	1
ES561504	Puerto de Tazacorte	1
ES541512	Puerto de O Freixo	1
ES541521	Puerto de Santa Uxía de Ribeira	1

Table 4. New ENC cells produced since last national report

Next figures show the new ENC cells and editions within the EAtHC published since the date of last national report (31 March 2024).

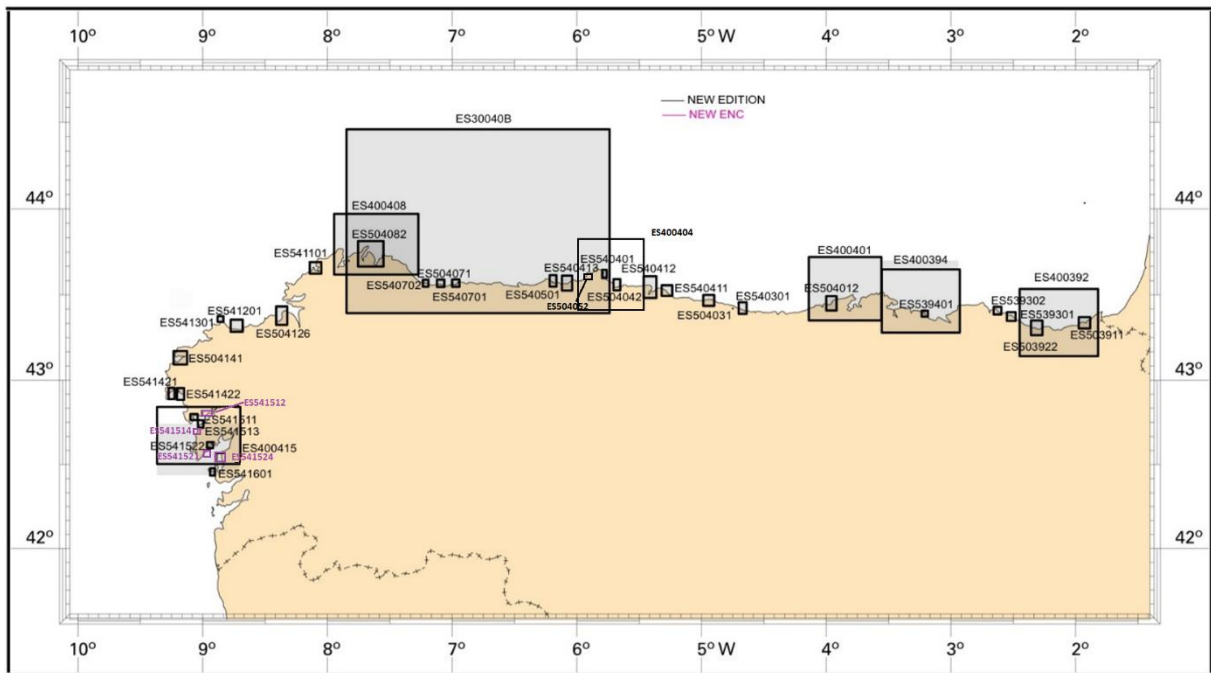


Figure 7. New ENC cells and editions produced in North of Spain since last national report (purposes 3, 4 and 5)

