INTERNATIONAL HYDROGRAPHIC ORGANIZATION

México

National Report

21th Meso-American and Caribbean Sea Hydrographic Commission (MACHC)

Secretaría de Marina
Dirección General Adjunta de Oceanografía, Hidrografía y Meteorología
https://digaohm.semar.gob.mx/

1. HYDROGRAPHIC OFFICE/SERVICE

The Government of Mexico has given the attribution to conduct hydrographic surveys and produce nautical charts and related nautical publications of Mexico to the Marine Secretariat. To comply with those attributions the Marine Secretariat has account with the Joint General Directorate of Oceanography, Hydrography and Meteorology (DIGAOHM)

This National Report provides specific information pertaining to individual products and services of primary interest to the MesoAmerican – Caribbean Sea Hydrographic Commission (MACHC) Region.

1.1 Government Agencies with hydrographic responsibilities in the MACHC Region

The Mexico **Marine Secretariat** carries out hydrographic surveys on the coasts, islands, ports and inland waterways of the country and compiles necessary and adequate information to prepare, and keep updated the national nautical cartography and publications, so that they are disseminated in a timely manner to guarantee the safety to navigation and contribute to the safeguarding of human life at sea, protection of the marine environment and promotion of national maritime development.

Hydrographic surveys are carried out, appropriate to the navigation safety requirements in order to prepare and publish nautical charts, paths, tide tables and other nautical publications to meet the needs of navigation safety, as well as disseminate notices to mariners in order to avoid dangers and to keep nautical charts and publications updated as much as possible.

The DIGAOHM is responsible for hydrographic surveys on designated federal waterways and inland rivers, and produces México ENCs

2. SURVEYS

The Mexican Navy carries out an Annual Hydrographic Survey Program according to the Mexican State needs and priorities, in order to provide ports with safe navigation and boost maritime trade. The Annual Hydrographic Survey Program prioritize the areas where hydrographic information is more needed accounting for the port importance, maritime traffic routes, age of the chart, changes on the maritime port infrastructure and the hydrographic coverage.

Hydrographic Surveys are conducted by the hydrographic teams and platforms using diverse sonar equipment from single beam to multibeam echosounders, according to the IHO standards, and the requirement to have a complete search of the sea bottom.

2.1 Coverage of new surveys.

During 2020 the following hydrographic surveys were performed:

2.1.1 Lazaro Cardenas, Survey.

In May 2020, the “P-MIC-2020-51100” hydrographic survey was completed, in order to obtain hydrographic information for the nautical chart MX 51100. The survey was carried out with Hydrographic Vessel ARM Tecolutla BI-08.

