INTERNATIONAL HYDROGRAPHIC ORGANIZATION

México
National Report

20th Meso-American and Caribbean Sea
Hydrographic Commission (MACHC)
Santo Domingo, República Dominicana
02 - 06 December 2019

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

Contenido

1. HYDROGRAPHIC OFFICE/SERVICE

The Government of México has given the attribution to conduct hydrographic surveys and produce nautical charts and related nautical publications of the Mexican waters 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

1.1.1 The Marine Secretariat through the DIGAOHM 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, including Notice to Mariners, 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 promoting national maritime development. In addition, Maritime Safety Information is compiled and sent to the regional coordinator of NAVAREAS IV and XII (National Geospatial Agency)

1.1.2 The Marine Secretariat through the Unit of Port Captaincies and Maritime Affairs (UNICAPAM) is responsible of care and maintenance of maritime aids to navigation, publishing list of lights and providing Maritime Safety Information through Nautical Warnings on the web site: https://www.gob.mx/semar/unicapam/acciones-y-programas/avisos-nauticos-160787.

1.2 Mexico Strategies for the MACHC Region

Mexico is willing to cooperate with other nations within the MACHC region to increase hydrographic capabilities, that allows safe navigation and protection of the marine environment.

2. SURVEYS

2.1 Surveys in Mexican waters

The Mexican Marine Secretariat 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.

In addition to carrying out the nautical charts for the Mexican State, the Marine Secretariat also performs hydrographic surveys to support government institutions, private businesses and agreements with countries that require it, according to the needs of each of them.

Figure 1.- Ports of México

2.2 Surveys carried out in 2019.

During the 2019 year the hydrographic vessels and survey teams carried out different hydrographic surveys in the Mexican waters, with the purpose of collecting hydrographic information to elaborate and update of nautical cartography.

2.2.1 Guaymas and Proximities, Survey.

From February 4th to April 5th, 2019, Hydrographic Survey “P-SON-2019-23200” was carried out in the coast near Guaymas and San Carlos, Sonora, in order to obtain bathymetric information for the following nautical charts: MX-23200, MX-23201, MX-23202, MX-23210, MX-23211 and MX-23212. The survey was carried out by the vessel. “ARM Tecolutla” (BI-08) and the Hydrographic Survey Teams.

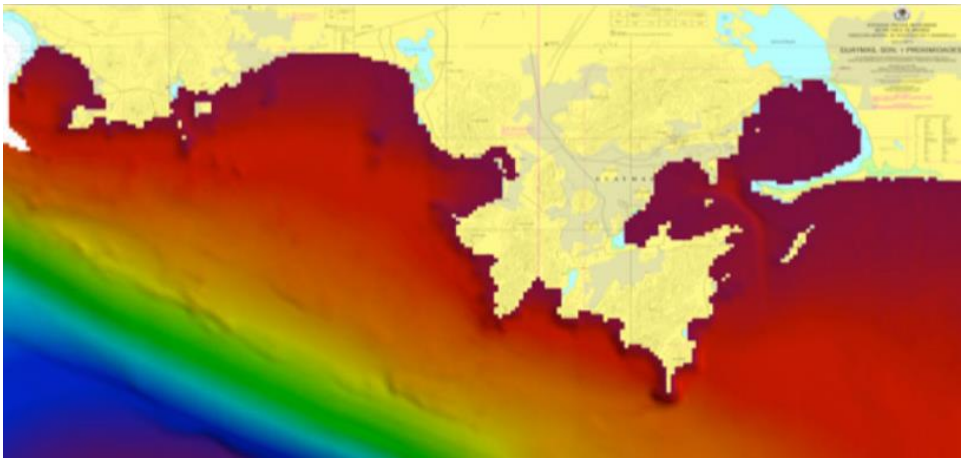

Figure 2. Guaymas and proximities Survey

2.2.2 Dos Bocas Survey.

From February 7th to April 21st, 2019, the “G-TAB-2019-83201” Hydrographic Survey was carried out for the bathymetric data acquisition in Dos Bocas Port, and nearby, in order to obtain the necessary hydrographic information for the Chart MX-83201 "Dos Bocas Tabasco Anchorage”. The survey was conducted by the Hydrographic Survey Teams.