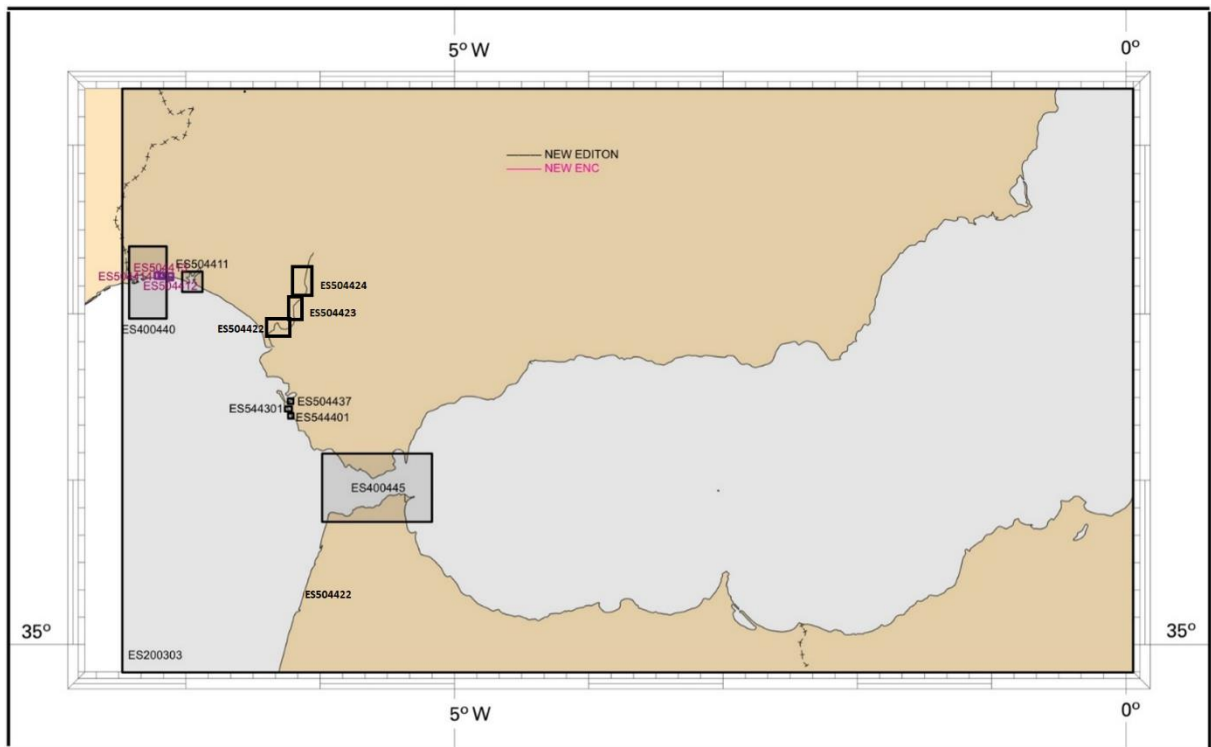


Figure 8. New ENC cells and editions produced in Gulf of Cádiz since last national report (purposes 3 and 5)

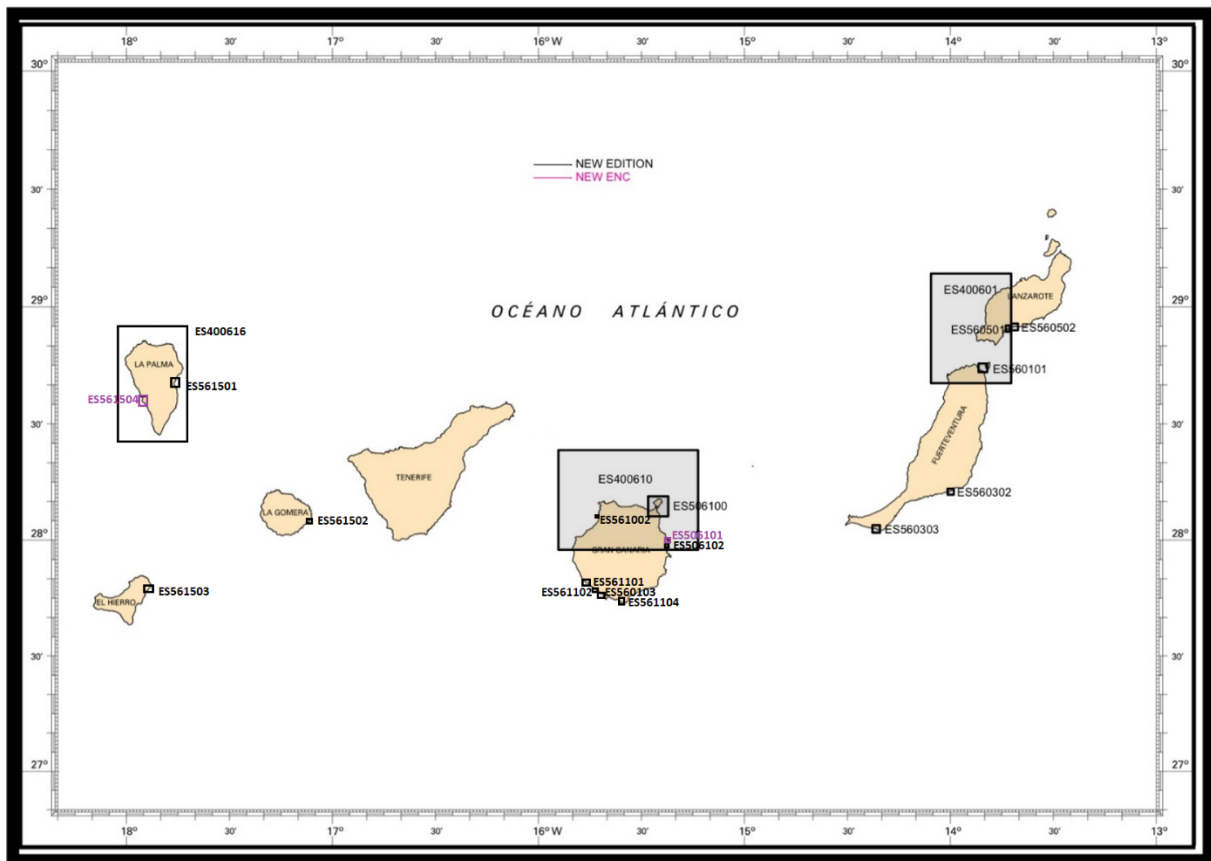


Figure 9. New ENC cells and editions produced in Canary Islands since the last national report (purposes 4 and 5)

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

In cooperation with IC-ENC and PRIMAR RENCs, IHM continues to exchange all the ENC information needed with Portugal (IHPT), France (SHOM) and UK (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 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

Nothing to report.

3.4. INT paper charts

Up to 31 March 2024, within the area of the EAthC, 9 national paper charts have been published, the IHM has produced 5 new editions (NE), 1 new chart (NC) and 3 new editions (NE) produced from charts produced by other Hydrographic Offices.

Table 5 and figures 10 and 11 show these NE and NC.