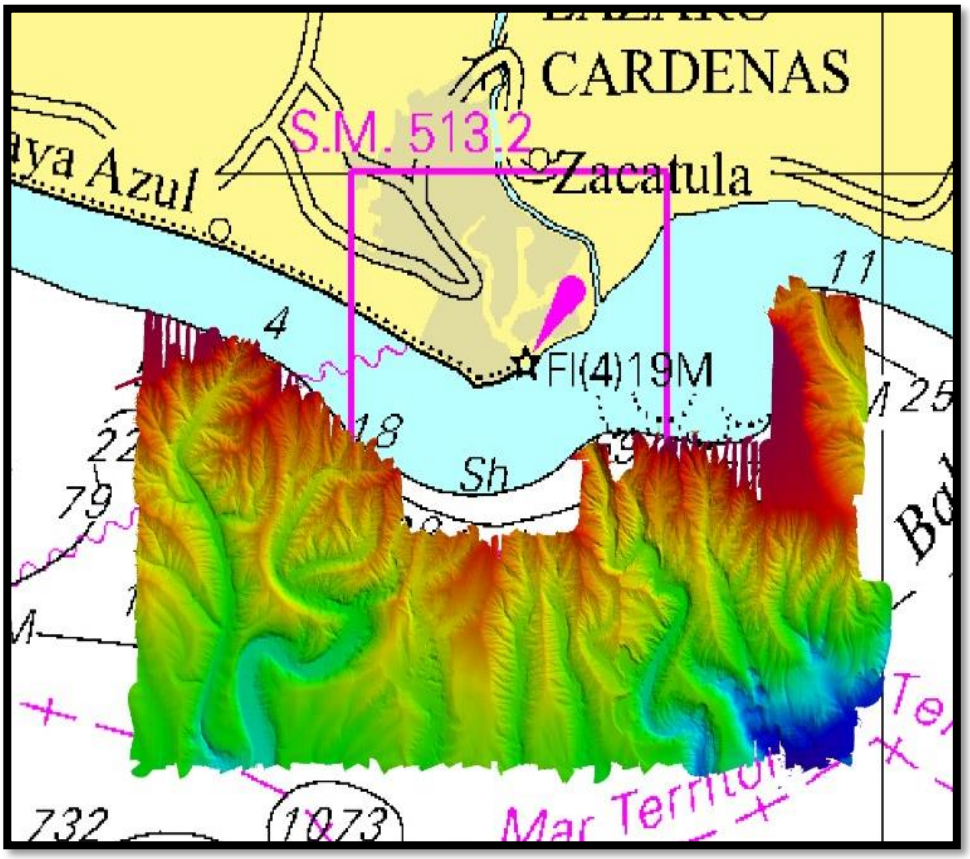

figure 1. Lazaro, Cardenas Survey

2.1.2 Manzanillo to Maruata Survey.

In April 2020, the “P-COL-2020-43000” hydrographic survey was completed, in order to obtain hydrographic information for the nautical chart MX 43000. The survey was carried out with Hydrographic Vessel ARM Tecolutla BI-08.

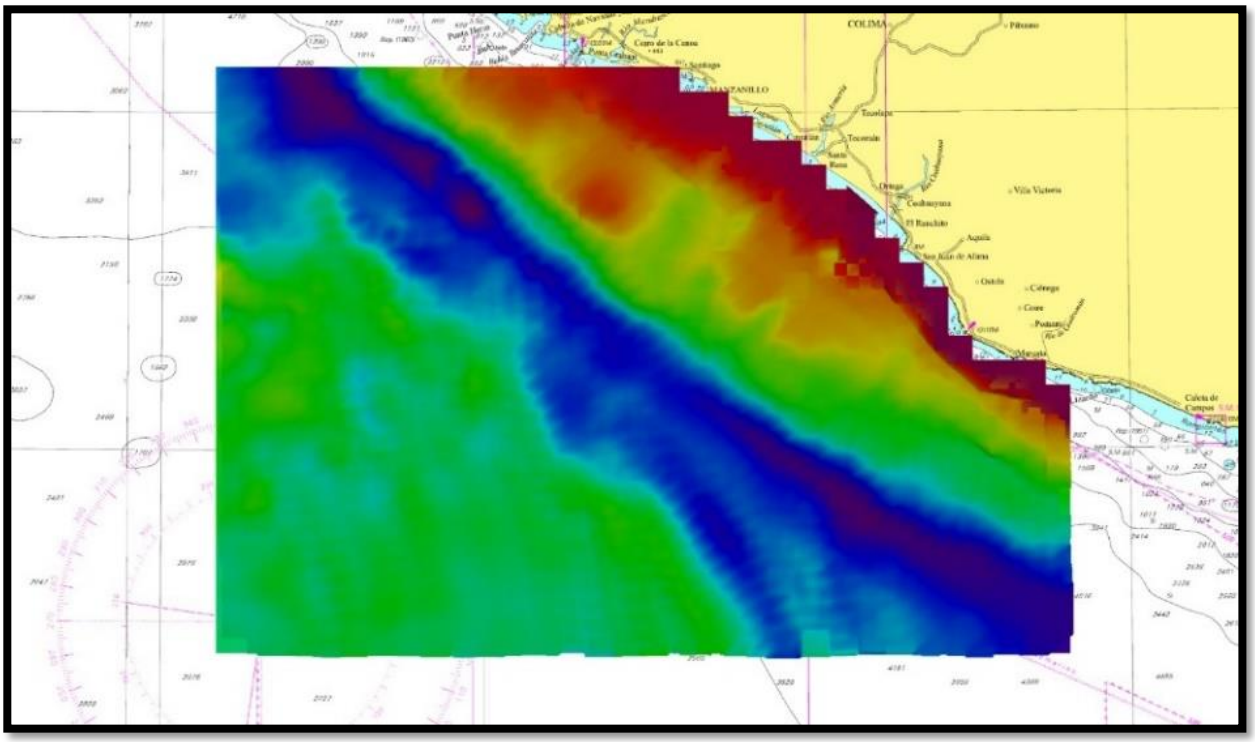

figure 2. Manzanillo to Maruata Survey

2.1.3 Puerto Peñasco, Sonora.

Hydrographic survey "P-SON-2020-21030" started in February 2020 and it was suspended in March due to COVID-19 pandemic, in order to obtain hydrographic information for the nautical chart MX 21030. The survey was carried out with Hydrographic Survey Teams.