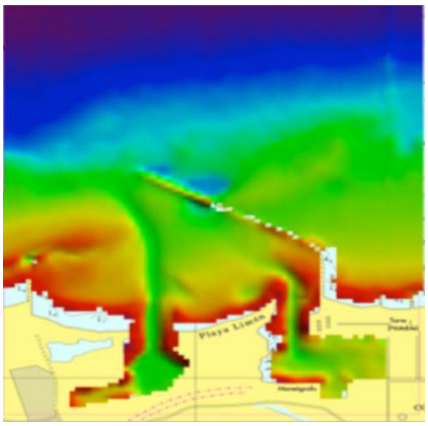

Figure 3. Dos Bocas Port Survey

2.2.3 Mazatlán Survey.

From February 11th to April 5th, 2019, the hydrographic survey "P-SIN-2019-31200" was carried out in Mazatlan, coast, in order to obtain hydrographic information for the following nautical charts: MX 31200, MX 31210 and MX 31220. The survey was conducted by the Hydrographic Survey Teams.

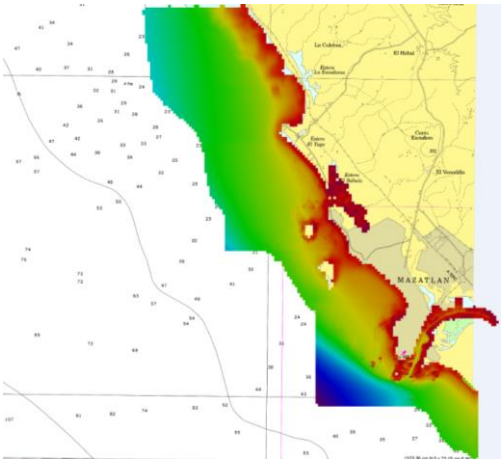

Figure 4. Mazatlan Survey

2.2.4 Tuxpan Survey

From June 24th to August 2nd, 2019, the "G-VER-2019-81100" hydrographic survey was carried out in Tuxpan Coast, and Tuxpan River, in order to obtain hydrographic information for the following nautical charts: MX81110, MX81111, MX81112 and MX81113. The survey was conducted by the Hydrographic Survey Teams.

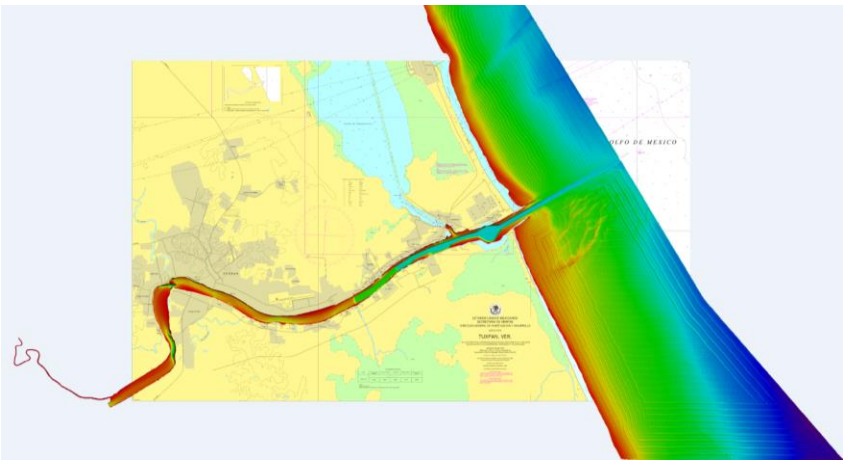

Figure 5. Tuxpan Survey

2.2.5 Nautla River to Tlacotalpan River, Survey.

In September 2019, the "G-VER-2019-82000" hydrographic survey was completed, in order to obtain hydrographic information for the nautical chart MX 82000. The survey was carried out with Hydrographic Vessels "ARM Tuxpan" and "ARM Antares".

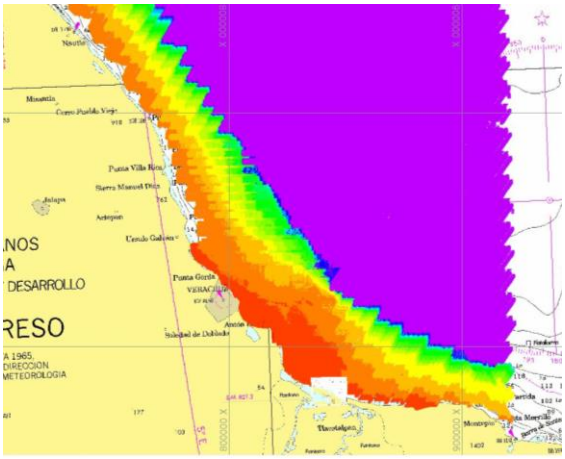

Figure 6. Nautla to Tlacotalpan Survey

2.3 Surveys Teams and Platforms.

The Marine Secretariat has two Hydrographic Survey Teams in the Gulf of Mexico and two in the Pacific Ocean, four survey vessels in the Gulf of Mexico and three in the Pacific Ocean.