NUM (INT)	SCALE	TITLE
6100 (INT 1928) NE	1/12 500	Puerto de Las Palmas
4126 (INT 1587) NE	1/10 000	Ría y puerto de A Coruña
4042 (INT 1853) NE	1/10 000	Puerto de Gijón
4052 (INT 1854) NE	1/7 500	Ría de Avilés
3940 (INT 1850) NC	1/12 500	Ría de Bilbao
3941 (INT 1851) NE	1/12 500	Puerto de Bilbao
43C (INT 1817) (NE) Pt.	1/150 000	De cabo de Sines a Lagos
42B (INT 1814) (NE) Pt.	1/150 000	De Aveiro a Peniche
68 (INT 1928) (NE) Pt.	1/350 000	Archipiélago de Madeira

Table 5. INT paper charts published since last national report

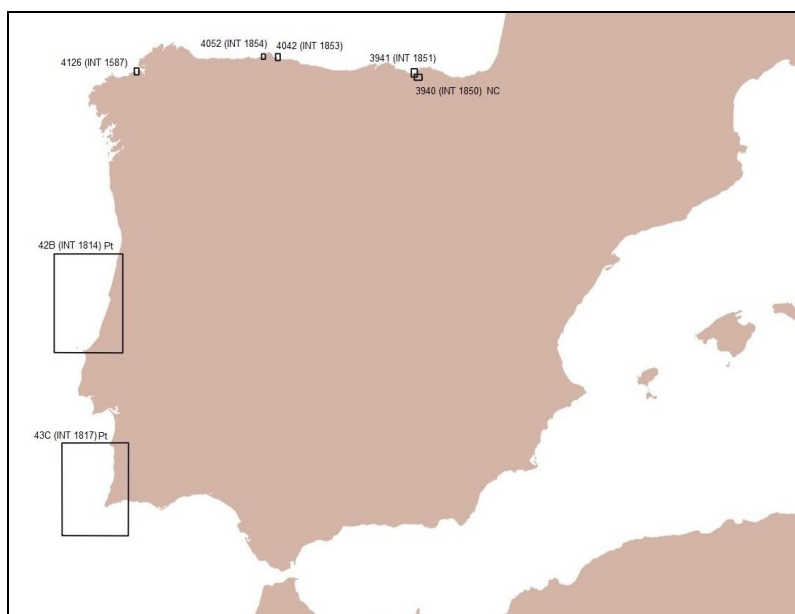


Figure 10. INT paper charts published since last national report (Iberian Peninsula)

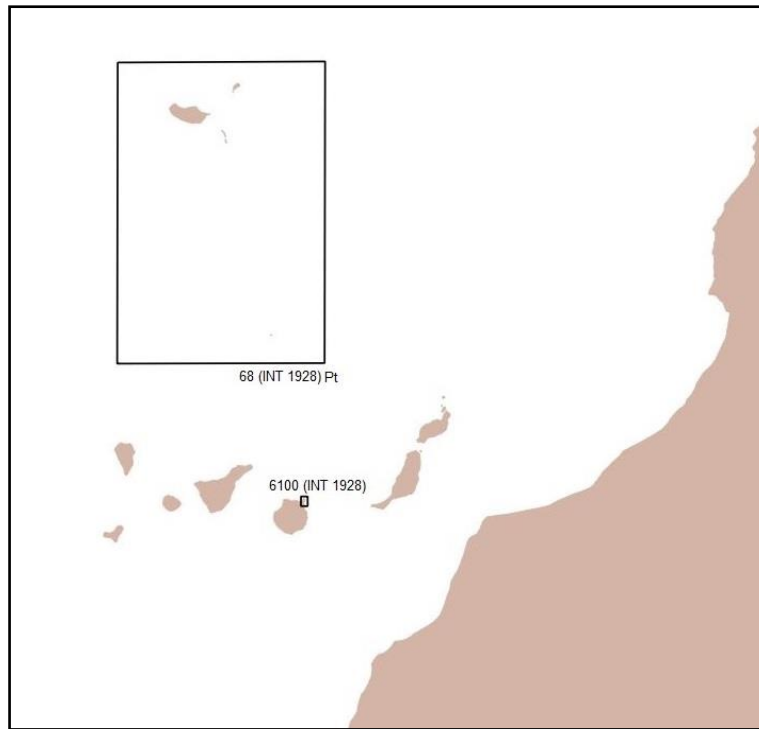


Figure 11. INT paper charts published since last national report (Canary Islands)

3.5. National paper charts

Since last national report within the area of the EAHC, 9 national paper charts have been published. These 9 new editions (NE).

All of them are shown in Table 6 and figures 12 and 13 show these NE.

NUM	SCALE	TITLE
4012 (NE)	1/10 000	Ría de Suances
4082 (NE)	1/20 000	Rías de Viveiro y O Barqueiro
4071 (NE)	1/10 000	Puertos de Ribadeo
3922 (NE)	1/10 000	Ensenada de Deba y puertos de Mutriku y Ondarroa
6102 (NE)	1/5 000	Puerto de Salinetas
4437 (NE)	1/5 000	Arsenal de la Carraca
616 (NE)	1/60 000	Isla de la Palma
6150 (NE)	1/7 500	Puertos de Santa Cruz de La Palma, San Sebastián de La Gomera y La Estaca
4125 (NE)	1/15 000	Rías de ares y Betanzos

Table 6: National paper charts published since the last national report



Figure 12. National paper charts published since the last national report (Iberian Peninsula).