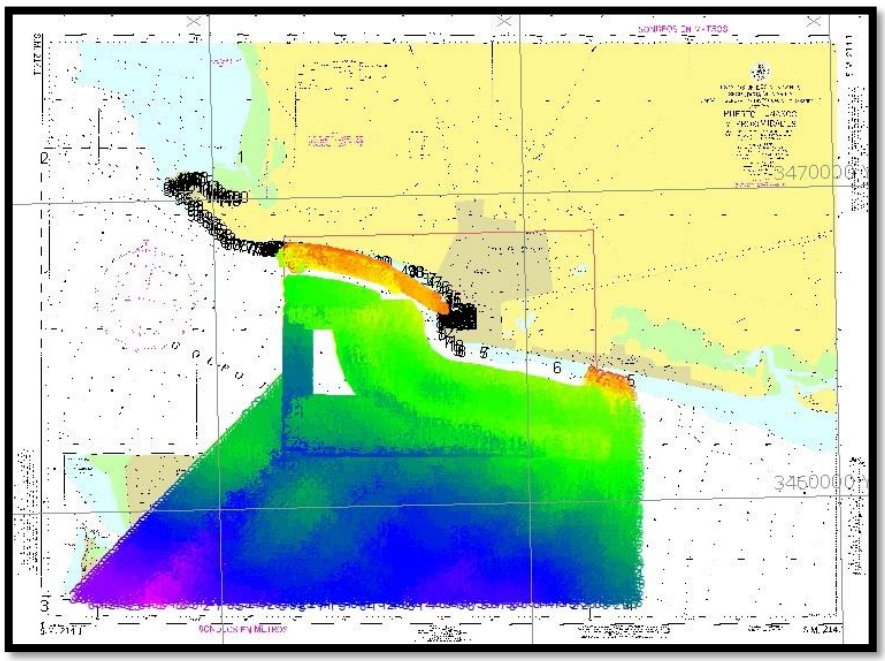

figure 3. Puerto Peñasco, Sonora

2.1.4 Alvarado, Veracruz.

Hydrographic survey “G-VER-2020-82210” started in February 2020 and it was suspended in March due to COVID-19 pandemic, in order to obtain hydrographic information for the nautical chart MX 82210. The survey was carried out with Hydrographic Survey Teams.

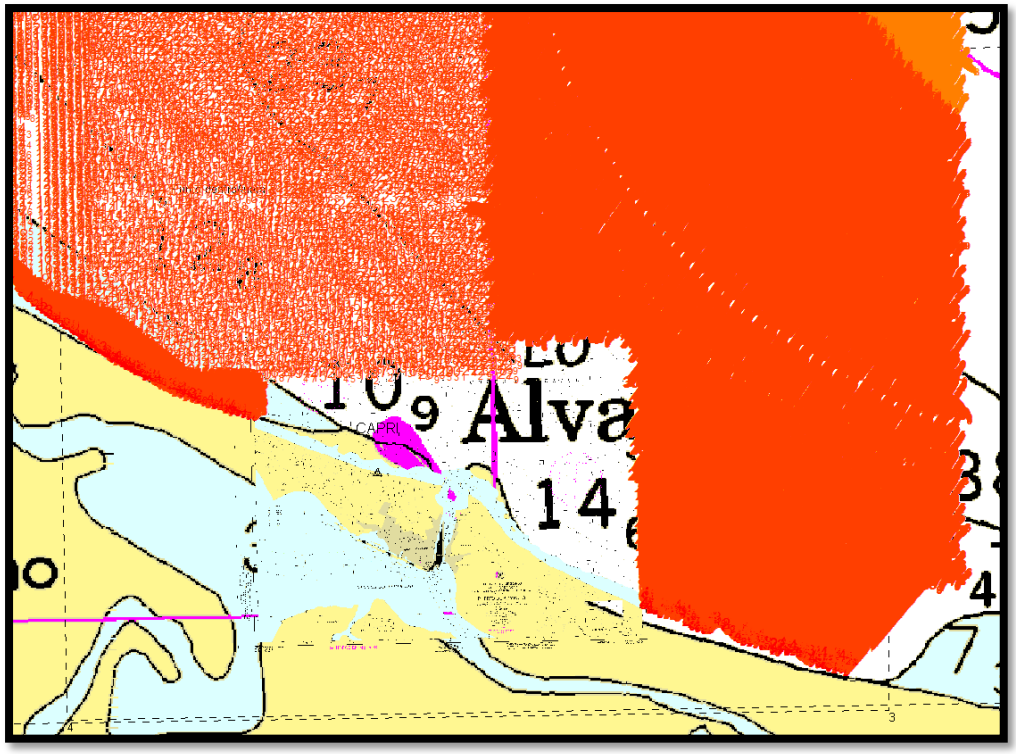

figure 4. Alvarado, Veracruz

2.2 New technologies and/or equipment

No new technologies and/or equipment were acquired

2.3 New ships

No new ships were acquired

2.4 Crowdsourced and satellite-derived bathymetry - national policy.

As a Hydrographic Office we are interested in actively participating with measuring our oceans, however we depend on other National Offices for the authorization of the application for shared bathymetry. That is the reason that we have not yet sent the CL IRCC 1/2020 and IHO 21/2020 responses.

2.5 Challenges and achievements.

Challenges: Due to COVID-19 pandemic, hydrographic surveys planned for this year were suspended, this

represents delays in our hydrographic survey program.