Figure 7. Survey Teams

Figure 8. Survey Platforms

2.4 Surveys programmed to 2020.

Surveys have been programmed for next year 2020, some of them will be conducted by the Survey teams and where needed by survey vessels, as described in the table below.

Table 1. Surveys Programmed for2020

CHART NAME	CHART #	SCALE	OBSERVATIONS.
COAZTACOALCOS TO DOS BOCAS	MX 83000	1:250,000	HYDROGRAPHIC VESSELS
DOS BOCAS, TAB. AND PROXIMITIES	MX 83200	1:60,000	HYDROGRAPHIC VESSELS
APPROACH DOS BOCAS TABASCO	MX83210	1.35,000	HYDROGRAPHIC VESSELS
CHILTEPEC, TAB.	MX 83211	1:7,500	SURVEY BRIGADES
TAMPICO AL RIO NAUTLA	MX 81000	1:1:250,000	HYDROGRAPHIC VESSELS
ISLA LOBOS, TUXPAN AND APPROACH.	MX 81100	1:70,000	HYDROGRAPHIC VESSELS
PLAYA DEL CARMEN, Q. ROO	MX 93121	1:3,000	SURVEY BRIGADES
SAN MIGUEL DE COZUMEL, Q. ROO N.	MX 93111	1:4,000	SURVEY BRIGADES
SAN MIGUEL DE COZUMEL, Q. ROO S.	MX 93112	1:4,000	SURVEY BRIGADES
PUERTO MORELOS	MX 93010	1:15000	SURVEY BRIGADES
PUERTO DE ALTAMIRA	MX 72110	1:10,000	SURVEY BRIGADES
RIO PANUCO –	MX 72120	1:20,000	SURVEY BRIGADES

PUERTO DE TAMPICO			
RIO PANUCO – CANAL	MX 72121	1:3,000	SURVEY BRIGADES
RIO PANUCO - ADUANA	MX 72122	1:3,000	SURVEY BRIGADES
DESEMBOCADURA DEL RIO PANUCO	MX 72123	1:3,000	SURVEY BRIGADES
RIO PANUCO ASTILLEROS	MX 72124	1:3,000	SURVEY BRIGADES
RIO PANUCO – EL MORALILLO	MX 72125	1:3,000	SURVEY BRIGADES
ALVARADO Y PROXIMIDADES	MX 82200	1:40,000	SURVEY BRIGADES
PUERTO DE ALVARADO, VER.	MX 82210	1:15,000	SURVEY BRIGADES
LAZARO CARDENAS, Y PROXIMIDADES	MX 51100	1:35,000	HYDROGRAPHIC VESSELS
SALINA CRUZ Y PROXIMIDADES	MX 62200	1:1:35,000	HYDROGRAPHIC
PORT SALINA CRUZ, OAX.	MX 62210	1:1:35,000	SURVEY BRIGADES
MANZANILLO A MARUATA	MX 43000	1:2500,00	HYDROGRAPHIC VESSELS

3. NEW CHARTS AND UPDATES

3.1 National program of nautical cartography (PNCN)

In 2017 The Mexican Marine Secretariat began a detailed analysis of the existing National Program of Nautical Cartography which had projected 427 charts at different scales. The objective was to have a more efficient scheme for paper nautical charts focus in the area where there is a need of updated information because the vessel traffic and importance of the ports.

The reduction in the number of charts is due to the current needs of the country, considering the international standards of the IHO and the national capabilities to conduct adequate surveys. These premises result in a more efficient program designed to focus the efforts on the areas where there is more marine navigation traffic and risk. 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. The distribution of the 254 nautical charts for the Mexican territory can be consulted on the web page: https://digaohm.semar.gob.mx/hidrografia/imageneshidrografia/ProgramaCartografiaNautica.pdf

3.2 Paper Charts.

The Mexican Marine Secretariat has produced 220 paper charts considered for the MACHC region. All these nautical charts are available at the different points of sale. However, it has to be considered that the total of 220 paper nautical charts produced until 2019; it represents a migration from an old nautical cartography plan that considered 427 charts to a new scheme of 254 charts.

3.3 Electronic Navigational Chart (ENC)

The Mexican Marine Secretariat currently maintains 147 ENCs in Mexican waters within the MACHC region (figure 5).

