SPAIN

NATIONAL REPORT

TO THE 17th MEETING OF THE EASTERN ATLANTIC HYDROGRAPHIC COMMISSION

(EAtHC)

Mindelo, CABO VERDE

28 – 30 September 2022

1 HYDROGRAPHIC SERVICE:

Instituto Hidrográfico de la Marina, Spanish Hydrography Office (IHM), did not have significant organization changes since last EAtHC 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 October 2021 up to September 2022.

2 SURVEYS:

2.1 Coverage of new surveys.

In the last year and for the purpose of updating the bathymetry of our national nautical chart scheme in the Atlantic Ocean, IHM conducted 13 surveys in this area with the ships and small boats of the Hydrographic Fleet. More specifically, one survey was performed in the Gulf of Cadiz (Huelva Port), eight in Canary Island (three of them in the West, specifically in La Palma Island, El Hierro Island and La Gomera Island, and the other five in Grand Canary Island), five in Gran Canary Island, and four in the Cantabrian Sea.

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) 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.

Figure 2. LHT Escandallo

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

Survey planning

IHM surveys were conducted in accordance with the current IHO standards (IHO S-44 6.0.0th 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 last year, 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), model "Otter Pro" equipped with an* EM 2040 portable and Seapath 130 OEM.

Figure 4. Unmanned Surface Vehicle VERIL 01[1].

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.

[1] *VERIL: Vehículo de Exploración Robótico Integrado Ligero; initials in Spanish language.*

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.

- *Remotely Pilot Aircraft System (RPAS).*

The IHM has also acquired in a 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.

Figure 5. RPAS and devices.

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 operational use of these new means is expected to begin in hydrographic surveys and expeditionary missions in the second quarter of 2022 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. The submitted proposal was approved. 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 cover from the coastline to deep waters.

3. NEW CHARTS & UPDATES.

3.1. ENCs

3.1.1 Production

Up to 1 August 2022, IHM has produced 31 ENCs within the area of the EAtHC (out of a total of 136 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
0	4	5	22	0

Table 1. Distribution of ENC production in the EAtHC area

EAtHC ENC Production until August 01, 2022					
Purpose	**Total**	**Published**	**Pending**	**% Published**	**% Pending**
2	3	3	0	100%	0%
3	11	11	0	100%	0%
4	38	38	0	100%	0%
5	97	83	14	85,5%	14,5%
6	14	1	13	7%	93%
Total	**162**	**136**	**29**	**82,7%**	**17,3%**

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

Since the last national report (1st August 2021) for de last meeting (29th September 2021) 2 new ENCs and 29 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 ENCs.

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

NEW EDITIONS FROM 01/08/2021 TO 01/08/2022		
NUMBER	**TITLE**	**ED.**
ES504430	Puertos de Cádiz	7
ES504431	Puertos de Rota, Base Naval y El Puerto de Santa María	8
ES504450	Puerto de Tarifa	7
ES504431	Puertos de Rota, Base Naval y El Puerto de Santa María	8
ES30041A	De Punta de Estaca de Bares a Cabo Finisterre	5
ES400404	Aproches de Gijón	6
ES400613	Aproches de Granadilla	3
ES540402	Puerto de Luanco	2
ES544381	Caño de Santi-Petri	2
ES504141	Ría de Camariñas	2
ES400618	Aproches de la isla de El Hierro	2
ES539411	Puerto de Bilbao	4
ES540611	Puerto de Luarca	2
ES540612	Puerto de Navia	2
ES30039A	De San Sebastián a Santoña	2
ES400611	Isla de Gran Canarias. Zona Sur.	2
ES30044B	Bahía de Cádiz y Ensenada de Huelva	9
ES504441	Puerto de Bárbate	3
ES30041B	De Cabo Finisterre a río Miño	4
ES400417	Aproches de A Guarda	3
ES504021	Puerto de San Vicente de la Barquera	3
ES504122	Ría de Ferrol	5
ES504123	Puerto de Ferrol	6
ES504125	Ría de Ares y Betanzos	3
ES504126	Puerto de La Coruña	6
ES503921	Puerto de Cetaria y Zumaia	3
ES504011	Puerto de Santander	8
ES504411	Puerto de Huelva	6
ES560301	Puerto del Rosario	3

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

NEW ENC's FROM 01/08/2021 TO 01/08/2022		
NUMBER	**TITLE**	**ED.**
ES504031	Puerto de Ribadesella	1
ES506131	Puerto de Granadilla	1

Table 4. New ENC cells produced since the last national report

Next figures show the new ENC cells and editions within the EAtHC published since the date of the last national report. (1st August 2021).