We are currently working on collaboration agreements with other national institutions that carry out hydrographic surveys in order to obtain their bathymetric data.

Nowadays we perform multibeam hydrographic surveys in shallow waters and mid-waters with our hydrographic survey teams and R/V´s, however we still have the need for equipment to carry out multibeam deep-water surveys beyond 1500 meters depth.

Achievements: With the recent implementation of Hydrographic database with the Bathy DataBASE solution we were able to generated all the bathymetric surfaces from the historical hydrographic surveys carried out in our organization as well as of some other internal cruises where other educational institutions have required our support for the handling of hydrographic equipment.

3. NEW CHARTS ANDUPDATES

National program of nautical cartography (PNCN)

In 2017 the Marine Secretariat began a detailed analysis of the existing National Program of Nautical Cartography which had projected 427 charts at different scales. The objective of the analysis was to make its cartographic system more efficient, modifying the number and scales of nautical charts according with the IHO standards.

The reduction in the number of charts is due to the current needs of the country, considering the international standards of the IHO. These premises result in a more efficient program designed for navigation. The aim is to cover in more detail the approximations to the coast, roads, bays, moorings and protected natural areas.

The result was a new cartographic scheme with a total of 254 nautical charts of which they will be: 5 global generals, 10 call generals, 33 coastal, 47 approach, 89 harbor, and 70 mooring.

3.1 ENC coverage, gaps and overlaps.

3.1.1 ENC coverage.

The Marine Secretariat currently maintains 150 ENCs in Mexican waters at different usage bands, within the MACHC region.

Existing 1

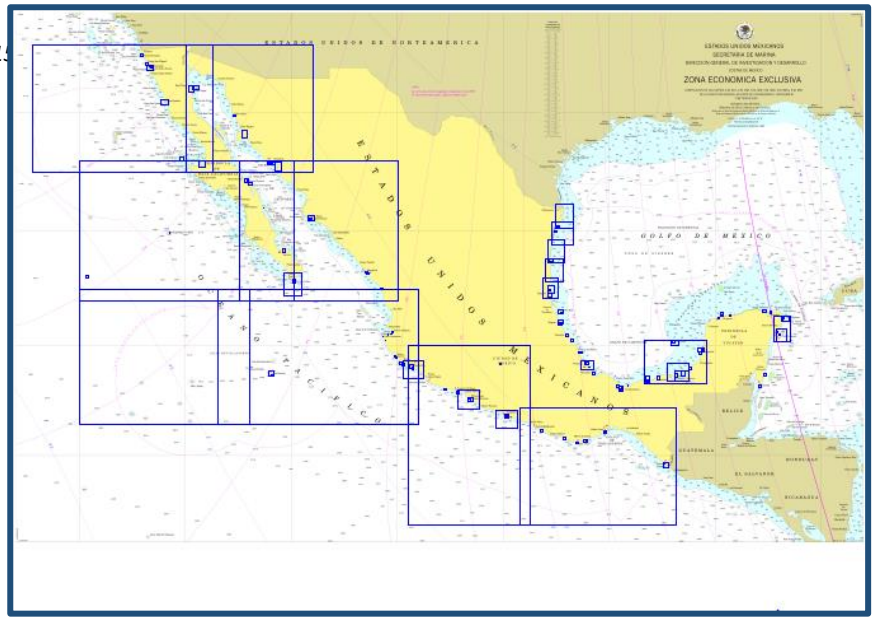

figure 5. ENC coverage

The actual ENC coverage can be consulted in the "Catalogo de cartas y publicaciones nauticas" at the following web page https://digaohm.semar.gob.mx/hidrografia/imageneshidrografia/CatalogoCartasyPubNauticas.pdf

3.1.2 Gaps

Currently the coastline is mostly covered by ENC at the appropriate scale. The national program of nautical cartography contemplates 254 nautical charts and includes the following purposes: general, coastal, approach, harbor and mooring. At the moment, the series of coastal ENCs are under construction. Actually 11 of 33 have been completed.

3.1.3 Overlaps

There are no problems with ENCs overlaps

3.2 ENC distribution method.

The distribution of Mexican ENCs is carried out worldwide through the International Centre for Electronic Navigational Charts(IC-ENC) and associated VARs.

The catalogue of Mexican ENCs can be found at the following address for consultation.https://digaohm.semar.gob.mx/hidrografia/imageneshidrografia/CatalogoCartasyPubNauticas.pdf

3.3 RNCs

Mexico's Secretary of the Navy produces rasterized BSB nautical products from each of its paper charts. These 221 BSB raster charts have the property of being georeferenced and the end user can display the position of a ship on the map image by connecting a computer-based navigation system to a global positioning system (GPS).