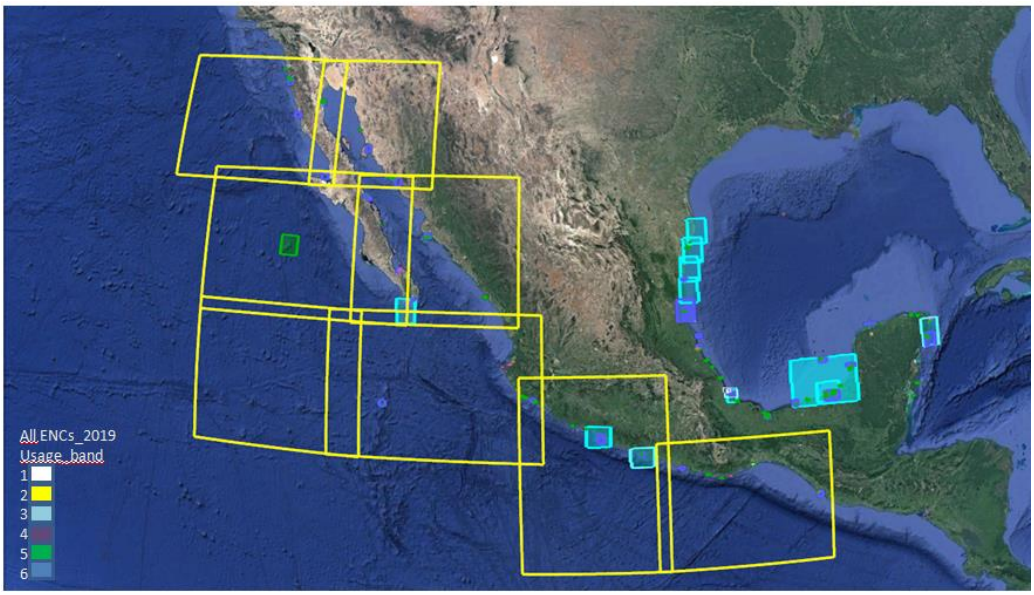

Figure 9. Actual ENCS mantained by Mexico.

The following table lists the Mexican paper chart produced by the Marine Secretariat available in the Year 2019

Table 2. New ENC cells 2019

Cell Name	Title	Posted
MX 92203	PUERTO JUAREZ, Q. ROO	07/03/2019
MX 82100	VERACRUZ Y PROXIMIDADES	25/06/2019
MX 82110	PORTULANO DE VERACRUZ	24/06/2019
MX 82111	NUEVO PUERTO DE VERACRUZ, VER	24/06/2019
MX 82112	VERACRUZ, VER	28/06/2019
MX562210	PORTULANO DE SALINA CRUZ, OAX.	11/09/2019
MX662211	SALINA CRUZ, OAX.	11/09/2019
MX 92201	ISLA MUJERES, CANCUN, Q. ROO.	To be sent to IC-ENC before December 9th
MX 92202	PUNTA SAM, Q. ROO.	To be sent to IC-ENC before December 9th
MX 92200	ISLA MUJERES, CANCUN, Q. ROO Y PROX.	To be sent to IC-ENC before December 9th

The following charts will be considered production targets for the next year 2020.

Table 3. Programmed ENC cells 2020

No.	Cell Name	Title
1	MX 0001	ZONA ECONOMICA EXCLUSIVA.
2	MX 71020	LA PESCA.
3	MX 23211	SANCHEZ TABOADA, SON.
4	MX 23212	GUAYMAS, SON.
5	MX 23201	SAN CARLOS, SON.
6	MX 23202	MIRAMAR, SON.
7	MX 23200	GUAYMAS, SON. Y PROXIMIDADES
8	MX 23210	PORTULANO DE GUAYMAS, SON.
9	MX 83110	COATZACOALCOS-PAJARITOS.
10	MX 83100	COATZACOALCOS, VER. Y PROX.
11	MX 83120	MINATITLAN - COATZACOALCOS, VER.
12	MX 92100	HOLBOX Y PROXIMIDADES.
13	MX 92000	DZILAM DE BRAVO A CANCUN.
14	MX 82000	RÍO NAUTLA A TLACOTALPAN
15	MX 43110	MANZANILLO, COL.
16	MX 43120	LAGUNA DE CUYUTLÁN.
17	MX 43100	BAHÍA DE MANZANILO, COL. Y PROX.
18	MX 31220	PORTULANO DE MAZATLAN, SIN
19	MX 31210	EL SABALO, SIN.
20	MX 31200	MAZATLAN, SIN, Y PROXIMIDADES
21	MX 62110	BAHÍA MAGUEY A BAHÍA CONEJOS, OAX.
22	MX 92030	LAS COLORADAS, YUC.
23	MX 62111	SANTA CRUZ HUATULCO.
24	SM-622.2	BAHÍAS DE HUATULCO Y PROXIMIDADES.