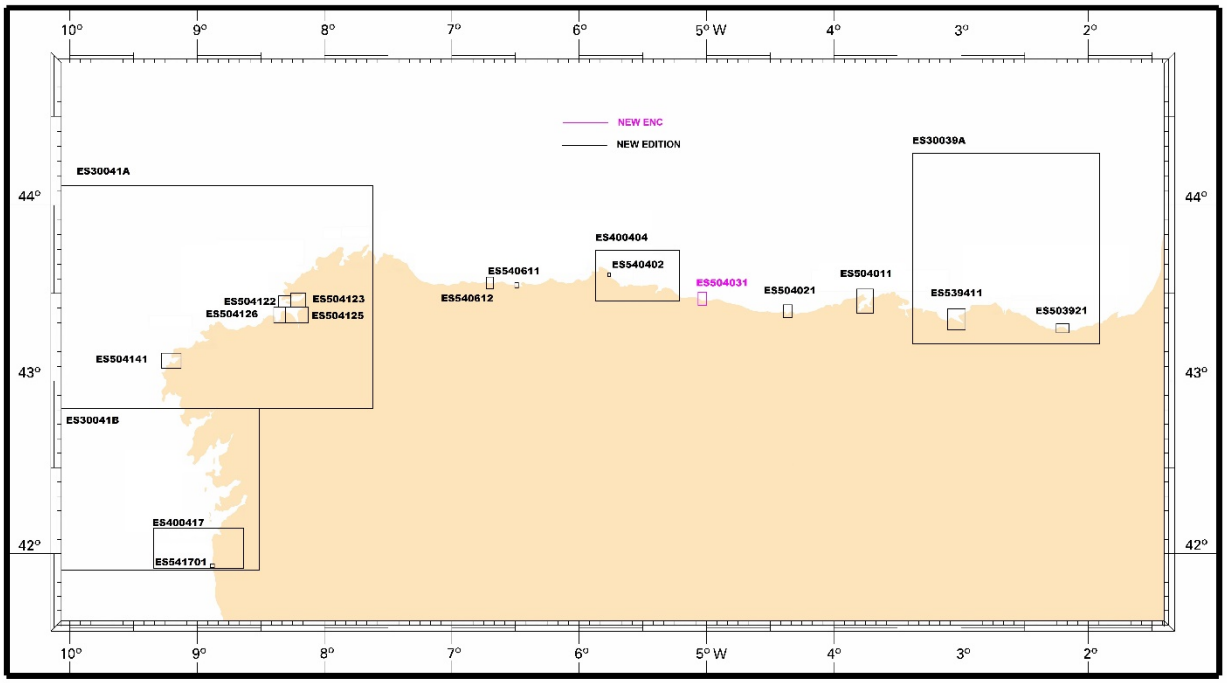

Figure 6. New ENC cells and editions produced in North of Spain since the last national report (purposes 3, 4 and 5)