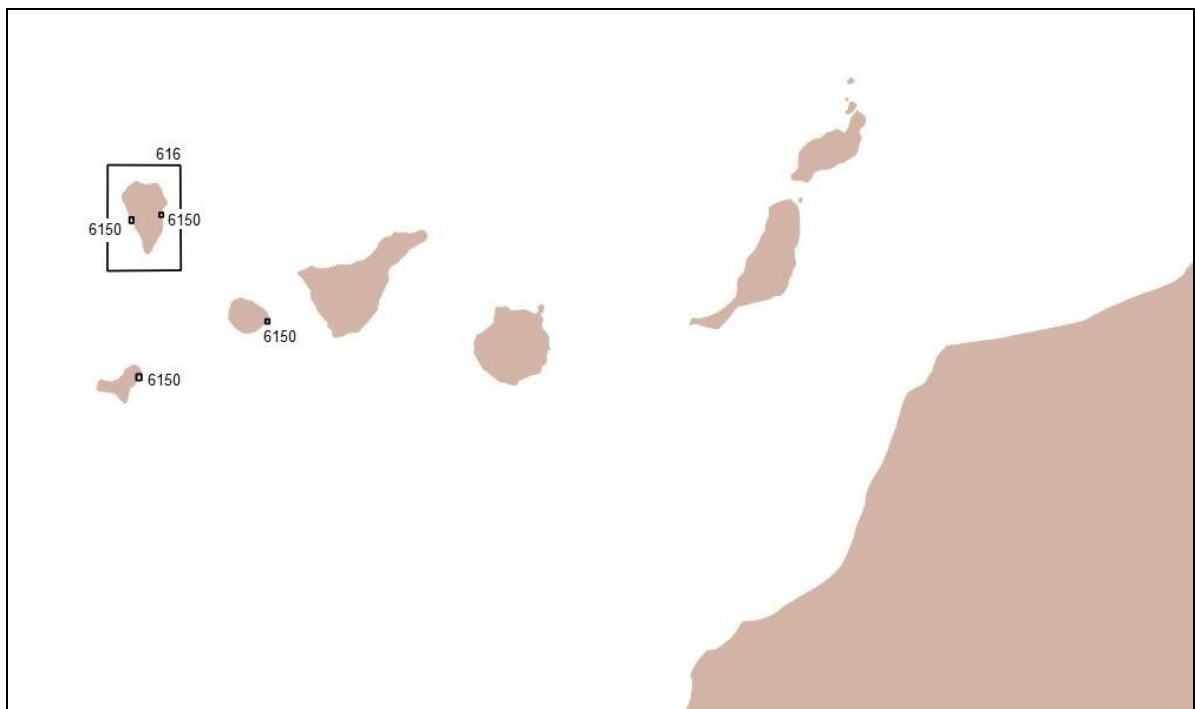


Figure 13. National paper charts published since the last national report (Canary Islands)

3.6. Problems encountered

Even though the Spanish catalogue lists of nautical charts covers part of the western African coast, no systematic surveys have been carried out by IHM in that area for decades, except for ad hoc surveys when vessels transit between the Iberian Peninsula and the Canary Islands. Therefore, no data are available for IHM to publish up-to-date editions of the existing charts.

3.7. Updates INT Catalogue.

During this period, cartographic updating of the INT charts assigned to Spain in the region G has been made, according to the catalogue INTtoGIS.

4 NEW PUBLICATIONS AND UPDATES

4.1 New publications

Nothing to report.

4.2 Updated publications

Translation into Spanish of the following publications:

- IHO S4 Publication, "Regulations of the IHO for International (INT) Charts and Chart Specifications of the IHO", Edition 4.9.0.
- IHO S-44 Publication, "International Hydrographic Organization Standards for Hydrographic Surveys", Edition 6.1.0.

Edition of the Spanish Catalog of Nautical Charts and other publications, 2024



Figure 13. 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”. New edition, 7th edition, 2022.

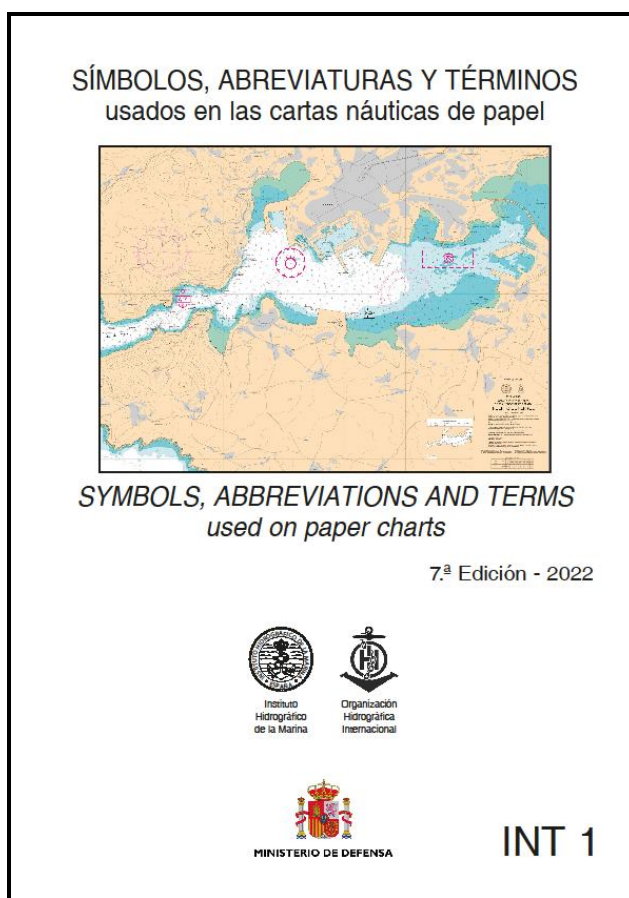


Figure 14. Publication INT 1

Radiosignals, 2023 edition.