3.4 Paper Charts, Raster Navigational Charts (RNC) & Electronic Navigational Charts (ENC) Distribution

Besides Electronic Navigational Charts, the Mexican Marine Secretariat produce and print a total of 220 paper nautical charts, they are distributed on nine points of sale in the national territory. The catalog of the paper and raster charts produced can be consulted in the following link:
https://digaohm.semar.gob.mx/hidrografia/imageneshidrografia/catalogo2019.pdf

Paper and Raster navigational charts can be requested also by sending an email to the next email address: ventaspublicacionesnauticas@gmail.com

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

EVG: through the different products and subscriptions offered EAST VIEW GEOSPATIAL http://www.gisresources.com/east-view-geospatial-offers-new-formats-lower-pricing-french-nautical-charts/

UKHO: through the different products and services offered by the UKHO www.gov.uk/government/organisations/uk-hydrographic-office

Distribution of the 144 cells is done through IC-ENC value added Resellers (VARs), for more information consult http://www.ic-enc.org/

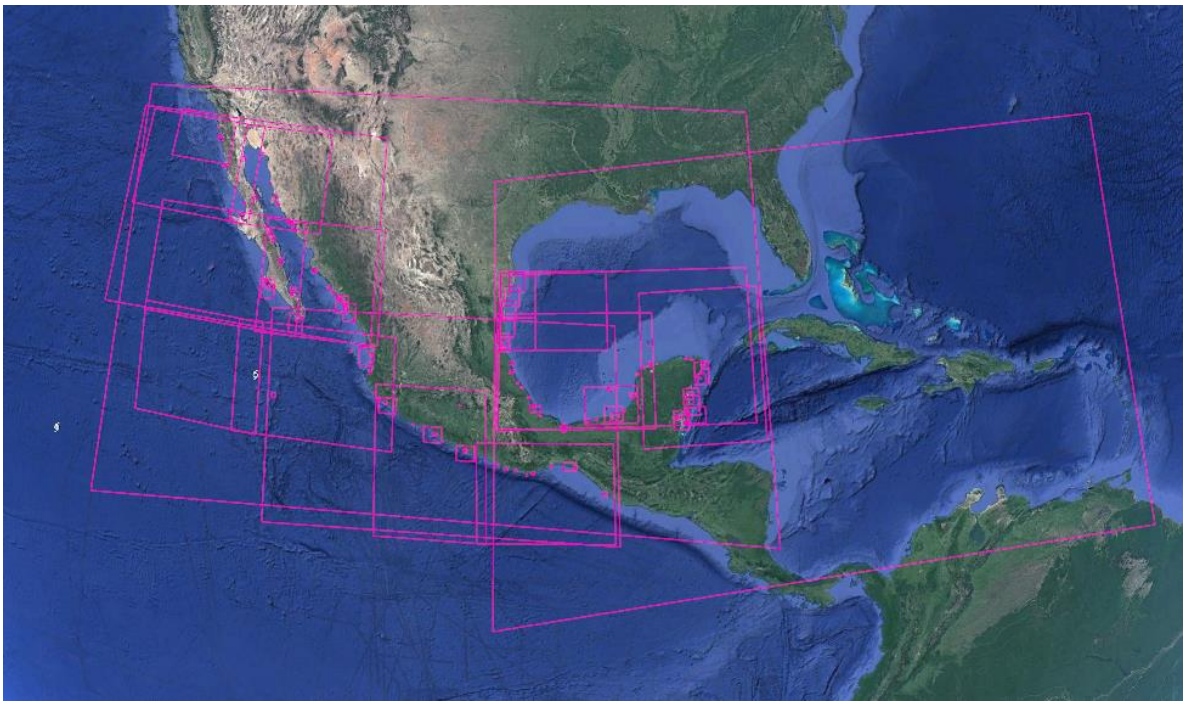

Figure 10. BSB charts produced by the Marine Secretariat of Mexico

3.5 International (INT) Charts

Mexico through the Marine Secretariat is responsible for the production and update of ten INT charts within the MACHC region. However, one is in the process of publishing, and the other needs to be addressed with the Hydrographic Office of Cuba to include updated information from their waters. The scales of these nautical charts are between 1:900.000 and 1:1.000.000.

Table 4. INT Chart under responsability of Mexico

Mexican Cells		
INT No.	**Title**	**Posted**
MX208080	ENSENDA A PUNTA EUGENIA B.C.	06/06/2018
MX208081	GOLFO DE CALIFORNA (NORTE)	07/06/2018
MX208082	PUNTA EUGENIA A CABO FALSO, B.C.	07/06/2018
MX208083	GOLFO DE CALIFORNA (SUR)	17/06/2018

MX208084	ISLA CLARION	19/04/2018
MX208085	ISLA ISABELA A MANZANILLO, COL.	08/06/2018
MX208086	MANZANILLO A LAGUNA CHAUTENGO	08/06/2018
MX208087	LAGUNA CHAUTENGO A PUERTO CHIAPAS	08/06/2018
MX204012	MEXICO-CUBA	UNDER DEVELOPMENT
MX204013	GOLFO DE MÉXICO	Need information on Cuba

4. NEW PUBLICATIONS AND UPDATES

4.1 New Publications

4.1.1 The DIGAOHM is working on the production of a Navigation Guide for Recreational boats, prepared by The Mexican Marine Secretariat and the National Commission of Natural Protected Areas in order to provide the maritime community with useful information to the navigator, as Meteorological, Oceanographic, Protected Natural Area information, and Charts and maps of the main areas of public use.