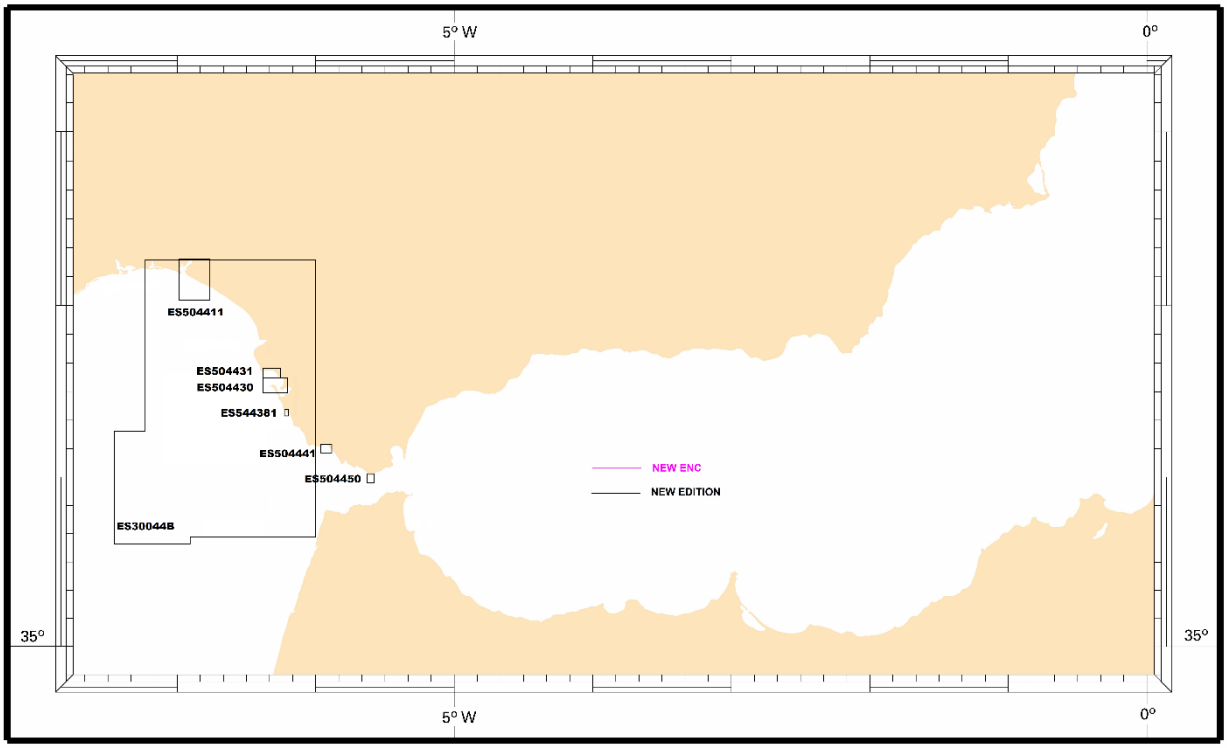

Figure 7. New ENC cells and editions produced in Gulf of Cádiz since the last national report (purposes 3 and 5)