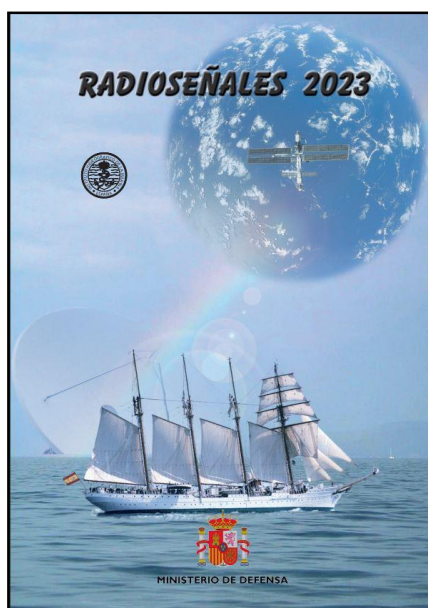


Figure 15. Radiosignals

Maritime signals, 2023 edition.

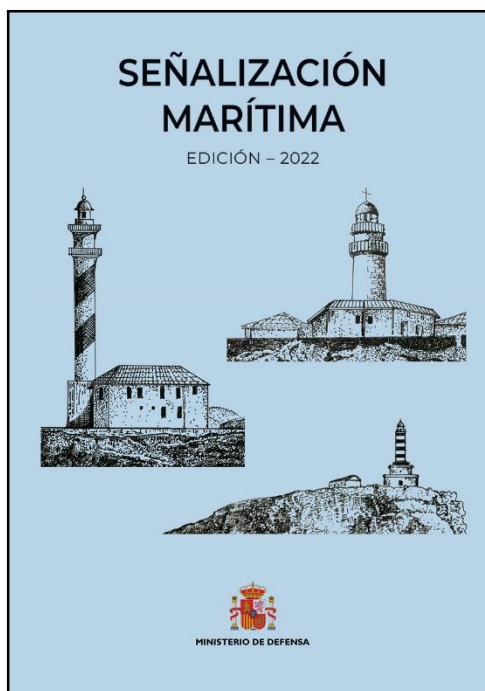


Figure 16. Maritime signals

Sailing Directions:

- Num.1, 2023 edition. North Coast of Spain, stretching from the River Bidasoa to the Ribadeo estuary. (Jun 2023)
- Num.2, 2022 edition. North and Northwest Coast of Spain, from Ría de Ribadeo to Cabo Finisterre. (Dic 2022)
- Num.3, 2023 edition. Northwest Coast of Spain, from Cabo Finisterre to Río Miño. (Dec 2023)
- Num. 5, 2024 edition. Southwest and South Coast of Spain, from Río Guadiana to Cabo Sacratif including the North and South Coasts of Gibraltar Strait. (Jan 2022)
- Num. 6, 2023 edition. South and south-east coast of Spain and the north coast of Africa, from Cape Sacratif to Cape La Nao, the north coast of Morocco and the coast of Algeria to Cape Kramis. (Mar 2023)
- Num. 7, 2024 edition. East Coast of Spain, from Cabo de La Nao to border with France. New edition is scheduled for next April.
- Num. 8, 2023 edition. Balearic Islands and north coast of Africa, comprising the Balearic Islands and the north coast of Algeria from Cape Kramis to the border with Tunisia. (May 23)
- Num. 9, 2023 edition. Northwest Coast of Africa, from Cabo Espartel to Cabo Verde, including Madeira, Selvagens and Cabo Verde Islands. (Oct 2023)
- Num. 10, 2020 edition. Canary Islands. (Oct 2022)

List of Lights:

- Part I, 2024 edition. Coasts of Spain and Portugal on the Atlantic Ocean, Africa West Coast from Cabo Espartel to Cape Verde (Senegal), Azores Islands, Madeira, Canary Islands and Cape Verde.
- Part II, 2024 edition. Gibraltar Strait, Balearic Islands and Mediterranean coasts of Spain, Morocco and Algeria.

4.3. Means of delivery.

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

<https://armada.defensa.gob.es/ArmadaPortal/page/Portal/ArmadaEspannola/cie/nciaihm1/prefLang-es/02ProductosServicios--021librosFaros>