Figure 11. Navigational Guide for recreational boats

4.1.2 The DIGAOHM is working on the frame of the National System of Statistic and Geographic Information to publish a Technical Standard for Hydrographic Surveys to be adopted by all government agencies of Mexico.

4.2 Publications updates

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/catalogo2019.pdf. 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, 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 zenit; which provides safety to navigators in the tides.

- Numerical Tables for Tide Prediction of the Pacific Ocean, Gulf of Mexico and Caribbean Sea, 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 contains general information for the navigator, points of sale of charts and nautical publications on both shorelines, prices and the list of the 220 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

- The Mexican Marine Secretariat through the DIGAOHM prepares and publishes the Notice to Mariners, whose purpose 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

- The Mexican Marine Secretariat through the DIGAOHM prepares and publishes the Mexican Derrotero (Coast Pilot), with information of interest to the navigator of each of the ports of both Gulf and Pacific coastlines and is available in digital format for consultation and free download on the Hydrography portal in the Internet 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

5. MARITIME SAFETY INFORMATION

5.1 Existing infrastructure for transmission

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.html and 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.

5.2 Notice to Mariners

The Mexican Marine Secretariat through the DIGAOHM prepares and publishes all relevant information that affects national nautical charts and publications, such as: reports of new hazards, casualties, obstructions, changes in navigation aids, changes in mapped depths , based on the provisions of Rule 9 point 3 chapter V of the International Convention for the Safety of Human Life at Sea (SOLAS); This publication is available from 2011 to date, on the 1st and 16th of each month, which can be consulted and downloaded for free on the website https://digaohm.semar.gob.mx/hidrografia/avisosalosmarinos.html. From January 2019 to date 21 biweekly Notice to Mariners publications have been issued

5.3 Nautical Warnings

The Mexican Marine Secretariat through the Unit of Port Captaincies and Maritime Affairs prepare and issue on its web page https://www.gob.mx/semar%7Cunicapam/acciones-y-programas/avisos-nauticos-2019-189634 Nautical warnings with maritime safety information that affects Mexican maritime areas, this information once reviewed and validated is integrated into the DIGAOHM fortnightly publication Notices to Mariners and NAVAREA messages sent to the regional coordinator of NAVAREA IV and XII (NGA), by email: navsafety@nga.mil, headed that, from January 2019 to date 84 Radio notices NAVAREA of the Gulf of Mexico area and 81 of the Pacific Ocean had been sent to the NAVAREA coordinator.

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

Table 5. Hydrographic coverage

	A	B	C
Depths < 200m	16%	05%	84%
Depths > 200m	08%	05%	92%

Currently, the Secretary of the Navy has the challenge of covering the entire bathymetric surface of the seabed from the Annual Hydrographic Survey Program through the Hydrographic Survey Teams, Hydrographic Vessels, Research Boats of other National Dependencies and International Bathymetric Data, all this with due compliance with the IHO standards.

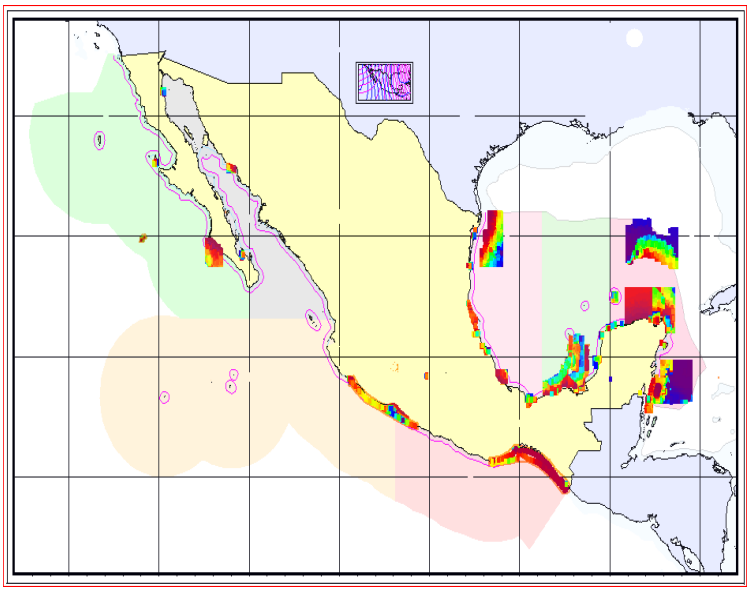

Figure 12. Bathy Data Base coverage with recent survey information

6.2 Nautical Chart Coverage Available:

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

A = percentage covered by INT series, or a paper chart series meeting the standards in M-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

Table 6. Nautical chart coverage.