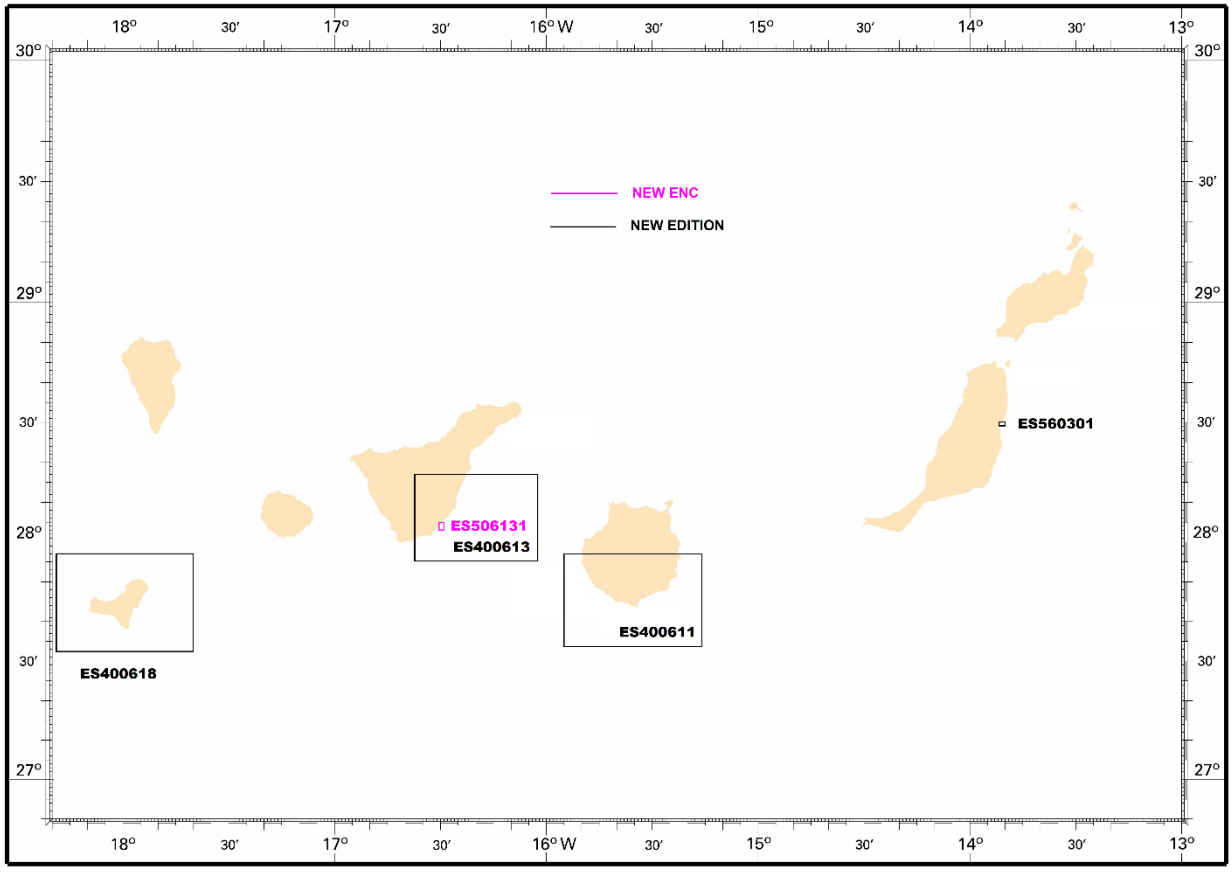

Figure 8. New ENC cells and editions produced in Canary Islands since the last national report (purposes 4 and 5)

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

Under the cooperation with the 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 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

Up to 1st August 2022, the IHM has produced 2 new editions (NE) of INT paper charts within the area of the EAtHC (out of a total of 5 published for all areas). Table 5 and figures 9 show these NE.

NUM (INT)	SCALE	TITLE
4122 (INT 1855) (NE)	1/10 000	Puerto Exterior y acceso a la ría de Ferrol
4011 (INT 1852) (NE)	1/15 000	Puerto de Santander