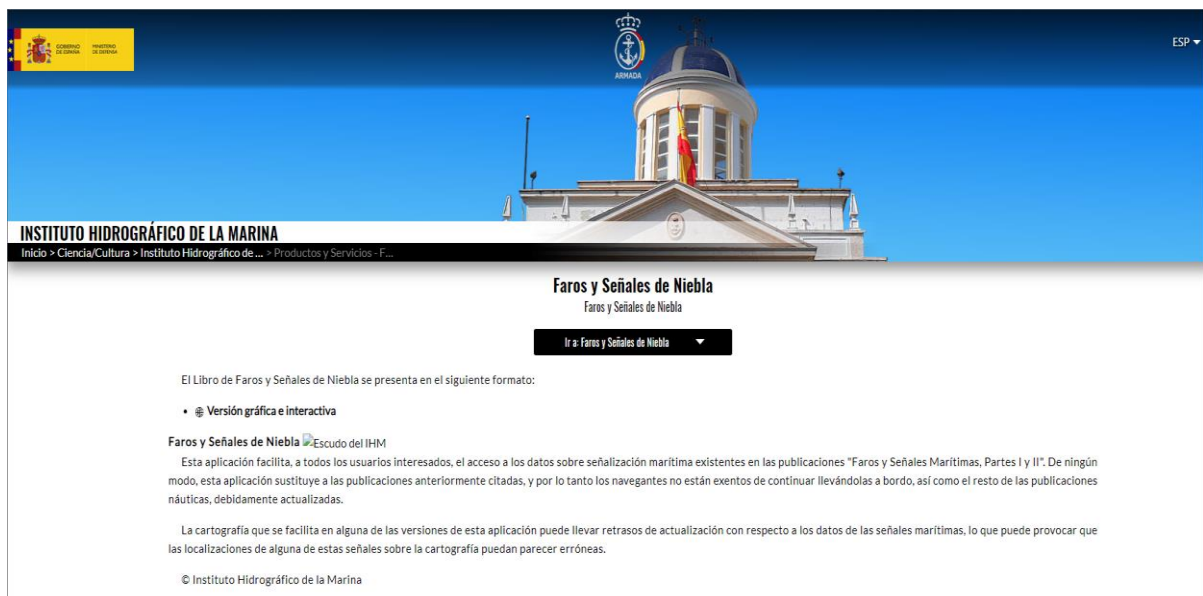


Figure 17. Screenshot of the List of Lights and Fog Signals interactive tool

5. MSI

5.1. Existing Infrastructures for transmission.

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.
- Cabo la Nao [X] English [M] Spanish.

5.1.1 NAVAREA III Coordinator: Spanish Hydrographic Institute (IHM).

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

Portugal and Morocco exchange MSI with SASEMAR to promulgate coastal warnings mainly from Tarifa NAVTEX Station.

Likewise, the INAVAREA III center receives MSI from Morocco, which is passed to SASEMAR to transmit as coastal warning from the NAVTEX stations, or is promulgated by the IHM as NAVAREA warning by SAFETYNET/SAFETYCAST.

On the contrary, Gibraltar authorities has not contacted the NAVAREA III center at any time during this period.

5.1.2. SAR Organization

Coordinator: SASEMAR through its National Centre (CNCS) in Madrid, and 19 Maritime Rescue Coordination Centre (MRCCs) located along the coast line of the Peninsula Iberica, Canary and Balearic Islands.

5.2. New infrastructure in accordance with GMDSS Master Plan

Nothing to report.

5.3. Problems encountered.

Nothing to report.

6. C-55

6.1. Spain. Iberian Peninsula. Charting Region G

6.1.1. Hydrographic Surveying (**LEVANTAMIENTOS**)

Survey coverage:

	A	B	C
Dephts < 200 m	36	64	0
Dephts > 200 m	98	0	2

Where:

A = percentage which is adequately surveyed.

B = percentage which requires re-survey at larger scale or to modern standards.
 C = percentage which has never been systematically surveyed.

6.1.2. Nautical Charting

Status of nautical charting within the limits of the EEZ

Purpose/ scale	A	B	C
Offshore passage/ Small	100	0	100
Landfall and Coastal passage/ Medium	100	0	100
Approches and Ports/ Large	100	0	87

A = percentage covered by INT series, or a paper chart series meeting the standards in S-4.
 B = percentage covered by Raster Navigational Charts (RNCs) meeting the standards in S-61.
 C = percentage covered by ENC's meeting the standards in S-57.

Regarding to ENC large scale coverage is important to notice that current percentage (87%) has been calculated over the new ENC production project, which aims to cover all national main and secondary ports.

6.1.3. Maritime Safety Information (MSI). (NAVEGACION)

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			
SAFETYCAST	X			

6.2. Spain. Canary Islands, Charting Region G

6.2.1. Hydrographic Surveying

	A	B	C
Dephts < 200 m	41	59	0
Dephts > 200 m	93	0	7

A = percentage which is adequately surveyed.

B = percentage which requires re-survey at larger scale or to modern standards.
 C = percentage which has never been systematically surveyed.

6.2.2. Nautical Charting

Status of nautical charting within the limits of the EEZ

Purpose/ scale	A	B	C
Offshore passage/ Small	100	0	100
Landfall and Coastal passage/ Medium	100	0	100
Approaches and Ports/ Large	100	0	95

A = percentage covered by INT series, or a paper chart series meeting the standards in S-4.
 B = percentage covered by Raster Navigational Charts (RNCs) meeting the standards in S-61.
 C = percentage covered by ENC's meeting the standards in S-57.

Regarding to ENC large scale coverage is important to notice that current percentage (95%) has been calculated over the new ENC production project, which aims to cover all national main and secondary ports.

6.2.3. 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 Coordinator
Port Information	X			Port Authorities

GMDSS IMPLEMENTATION (IMO Publication 970–GMDSS Manual)

SERVICE	Yes	No	Partial	Notes
Master Plan	X			
Area A1	X			Via SASEMAR
Area A2	X			Via SASEMAR
Area A3	X			Via NAVAREA Coordinator
NAVTEX	X			Via SASEMAR
SafetyNET	X			Via NAVAREA Coordinator
SAFETYCAST	X			Via NAVAREA Coordinator

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.