Purpose/Scale	A	B	C
Offshore passage/Small	80%	1.8%	0%
Landfall and Coastal passage/Medium	0%	13.%	12.2%
Approaches and Ports/Large	0%	39.%	24.3%
Percentage of Group A showing depths in metres	100%		
Percentage of Group A referenced to a satellite datum	100%		

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 Specialty of Hydrography is supported by the DIGAOHM and the Directorate of hydrography.

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

7.1.1 Specialty in hydrography and cartography (offer)

The Specialty of Hydrography is a one-year postgraduate course held at the Oceanographic Institute of the Gulf of Mexico and the Caribbean Sea. Currently in the school year from January 14, 2019 to January 19, 2020, generation XIX has the following number of students: 06 officers of the Mexican Marine Secretariat, 02 national civilians, 03 foreign officers of the Project to Strengthen Capacities Hydrographic in Mesoamerica and the Caribbean Sea (FOCAHIMECA); In the school year from August 1, 2019 to July 19, 2020, generation XX has the following number of students: 04 officers of the Mexican Marine Secretariat, 02 national civilians. The next course will start on July 2020.

7.1.2 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. The class is expected to start on July 2020.

7.1.3 Backscatter and Multi-spectrum (offer)

From October 29 to 31 of 2019, a backscatter and multi-spectrum workshop was offered to the staff of the Directorate of Hydrography and students of the Specialty of Hydrography, having as instructors Samantha Bruce, Manager of the Survey Application and Mike Brissete, Technical Engineer for Latin America, both of the R2Sonic Company.

The objective of the workshop was to analyze the functions and applications with which the R2Sonic2024 multi-beam echo sounder was designed, by showing how to acquire the multi-beam data with 3 frequencies (medium, high and low) simultaneously so that the data processing could be applied the necessary filters to obtain the multispectral backscatter mosaic and a better understanding of underwater relief and characterization.

Figure 13. Students at the Trainning on Backscater and multispectrum

7.1.4 Side Scan Sonar (offer)

From November 11 to 13 of 2019, the Seaprod Mexican company offered the staff of the directorate of Hydrography and students of the Specialty of Hydrography, a side scan sonar curse. The purpose was to know principles of operation and techniques to acquire and process side scan sonar data of the seabed.

Figure 14. Students at the Training on side scan sonar

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 people trained is used to disseminate the knowledge learned to the new DIGAOHM hydrographers and also to the countries participating on the FOCAHIMECA project in the region.

The Mexico Marine Secretariat have taken advantage of the Capacity Building programs promoted by the IHO and those under special agreement between the Mexican Navy and Navies of friendly countries. There is still a demand of the DIGAOHM to get more people trained on the field of nautical cartography.

7.2.1 On August of 2019, Commander Simitrio Morales López, began the Postgraduate Course on Ocean Bathymetry, with a duration of 12 months in the University of New Hampshire (UNH), EE.UU. The postgraduate is 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.

Figure 15. Student at UNH Postgraduate Course on Ocean Bathymetry

7.2.2 On August 2019, Commander Adrián Montufar Arroyo, began his Master's studies in Hydrographic Sciences at the University of South Mississippi (USM) USA, The Master's degree is funded by the Republic of Korea and is promoted by the IHO.

Figure 16. Student at the USM Master on Hydrographic Science

7.2.3 Lieutenant Junior Grade Miguel Garcia Camarillo is attending the Hydrography and Oceanography Course Category "A" with a duration of 2 years at the Hydrographic and Oceanographic Service of Chile (SHOA). The Hydrographic Service of Chile offers the opportunity to train national and foreign students; providing them with the necessary bases to serve as Heads of Commission Groups and thus be able to implement the different designated hydrographic surveys.

Figure 17. Student at the SHOA Hydrography and Oceanography Course

7.2.4 Lieutenant Junior Grade Felipe Ortiz Soto, attended from July 23rd to 25th, 2019, to the Chart Adequacy Workshop, promoted by NOAA's Office of Coast Survey, which took place in the city of Silver Spring (Maryland) USA.