Table 5. INT paper charts published since the last national report

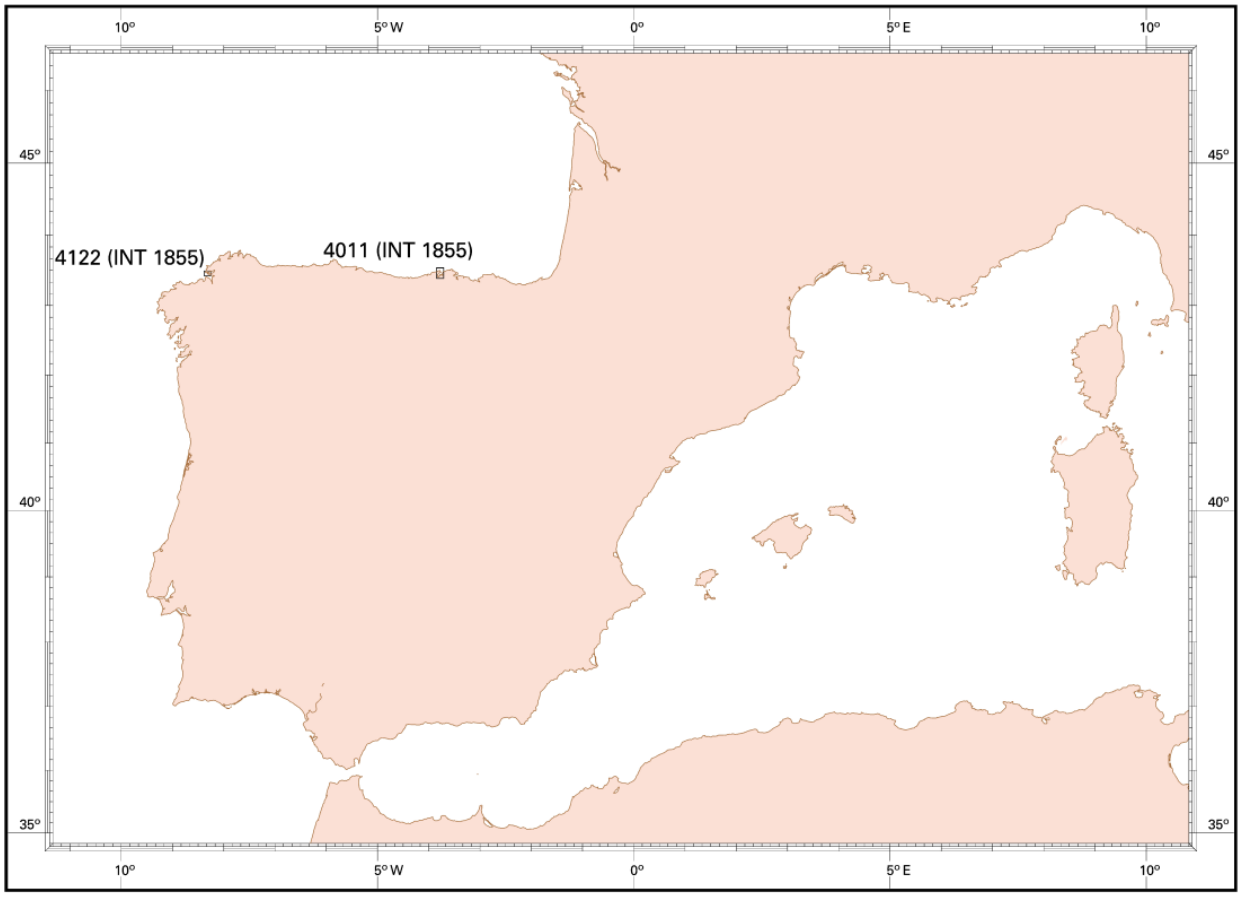

Figure 9. INT paper charts published since the last national report (Iberian Peninsula)

3.5. National paper charts

Since the last national report (1st August 2021) within the area of the EAtHC, 4 national paper charts have been published. These 3 new editions (NE) and 1 new chart (NC) are either produced from national data or adopted from charts produced by other Hydrographic Offices. All of them are shown in Table 6 and figures 10 and 11 show these NE and NC

NUM	SCALE	TITLE
4438 (NE)	1/5 000	Barra de Sancti-Petri
6131 (NC)	1/7 500	Puerto de Granadilla
4171 (NC)	1/10 000	Puertos de A Guarda y A Pasaxe
3921 (NE)	1/10 000	Puertos de Getaria y Zumaia.