SEMAR MACHC

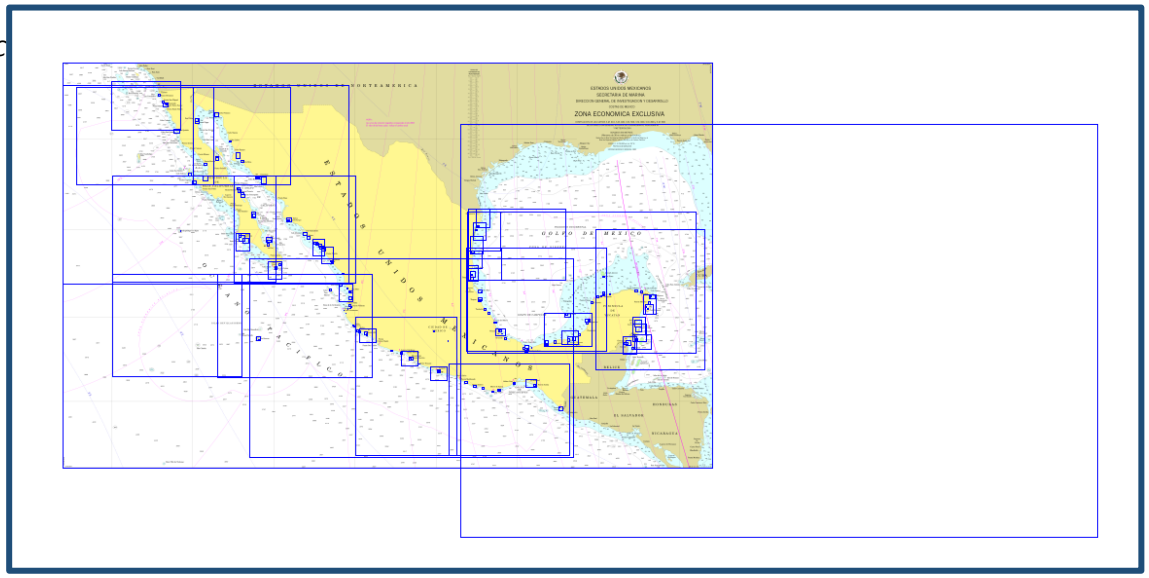

figure 6. Raster Chart coverage

Above is a graph of the BSB coverage of the MACHC region. A detailed catalog can be downloaded at: https://digaohm.semar.gob.mx/hidrografia/imageneshidrografia/CatalogoCartasyPubNauticas.pdf

3.4 INT Charts

Mexico through the Marine Secretariat is responsible for the production and update of nine INT charts within the MACHC region. However, in the Gulf of Mexico and Caribbean Sea two are in the production process.

INT No	Title	Posted
MX 8080 (INT)	ENSENDA A PUNTA EUGENIA B.C.	06/06/2018
MX 8081 (INT)	GOLFO DE CALIFORNA (NORTE)	07/06/2018
MX 8082 (INT)	PUNTA EUGENIA A CABO FALSO, B.C.	07/06/2018
MX 8083 (INT)	GOLFO DE CALIFORNA (SUR)	17/06/2018
MX 8084 (INT)	ISLA CLARION	19/04/2018
MX 8085 (INT)	ISLA ISABELA A MANZANILLO, COL.	08/06/2018
MX 8086 (INT)	MANZANILLO A LAGUNA CHAUTENGO	08/06/2018
MX 8087 (INT)	LAGUNA CHAUTENGO A PUERTO CHIAPAS	08/06/2018
MX 4012 (INT)	MEXICO-CUBA	in process
MX 4013 (INT)	GOLFO DE MÉXICO	in process

3.5 National Paper Charts.

The Mexico Marine Secretariat has produced 221 paper charts considered for the MACHC region. All these nautical charts are available at the different points of sale

- Dirección General Adjunta de Oceanografía, Hidrografía y Meteorología. Mexico City.
- Oceanographic Institute of the Gulf and Caribbean Sea. Veracruz, Veracruz.
- PacificOceanographicInstitute. Manzanillo, Colima.
- 6 Oceanographic Stations in the rest of the country.