8. OTHER ACTIVITIES

8.1 Marine Spatial Data Infrastructures (MSDI) Progress

8.1.1 International

The Meso American and Caribbean Sea Hydrographic Commission has established a Working Group to support the development of MSDI in the region, Mexico is participating with the data from its nautical charts and is leading nationally an effort to promote the creation of a national MSDI according to international specifications.

8.1.2 National Marine Spatial Data Infrastructures (MSDI) Progress

On August 29, 2017, the Marine Secretariat promote creation of the Technical Committee Specialized in Marine Information (CTEIM), under the National System of Statistic and Geographic Information, with the aim of promoting that marine information in Mexico is generated, processed and disseminated, in compliance with national and international standards, that contribute to its homogeneity and interoperability, so that it could be useful for the establishment of public policies in the matter.

The CTEIM is chaired by the Marine Secretariat and integrated by diverse government agencies in charge of producing marine information, as well as observing academic and research institutions.

The first task of CTEIM was to prepare a diagnosis of needs and sources of marine information, to be based on the work program and direct efforts to meet the information needs detected. Other result of the diagnosis was a list of web pages where marine information can be consulted.

Table 7. Marine Information by Mexico government agencies

Dependencia	Sistema	Página web	Contenido
Secretaría de Marina (SEMAR – DIGAOHM)	Archivo de Información Oceanográfica Nacional (AION).	Solicitar acceso a través de la liga: 1. dependencia educativa: https://digaohm.semar.gob.mx/oceanografia/DatosOceanograficos.html 2. empresas privadas: https://digaohm.semar.gob.mx/oceanografia/DatosOceanograficosPriv.html	El AION Integra los datos e información metoceánica generados por las dependencias pertenecientes a la Administración Pública Federal e Instituciones Académicas nacionales y extranjeras, que resulten de las investigaciones realizadas en el Mar Territorial y Zona Económica Exclusiva a fin de resguardar y mantener actualizado el AION.
Comisión Nacional del Agua (CONAGUA)	Sistema Nacional de Información del Agua (SINA)	http://sina.conagua.gob.mx/sina/	El SINA es el sistema institucional de la CONAGUA, a cargo de la Subdirección General de Planeación, a través de la Gerencia de Coordinación Interinstitucional. El SINA integra y publica información estadística y geográfica del sector hídrico con información proveniente de diversas áreas de CONAGUA y de otras instituciones.

Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO)	Sistema de Información y Análisis de Ecosistemas Marinos de México (SIMAR)	https://simar.conabio.gob.mx/	Es una plataforma web on-line interactiva es un desarrollo tecnológico de la CONABIO, que integra y visualiza datos in-situ (a través del sistema in-situ de monitoreo oceánico, SIDMO), de diversas instituciones que realizan labor de monitoreo marino-costero, y productos satelitales de temperatura y color del océano (a través del sistema satelital de monitoreo oceánico, SATMO). De ambos módulos se derivan sistemas operacionales de evaluación de ecosistemas y alertas tempranas para la toma de decisiones, como instrumentos para la conservación y uso sostenible de la biodiversidad (ej. en áreas naturales protegidas marinas).
UNAM	Repositorios de datos del Instituto de Ciencias del Mar y Limnología	http://metadata.icmyl.unam.mx/	Es un servicio digital que tiene por objetivo proporcionar una plataforma confiable, con la capacidad suficiente para digitalizar, resguardar y administrar el conocimiento multidisciplinario que se ha estado generando, derivado de la investigación y exploración de los sistemas acuáticos de México y en particular por la comunidad académica del Instituto de Ciencias del Mar y Limnología (ICML), UNAM.
CNH	Mapa de la Industria de Hidrocarburos	https://mapa.hidrocarburos.gob.mx/	Esta herramienta permite seleccionar elementos de varias capas, a partir de la coincidencia espacial con otra capa.Se permiten tres tipos de selecciones: • Dentro de: identifica los elementos que están contenidos completamente dentro del elemento seleccionado. • Intersección: identifica los elementos que comparten al menos un punto en común con la geometría del elemento seleccionado. • Cruzan: identifica elementos que comparten parcialmente, pero no todos los puntos interiores, con la geometría del elemento seleccionado.

8.2 Participation on international Conferences

From July 15th to 20th, 2019, Lieutenant Cecilia Zuleima Cortina Guzmán, participated in the 29th International Cartographic Conference in Tokyo, Japan, with the poster entitled: "Workshop on Adaptation of Cartographic of the Oceanic and Atmospheric Administration of the United States NOAA, which was presented during his internship in 2018 as a student of the GEBCO program. The conference was organized by the International Association of Cartographers (ICA) and aims to promote the profession and discipline of cartography and Geographic Information Sciences in the international context.

Figure 18. Participation on the 29th International Cartographic Conference.