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

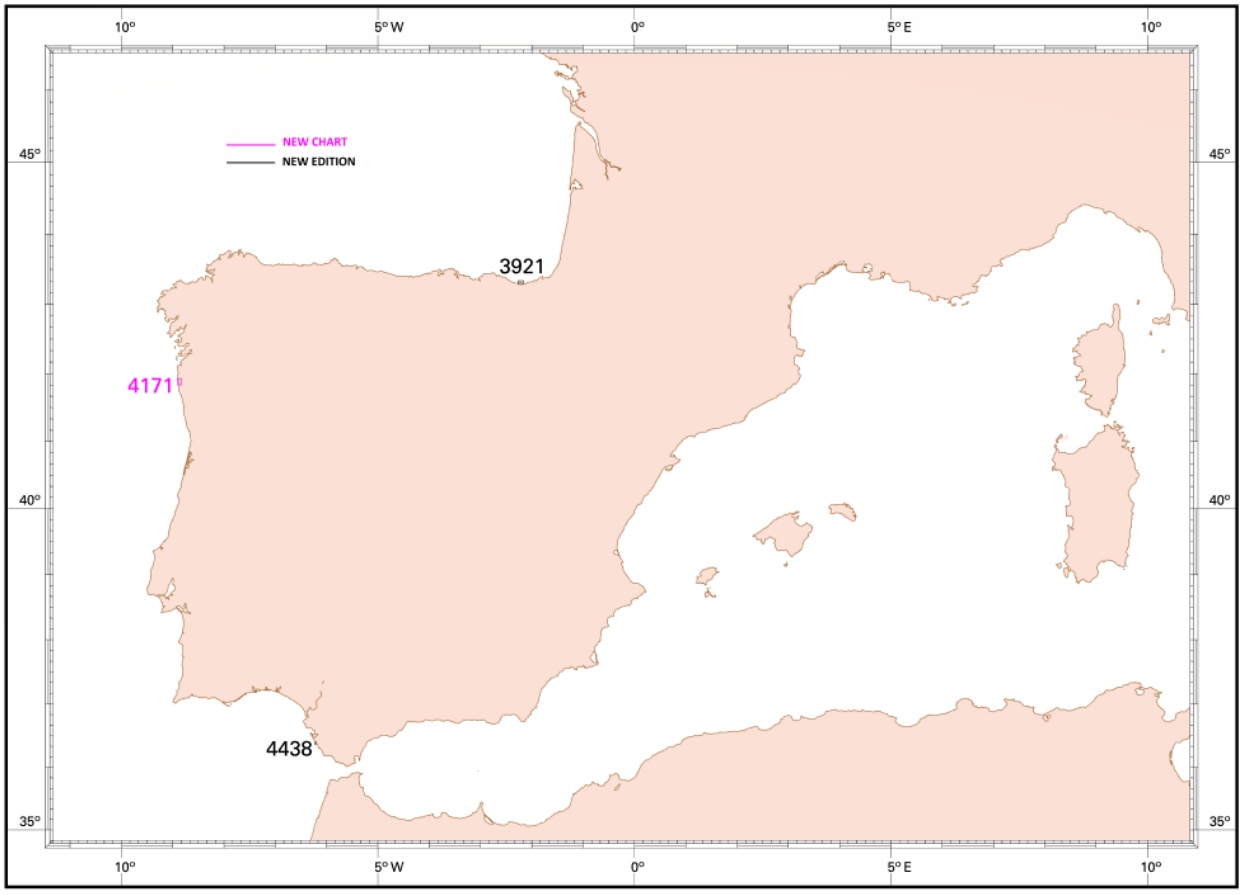

Figure 10. National paper charts published since the last national report (Iberian Peninsula).