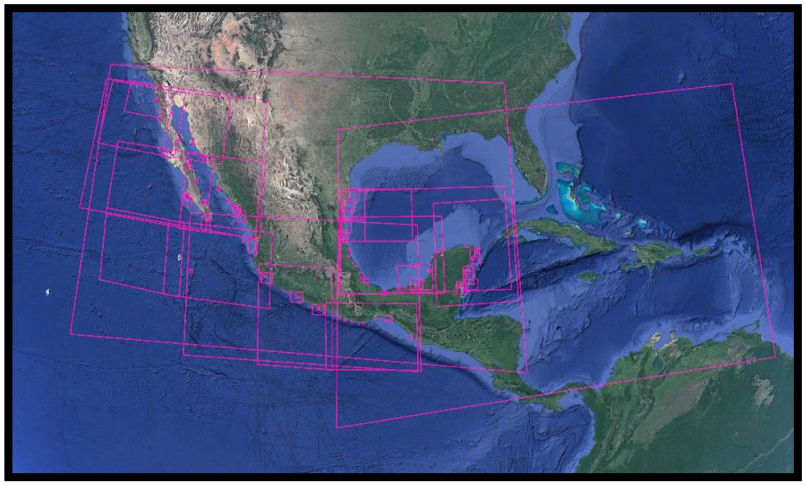

figure 7. Paper Chart coverage

The catalog of the paper charts produced can be consulted in the following link: https://digaohm.semar.gob.mx/hidrografia/imageneshidrografia/catalogo2019.pdf. Paper navigational charts can be requested also by sending an email to the next email address: ventaspublicacionesnauticas@gmail.com

Additionally, the Mexico Marine Secretariat maintains cooperation and commercial agreements to sell Mexican charts or use their data to produce derivative products.

During this year the construction of 8 nautical charts was contemplated, having exceeded the expectation with a total of 10 nautical chart.

1.	MX 71020	LA PESCA	1:20,000
2.	SM 233.5	BAHIA GUASIMAS, SON. Y PROXIMIDADES	1:35,000
3.	MX 23200	GUAYMAS, SON. Y PROXIMIDADES	1:35,000
4.	MX 23210	PORTULANO DE GUAYMAS, SON.	1:10,000
5.	MX 23201	SAN CARLOS, SON.	1:3,500
6.	MX 23202	MIRAMAR, SON	1:3,500
7.	MX 23212	GUAYMAS, SON.	1:3,500
8.	MX 83100	COATZACOALCOS, VER Y PROXIMIDADES	1:30,000
9.	MX 83110	COATZACOALCOS - PAJARITOS	1:10,000
10.	MX 83120	MINATITLAN - COATZACOALCOS	1:20,000

3.6 Other charts, e.g. for pleasure craft.

No apply.

3.7 Challenges and achievements.

Currently the challenge is to produce the series of coastal nautical charts of the coast of Mexico.

4. NEW PUBLICATIONS AND UPDATES

4.1 New Publications

No apply

4.2 Updated publications and Means of delivery, e.g. paper, digital.

4.2.1 The DIGAOHM edit and keep updated nautical publications in printed format, which are sold and distributed on nine points of sale in the national territory. The nautical publications catalog can be consulted in the following link: https://digaohm.semar.gob.mx/hidrografia/imageneshidrografia/CatalogoCartasyPubNauticas.pdf

The Nautical publications can be requested also by sending an email to the next email address: ventaspublicacionesnauticas@gmail.com. The following are the printed format nautical publications:

- The Graphic Tide Prediction Calendar, are edited annually and contains tide height forecast information, the Reference Plane is the medium sea level, the units of measure used are meters and feet, shows the time zone of each locality, likewise It contains information on the lunar phases (Full Moon, Waning Quarter, New Moon, Growing Quarter) and the time they pass through the zenith; which provides safety to navigators in the tides.

- Numerical Tables for Tide Prediction of the Pacific Ocean, Gulf of Mexico and Caribbean Sea. are edited annually, These Tables show the predictions for the heights and times of the pleas and lows associated with the vertical movement of the area, and can be useful in obtaining the depth of water under the keel or over shallow waters for anchoring, as well as, to establish the established time of landing on the beach in a smaller vessel. Tidal analyzes were used from

analyzes analyzed in observations recorded by a network of sensors; For this purpose, 365-day series of hourly heights were used, except in some ports where there are no series of that extension, from harmonic heights from 37 to 107 harmonic constants are calculated by the method of least squares for each port.

4.2.2 The DIGAOHM edit and keep updated nautical publications in digital format that can be consulted or downloaded from the following web pages:

- Nautical charts and publications catalog is updated monthly and contains general information for the navigator, points of sale of charts and nautical publications on both shorelines, prices and the list of the 221 nautical charts of paper and raster (.bsb) of the Pacific Ocean, Gulf of Mexico and Caribbean Sea classified as follows: general, coastal charts, approach, harbor and mooring of the Pacific Ocean, coastal charts, approach, harbor and mooring of the Gulf of Mexico and the Caribbean Sea. It includes the updated list of electronic nautical charts S-57, maintained by the DIGAOHM and for distribution with the International Center for Electronic Nautical Chart (IC-ENC) in the united kingdom, for more information check the page http://www.ic.enc.org

- Notice to Mariners is published fortnightly. The purpose of this publication is to present critical information to navigation that affects nautical charts or publications. Publications from 2011 to date can be consulted and downloaded for free on the website https://digaohm.semar.gob.mx/hidrografia/avisosalosmarinos.html