In 2019, the Specialization Program in Hydrography & Oceanography for Naval Officers (Category A) was presented and defended to the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC), getting its recognition. The program is currently being revised for improving its quality in order to renew the category A recognition in 2025.

In 2020 the Specialization Program in Hydrography & Oceanography for Naval Petty Officers (Category B) was presented and defended to the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC), getting its recognition. The program is also being revised for improving its quality in order to renew the category B recognition in 2026.

The virtual portal, as a supporting knowledge center for students including a repository for teaching documents, regulations, procedures, relevant links and various learning resources was implemented. The learning platform MOODLE is also used for both online training and complementing classroom courses, as it can be used as a basic repository of student resources and as a network learning environment for students to interact, access content and complete tasks, monitoring their full performance online and in the classroom.

The list of students who have attended these courses in the last two academic years is as follows:

Academic year	Category A course	Category B course
2022-2023	3 Officers from Spanish Navy 1 Officer from Argentina 1 Officer from Tunisia 1 Officer from Perú 1 Officer from Dominican Rep.	4 Petty Officers from Spanish Navy
2023-2024	3 Officers from Spanish Navy 1 Officer from Argentina 1 Officer from Uruguay	4 Petty Officers from Spanish Navy

Nowadays, all the students who take the above mentioned courses are military staff. Non-Spanish military students' attendance is offered through a Collaboration Agreement (Collaboration Program with Foreign Countries regarding Military Training) signed between the Spanish Ministry of Defense and other countries. This agreement provides grants/ scholarships for students' attendance to the above mentioned courses. The point of contact for these matters is generally the Defense Attaché to the corresponding Spanish Embassy.

7.2. Training received, needed, offered

Apart from the training received by Spanish Navy officers and petty officers in the courses reflected in paragraph 7.1 above, several Spanish officers have accomplished Master degrees:

- Master's degree in Cartographic Geotechnologies, Engineering and Architecture (University of Salamanca) from September 2021 to July 2022.

- Global Master in Affairs Audiences: Lobby, Corporate Diplomacy and Intelligence Analysis (IMF Smart Education), from September 2022 to October 2023.

Currently one officer is studying a Master's Degree in Data Analysis Engineering, Process, Improvement and Decision Making at the Politechnical University from Valencia, from September 2023 to October 2024.

7.3. Definition of proposals and requests to the IHO CBSC.

Specialization course in Hydrography & Oceanography for Naval officers (Category A) and petty officers (Category B):

As indicated in point 7.1 above, the attendance of non-Spanish students is offered through a collaboration agreement with regard to military training, signed between the Spanish Ministry of Defence and other countries, through The Collaboration Program with Foreign Countries regarding Military Training. This agreement provides grants/scholarships for the attendance to the above-mentioned courses. The point of contact for these matters is the Defence Attaché to the corresponding Spanish Embassy.

7.4. Status of national, bilateral, multilateral or regional development projects with hydrographic component.

IHM has an updated bilateral agreement with France signed in 2006 in Brest and published in Spanish Official Bulletin in 2016.

IHM has an International Administrative Agreement with United Kingdom Hydrographic Office, signed in 2022.

IHM is in the final signature process for the bilateral agreement with the Portuguese Hydrographic Office. It's expected to sign it the short term.

8. OCEANOGRAPHIC ACTIVITIES

8.1. General

The IHM continues with the development of an Internet access web page that includes tide gauge information from national ports in order to facilitate its exploitation from the Internet.

The installation of permanent tide stations at locations that will improve the current coverage of the national tide gauge network is almost completed. The data obtained are already being shared with other national tidal agencies that also have their own permanent tide gauges.

8.2. GEBCO/IBC's activities

IHM has been part of the EMODnet Project from 2013 to June 2016. Therefore, GEBCO grid is currently making use of IHM data, from this project.

Moreover, IHM is collaborating in SEABED 2030 and GEBCO projects, providing data collected from Spanish Navy Schoolship «Juan Sebastian de Elcano» during her training cruises through Atlantic and Pacific Ocean.

8.3. Tide gauge network

There is a network of IHM tide gauges throughout Spain with more than 25 sensors distributed along the coast. Another 15 are planned to be installed this year.

8.4. New equipment

This year IHM has built an oceanographic buoy that have been anchored in Antarctica with the capacity to provide real time sea level data.



Figure 18. Bouy for measuring sea level in real time

IHM has also acquired a sensor to measure water depth, which is towed by the RPAS. Its purpose is to be able to work in areas inaccessible for any vessel.



Figure 19. RPAS towing sensor

8.5. Problems encountered

Nothing to report.

9. OTHER ACTIVITIES

9.1. Participation in IHO Working Groups

IHM takes part in the following Hydrographic Commissions:

- Hydrographic Commission on Antarctica (HCA)
- East Atlantic Hydrographic Commission (EAthC)
- Mediterranean and Black Sea Hydrographic Commission (MBSHC), acting as NAVAREA III Coordinator and leaving the chairmanship on 1 April 2022.
- Meso-American and Caribbean Sea Hydrographic Commission (MACHC), as Observer.
- South West Atlantic HC (SWAtHC), as Observer.
- South East Pacific Regional Hydrographic Commission (SEPRHC)

And in a wide variety of working groups:

- Hydrographic Services and Standards Committee (HSSC)
- ENC Standards Maintenance Working Group (ENC-WG)
- Worldwide ENC Database Working Group (WENDWG)
- S-100 Working Group (S-100 WG)
- S-100 Project Team (S-100 PT)
- Hydrographic Surveys Working Group (HSWG).
- Nautical Information Provision Working Group (NIPWG)
- Nautical Cartography Working Group (NCWG)
- Tidal and Water Level Working Group (TWLWG)
- World-Wide Navigational Warning Service Sub-Committee (WWNWS)
- Inter-Regional Coordination Committee (IRCC)
- Marine Spatial Data Infrastructure Working Group (MSDIWG)
- Capacity building subcommittee (CBSC).