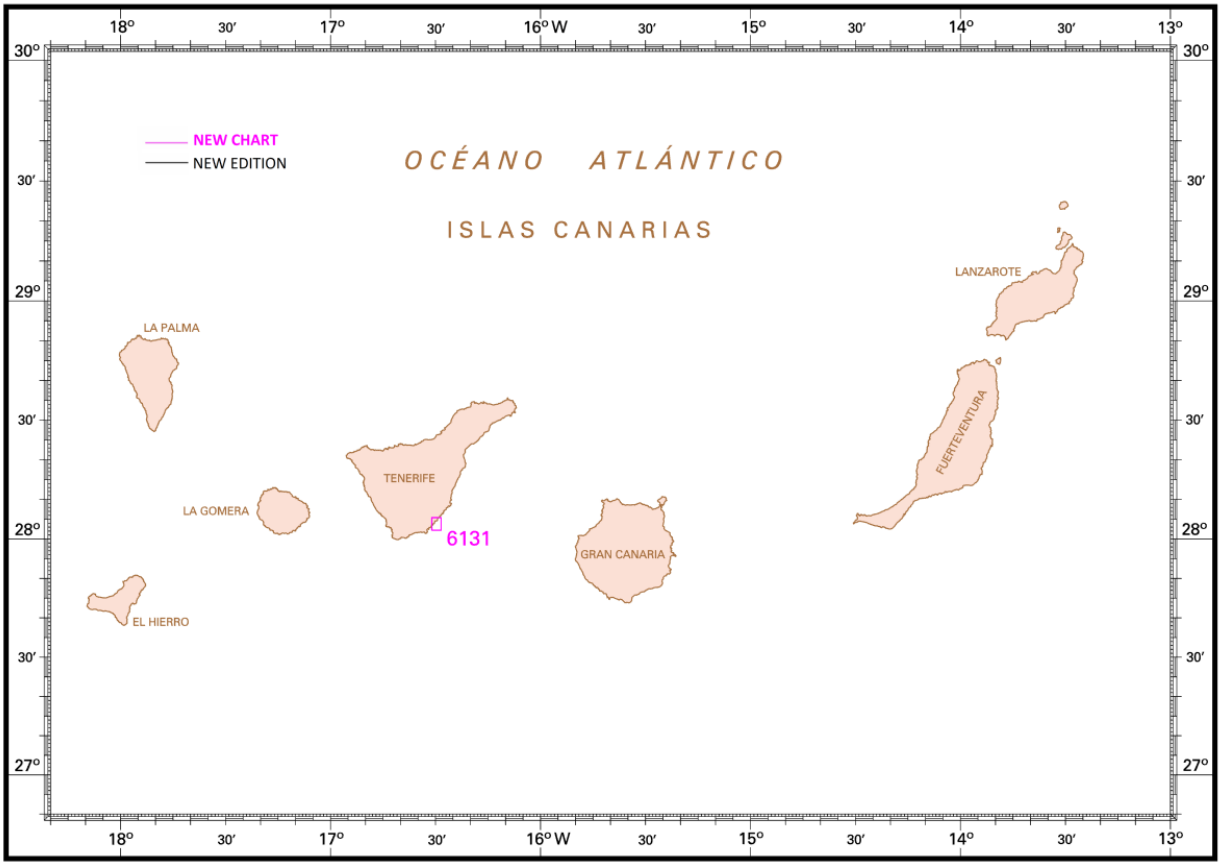

Figure 11. National paper charts published since the last national report (Canary Islands)

In April 2022, the Portuguese nautical chart number 26409 and the Spanish nautical chart 4171 were published, both corresponding to the area of the mouth of the Miño River. This is the second joint project of its kind carried out by both countries.

3.6. Problems encountered

Even though the Spanish catalogue lists nautical charts covering part of the western African coast, no systematic surveys have been carried out by IHM in that area for decades, except for soundings of opportunity 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, it has been made cartographic updating of the INT charts assigned to Spain in the region G, according to the catalogue INToGIS.

4 NEW PUBLICATIONS AND UPDATES

4.1 New publications

NTR.

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, 2022, editions.

Figure 12. 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) planned before the end of this year.

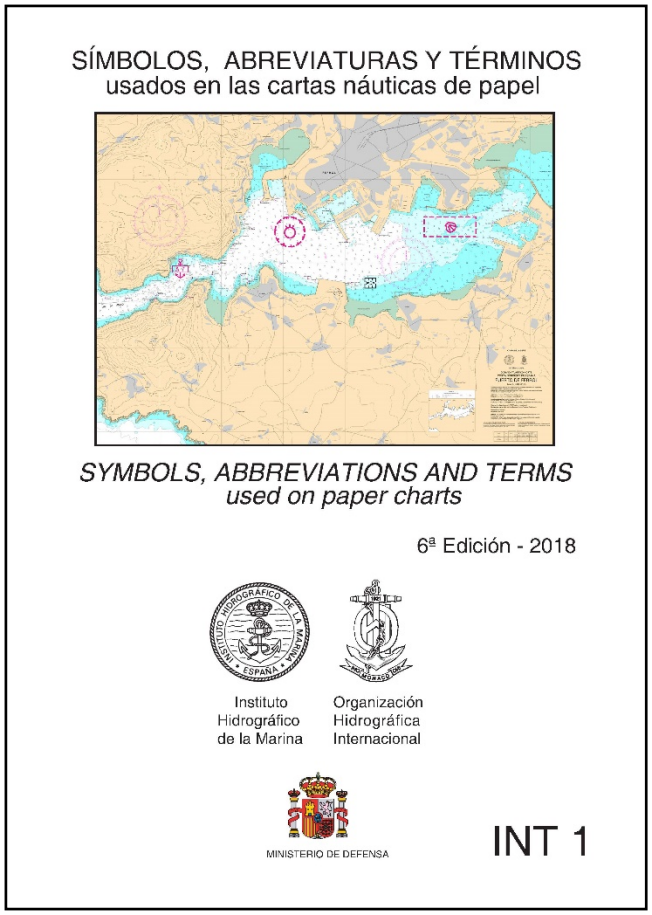

Figure 13. Publication INT 1

Radiosignals, 2021 edition. New edition is scheduled for September

Sailing Directions:

- Num. 2, 2020 edition. North and Northwest Coast of Spain, from Ría de Ribadeo to Cabo Finisterre. New edition is scheduled for next November.
- Num.3, 2021 edition. Northwest Coast of Spain, from Cabo Finisterre to Rio Miño. (Dec 2021)
- Num.4, 2022 edition. Coast of Portugal and Açores Islands. (May 2022)
- Num. 5, 2022 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. 7, 2022 edition. East Coast of Spain, from Cabo de La Nao to border with France. (Mar 2022)
- Num. 9, 2021 edition. Northwest Coast of Africa, from Cabo Espartel to Cabo Verde, including Madeira, Selvagens and Cabo Verde Islands. (Oct 2021)
- Num. 10, 2020 edition. Canary Islands. New edition is scheduled for next September

List of Lights:

- Part I, 2022 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, 2022 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**:**

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

Figure 15. 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.