- Mexican Derrotero (Coast Pilot), contains information of interest to the navigator of each port of Mexico and is available in digital format for consultation and free download on the Hydrography portal in the Internet web page https://digaohm.semar.gob.mx/derrotero/derrotero.html

- Tourism Agenda of the Gulf and Mexican Pacific, The Mexican Marine Secretariat and The Secretary of Tourism carried out a collaboration agreement to jointly integrate the nautical and cartographic tourist information of the main ports corresponding to the coast of the Gulf of Mexico and the Mexican Pacific, compiled in the “Nautical Tourist Agendas” with the objectives of promoting national tourism development as well as guaranteeing navigation safety in Mexican marine areas. The nautical charts shown in the Nautical Tourist Agendas, are illustrative and are NOT suitable for navigation Mexican marine areas. The nautical charts shown in the Nautical Tourist Agendas, are illustrative and are NOT suitable for navigation https://digaohm.semar.gob.mx/hidrografia/AgendaTuristicaGolfoPacifico.html

- Chart No. 1 available in digital format and for free download on the page in order to show or make known those symbols that are used in national nautical charts. https://digaohm.semar.gob.mx/hidrografia/imageneshidrografia/carta1_edicion5.pdf

4.3 Challenges and achievements

The main challenge this year was undoubtedly keeping us operating with all the restrictions imposed by the COVID-19 pandemic. Several projects had to be postponed, prioritizing health over productivity, and processes had to be adapted for home work when possible.

5. MARITIME SAFETY INFORMATION

5.1 Existing infrastructure for MSI dissemination

Dissemination of maritime safety information affecting Mexican Marine Zones is done via NAVAREA Coordinator Zones IV and XII (U.S.A), prepared on the basis of the "Joint IMO/IHO/WMO Manual on Maritime Safety Information".

The Mexican Marine Secretariat through DIGAOHM is the national coordinator of the Global Maritime Distress and Safety System (GMDSS), which is a set of safety procedures, equipment and communication protocols designed to increase safety and security. facilitate navigation and rescue of vessels in danger, this system is regulated by the International Convention for the Protection of Human Life at Sea (SOLAS); and through the maritime and public community in general, all the information that affects the navigation routes on our coasts and waterways, errors in nautical charts and publications, or any novelty that constitutes a Danger to navigation, are collected through the report format available for free download on the page https://digaohm.semar.gob.mx/hidrografia/avisosalosmarinos.htmland is sent to the email digaohm.navegacion@semar.gob.mx, the information is processed and sent to the regional coordinator (NGA) of NAVAREAS IV and XII.

Local Nautical Warnings are also made available on the website: https://www.gob.mx/semar/unicapam/acciones-y-programas/avisos-nauticos-160787.

Weather bulletins and forecasts are also available on the website: http://meteorologia.semar.gob.mx/

5.2 Statistics on work of the National Coordinator

In 2020, 165 NAVAREA messages were prepared and sent to the NAVAREA regional coordinator; 101 from the Gulf of Mexico area and 64 from the Pacific.

5.3 New infrastructure in accordance with GMDSS Master Plan.

No apply

5.4 Challenges and achievements.

No apply

6. C-55

The purpose of IHO Publication C-55 is to present a clear picture of the global coverage of hydrographic surveys and nautical charts and the scope of effective organizations for the timely promulgation of information on navigation safety. The following tables summarize the coverage of the survey and the nautical chart in Mexican waters.

6.1 Available hydrographic coverage:

The state of the hydrographic studies of navigable waters in the Mexican waters of the Gulf of Mexico and the Pacific Ocean up to the limits of the EEZ is as follows:

A = percentage that is properly surveyed

B = percentage that requires a new survey on a larger scale or according to modern standards

C = percentage that has never been systematically surveyed

	A	B	C
Depths < 200m	18%	10%	82%
Depths > 200m	15%	05%	85%

6.2 Nautical Chart Coverage Available:

Coverage of charts published by Mexico in the MACHC region, where:

A = percentage covered by INT or other charts meeting 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

Purpose/Scale	A PAPEL	B RASTER	C ENC
Offshore passage/Small	80%	80%	80%
Landfall and Coastal passage/Medium	33.3%	33.3%	33.3%
Approaches and Ports/Large	13.1%	13.1%	13.1%
Percentage of Group A showing depths in meters	100%		
Percentage of Group A referenced to a satellite datum	100%		
Data Source	Mexico		

7. Capacity Building

7.1 Offer of Capacity Building

The Marine Secretariat through the Naval University has the Mission of held training programs at different levels from technical, professional and post graduate levels to promote and regulate naval education. With this purpose, among others it carries out the specialty of hydrography at the Oceanographic Institute of the Gulf of Mexico and Caribbean Sea.

The DIGAOHM also promotes training programs and workshops on different aspects of hydrography to keep its staff updated on new technology.