It is important to highlight that IHM also takes part in the following NATO working groups:

- Geospatial Maritime Working Group (GMWG).
- Geospatial Maritime Working Group Technical Panel (GMWG TP)
- Defence Maritime Geospatial Exchange Model (DMGEM).
- AML NATO Co-Production Program (NACPP) (Additional Military Layers).
- Military Oceanography Working Group (MILOC).
- ACO Meteorological and Oceanographical Conference with cooperative partners (AMC+CP)
- IC –ENC Technical Panel (IC-ENC TP)

9.2. Meteorological data collection

IHM collects meteorological data from two weather stations deployed in different military facilities. Additionally, IHM has three automatic tide gauge stations installed with meteorological sensors, also with internet access to data.

9.3. Geospatial studies

The project to develop a Hydrographic Vertical Reference Surface along the Spanish Coast using ellipsoidal heights is underway. To achieve this goal, the ellipsoidal heights of all the Spanish tide gauges are being measured. In addition, two new pieces of equipment have been built to measure the ellipsoidal height in different places and increase our reference stations, the DeepMotion GNSS_INS device, to be deployed on a buoy in the sea, and the referenced DeepWaves GNSS acoustic tide gauge to be deployed on a fixed station along the coastline of the coast.

IHM has acquired seventeen DeepMotion and seven DeepWaves to augment the grid of ellipsoidal heights, not only along the coast, but also in the sea.

The new Hydrographic Vertical Reference Surface has been modeled from:

- Ellipsoidal height data of Lowest Astronomical Tide (LAT) of each tide gauge deployed along the Spanish coasts.
- Tidal height data using coastal oceanic buoys.
- Oceanic satellite altimetry data.
- Geoid model data (EGM08).

9.4. Disaster prevention

IHM has just reported its Disaster Responder Framework for this commission.

9.5. Environmental protection

Naval Support continues developing R&D projects such as SIAAMETOC regarding with Environmental Support.

Also, it has been acquired meteorological and oceanographic buoys which permits to collect information and validate numerical models near the coast for naval operations and bathymetric surveys.

Furthermore, IHM continues supporting military naval deployments globally with METOC officers and telematically.

IHM continues providing information to military units of Spanish Navy regarding to risk and procedures to assure the security of natural species and their habitats.

9.6. Astronomical observations

Nothing to report.

9.7. Magnetic/Gravity surveys

Nothing to report.

9.8. MSDI Progress

IHM is a participant in the working group on Infrastructure of Spanish Spatial Data (*GT-IDEE*) and in the Board of the Spanish Geographic Information Infrastructure (*Consejo Directivo de la Infraestructura de Información Geográfica de España – CODIIGE*), 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 Spanish Spatial data infrastructure (<http://www.idee.es>), which constitutes the MSDI.

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

<http://centrodedescargas.cnig.es/CentroDescargas/index.jsp>

IHM has developed and improved its own SDI (IdeIHM), with the purpose of giving an answer to the increasing demand of users to have access to nautical information. A new portal design and web viewer can be found at:

<http://ideihm.covam.es/index1.html>

This SDI offers the following services available in:

<https://ideihm.covam.es/servicios.html>

Nautical Chart WMS Services.

These services provide access to some geographical information, which is included in the IHM official nautical cartography. Data are selected from Electronical Nautical Charts (ENC) already produced by 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 provides capability 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 provides capability of Catalog and the metadata files search, 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 provides capability to display and download the straight territorial sea baseline (LBR in Spanish language).

WMS/WFS for Maritime boundaries.

This service provides capability to display and download the maritime limits as national territorial waters, contiguous zone, continental platform and exclusive economic zone.

WMS/WFS for IHM nautical chart catalogue scheme.

This service provides capability to display and download the Spanish IHM nautical chart catalogue scheme, both for paper nautical chart and Electronic Nautical Chart (ENC).

WMS/WFS for military maritime practice areas.

This service provides capability to display and download the scheme with the assigned areas for military training (amphibious, aerial, surface and submarine areas).

WMS/WFS for List of Lights and Fog Signals.

This service provides capability to display, download and access to the data on maritime signalling existing in the publications "List of Lights and Maritime Signals, Parts I and II".

Application Programming Interface (API) for prediction of tidal data.

This service provides access to the Tidal Prediction Tables, published by IHM. This API is intended to offer users the possibility of importing data from IHM publication to their web pages and documents through an automatized licensing process. The service permits, in an intuitive manner, to build up the URL, step by step, to get the final data.

URL: <https://ideihm.covam.es/apimareas>

Mobile application with nautical information

It has been developed an application for electronic devices (for Android system and IOS) with access to the IHM WMS services, tidal prediction, nautical chart catalogue, maritime signals and notices to mariners.