NAVAREA III Coordinator: Spanish Hydrographic Institute (IHM).

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

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

Likewise, the IHM 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.

5.1.1. SAR Organisation

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

5.2. New infrastructure in accordance with GMDSS Master Plan

NTR.

5.3. Problems encountered.

NTR.

6. C-55

6.1. Spain. Iberian Peninsula. Charting Region G

6.1.1. Hydrographic Surveying

Survey coverage:

	A	B	C
Dephts < 200 m	78	22	0
Dephts > 200 m	92	0	8

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 ENCs 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).

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			

6.2. Spain. Canary Islands, Charting Region G

6.2.1. Hydrographic Surveying

	A	B	C
Dephts < 200 m	43	57	0
Dephts > 200 m	85	0	15

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 ENCs 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 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.

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.

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 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
2021-2022	2 Officers from Spanish Navy 1 Officer from Argentina 1 Officer from Tunisia	3 Petty Officers from Spanish Navy
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

Nowadays, all the students who take the aforementioned courses are military staff. Non-Spanish military students' attendance is also 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.

- Master in Oceanography (University of Cádiz), from September 2020 to July 2021.

It is predicted to continue sending Spanish officers to perform Masters Degrees, in accordance with IHM needs.

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 though 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 and published in Spanish Official Bulletin in 2016.

IHM is in the final signature process for the bilateral agreement with the United Kingdom Hydrographic Office. Furthermore, IHM is working in a bilateral agreement with the Portuguese Hydrographic Office to sign it in a short period of time.

8. OCEANOGRAPHIC ACTIVITIES

8.1. General

IHM has developed an internet access website that includes tidal information of national ports in order to facilitate its exploitation from the Internet. This web page is being continuously improved and it´s not a substitute of Tide Tables. Development of Tides web information has to be improved in order to include historical data as well as metadata.

Installation of permanent tide stations in locations that will improve the current coverage of the national tide gauge network is still in process. Once deployed, it is to share your data with other national bodies studying the tide, and 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 has collaborated in SEABED 2030 and GEBCO projects, providing data from Research vessel Hesperides and Sarmiento de Gamboa in 2021. These data are from Atlantic Ocean and Antarctic waters.

8.3. Tide gauge network

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

8.4. New equipment

We´re modernizing our own tide gauges, which already incorporate GNSS information. Work is underway to integrate all our tide gauges with the ability to transmit data in real time.

8.5. Problems encountered

NTR

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.

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).
- IHO-EU Network Working Group (IENWG)

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 Pannel (GMWG TP)
- Defence Maritime Geospatial Exchange Model (DMGEM).
- AML NATO Co-Production Program (NACPP) (Additional Military Layers).
- Military Oceanography Working Group (MILOC).
- IC –ENC Technical Panel (IC-ENC TP)

9.2. Meteorological data collection

We currently have two weather station deployed. One of them in the Arsenal of Ferrol and the other one in training camp Sierra Retín, with internet access to data.

Additionally, we have 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 at 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, as a MBSHC Chair, proposed the adoption of a disaster response framework (DRF) for the region. It was adopted by the plenary (23MBSHC) and an action was created to fill a file with basic information of each Member State for DRF.

9.5. Environmental protection

IHM continues feeding a database of whale watching with the information received from Navy ships.

IHM recommends noise policies to avoid risk to mammals in the areas of scientific studies where transmissions are made.

9.6. Astronomical observations

NTR

9.7. Magnetic/Gravity surveys

NTR

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 a mobile application (for Android system and IOS) with access to the IHM WMS services, tidal prediction, nautical chart catalogue, maritime signals and notices to mariners.