7.1.1 FOCAHIMECA project (offer)

Since 2015 the Marine Secretariat together with the Mexican Agency for International Development Cooperation (AMEXCID) carry out the project for the Strengthening of Hydrographic Capacities in Mesoamerica and the Caribbean Sea (FOCAHIMECA). 25 countries of the MACHC Region are beneficiaries of this project. To the date, the project has funded 11 students to take the specialty of hydrography in Mexico. Because of the COVID19, the project has been suspended. Ways are currently being sought to continue with the project through distance training or a mixed modality.

7.2 Demand of Capacity Building

Participation of Mexico Marine Secretariat on capacity building programs promoted by the IHO have been a keystone to increase hydrographic capability of Mexico to conduct appropriate Surveys and produce nautical charts and publications for safety to navigation and protection of the marine environment.
The Mexico Marine Secretariat have taken advantage of the Capacity Building programs promoted by the IHO.

7.2.1 On September of 2020, Commander Simitrio Morales López, completed the Postgraduate Course on Ocean Bathymetry, with a duration of 12 months in the University of New Hampshire (UNH), EE.UU. The postgraduate was financed by the Nippon Foundation with the purpose to train a new generation of scientists and hydrographers with knowledge on Ocean Bathymetry and promoted by the GEBCO project and the IHO.

7.2.2 On August of 2020, Commander Adrian Montufar Arroyo, completed the Master on Hydrography course, with a duration of 12 months in the University of Southern Mississippi (USM), EE.UU. The postgraduate was financed by the Republic of Korea and is recognized as Cat A by the IHO.

Mexico will continue to seek opportunities for formal training of its staff in Cat A hydrography and Cat B cartography.

8. Oceanographic activities

8.1 General

The Marine Secretariat through the DIGAOHM, carries out Oceanographic, Hydrographic and Meteorological studies, in order to support Naval Operations; contributing to the National Maritime Development, the safeguarding of human life at sea, navigation safety and the protection of the marine and coastal environment, as well as integrating the National Oceanographic Information file.

8.2 GEBCO/IBC´s activities, GEBCO Seabed 2030 activities.

During MACHC 2020 conference, Mexico offer to provide the MACHC regional Seabed 2030 Coordinator. Ensign Cecilia Cortina Guzman has been working coordinating efforts within the region, and also participating in the IBCA project.

8.3 Tide Gauge Network.

The Marine Secretariat has a permanent national sea level monitoring system, made up of first-rate Tidal Stations, which provide accurate and reliable information, in order to observe the sea level before the effects of the global climate change. Monitor, generate and provide information regarding sea level, in order to develop graphic calendars and numerical tables of tide prediction of the maritime regions of the country, which allow to contribute to safety in navigation, preserving human life at sea, as well as providing information in real time in the face of the intensification of extreme events, as a tool in decision making.

8.4 New Equipment.

No apply

9. Spatial Data Infrastructure: status of MSDI

9.1 Relation with NSDI

Mexico has the National Statistical and Geographical Information System (SNIEG), which is the set of Units organized through the Subsystems, coordinated by the National Institute of Statistical and Geographical Information (INEGI) and articulated through the National Information Network, with the purpose of producing and disseminating the Information of National Interest. In 2017, the Marine Secretariat proposed the creation of the Technical Committee for Marine Information (CTEIM) within the framework of SNIEG with the aim of promoting that marine information in Mexico is generated, processed and disseminated in accordance with national and international standards, which contribute to its homogeneity and interoperability, so that it is useful for the establishment of national public policies.

On November 17 of this year, the CTEIM approved the creation of the working group on hydrographic information in which issues related to the national development of the marine spatial data infrastructure will be discussed. The first topics to work on will be: the creation of mandatory national technical standards for hydrographic surveys by government agencies, development of spatial data infrastructure for bathymetry and cooperation agreements between government agencies to share and disseminate bathymetric information.

9.2 Involvement in regional or global MSDI efforts.

Mexico has been participating in the efforts of the MACHC to share hydrographic and cartographic

information in the MACHC MSDI portal.

9.3 National implementation of the Share Data Principles – including any national data policy and impact on marine data.

One of the activities appointed to the CTEIM is the development of spatial data infrastructure for bathymetry and cooperation agreements between government agencies to share and disseminate bathymetric information.

9.4 MSDI national portal.

The CTEIM is approved the creation of a working group to design and develop a National Data Hub for Marine information.

9.5 Best practices and lessons learned.

This year it has been especially difficult to advance projects with other agencies. The need to coordinate our actions with other agencies has forced us and at the same time created the opportunity to explore new forms of communication using current technology, adapting the procedures for the maintenance of inter-institutional cooperation. Even if conditions return to normal at some point and the restrictions imposed by the COVID19 pandemic are lifted, the experience gained in the use of these communication methods will remain.