

**MESO AMERICAN – CARIBBEAN SEA HYDROGRAPHIC COMMISSION  
(MACHC)**

**24<sup>th</sup> CONFERENCE OF THE MESO AMERICAN – CARIBBEAN SEA  
HYDROGRAPHIC COMMISSION (MACHC24)  
Paramaribo, Suriname – December 12 to 15, 2023**

**NATIONAL REPORT FROM BRAZIL TO THE MACHC24**

**1. Hydrographic Office / Service:**

- a) Name of the institution: Directorate of Hydrography and Navigation (DHN).
- b) Description: DHN is responsible for hydrographic surveys and its analysis, nautical chart production, nautical publication release, weather forecast broadcast, maritime safety information and navigational warning broadcast, oceanographic data analysis, hydrographic training and capacity building implementation.
- c) Submitted by: Lt. Cmdr Christopher Florentino, christopher@marinha.mil.br

**2. Surveys:**

- a) Coverage of new surveys: from December 2022 to November 2023, the Brazilian Navy Hydrographic Vessels carried out surveys in the Amazon Basin, contributing to the nautical cartography production of the area.

<b>Vessel</b>	<b>Survey – Area</b>	<b>Period</b>
Navio Hidroceanográfico Garnier Sampaio	Amazon River (Between Pedreira Islands and Channel Grande do Curuá)	Nov. to Dec. 2022
Navio Hidroceanográfico Garnier Sampaio; Aviso Hidroceanográfico Fluvial Rio Xingu; and Aviso Balizador Denébola	Tocantins River (Between the mouth and Mocajuba)	Apr. to Jun. 2023
Navio Hidroceanográfico Balizador Tenente Castelo	Amazon River (Between Prainha and Almerim)	May to Jul. 2023
Navio Hidroceanográfico Garnier Sampaio; Aviso Hidroceanográfico Fluvial Rio Xingu; and Aviso Balizador Denébola	Pará River (Between the mouth Tocantins River to Furo Arrozal)	Jul. to Aug. 2023
Navio Hidroceanográfico Balizador Tenente Castelo	Amazon River (Between the mouth Xingu River and Tuquara Island)	Aug. to Sep. 2023

Aviso Hidroceanográfico Fluvial Rio Solimões	Negro River (Between Remanso and Marabá)	Jun. to Sep. 2023
Aviso Hidroceanográfico Fluvial Rio Solimões	Solimões River (Between Tomanicoá to Tarará Island)	Feb. to Apr. 2023
Navio Hidroceanográfico Fluvial Rio Branco	Amazon River (Port of Manaus)	Jul. to Aug. 2023
Aviso Hidroceanográfico Fluvial Rio Negro	Madeira River (Between Vila Belmonte to Enseada do Manivão)	Jan. to Feb. 2023
Navio Hidroceanográfico Fluvial Rio Branco	Madeira River (Between Itapenima to Aripuanã)	Mar. 2023
Aviso Hidroceanográfico Fluvial Rio Negro	Negro River (Between Castanheira and Remanso)	Ago. 2023

- b) Coverage of new surveys carried out by private entities:  
DHN is responsible for controlling the hydrographic surveys performed in the jurisdictional waters of Brazil by Brazilian Navy survey vessels and private companies. From December 2022 until November 2023, 40 hydrographic surveys were carried out in Amazon Basin.
- c) New technologies and /or equipment:  
Five photogrammetric surveys were carried out using the Unmanned Aerial Vehicle (UAV), model Dji Mavic 2 Pro PPK. This equipment has a PPK module, which enables a kinematic post processing and a camera capable to achieve a 25cm resolution. The results were assessed as suitable to support the cartographic update process.
- d) New ships: XXX.
- e) Crowdsourced and satellite-derived bathymetry - national policy: under evaluation. They are not recognized as valid chart update sources so far.
- f) Challenges and achievements:  
- Refinement of tidal reduction data at Amazon river mouth is still a challenge. The region known as “bump” has a high-speed current which hinders a tide gauge to be set.  
- Provision of trainings in hydrographic data analysis and charting production to the Regional Hydrographic Branches in Belém-PA and Manaus-AM is a particular challenge due to the great distance and the difficulty to harmonizing DHN with their own production.

### 3. New charts & updates:

- a) ENC coverage, gaps and overlaps:  
Brazilian ENCs don't present gaps neither overlaps due to internal and external (IC-ENC) systematic checks.

Three new cells were produced since last MACHC Conference:

BR404051 – De Manacapuru à Ilha Periquitos

BR404054 – De Anori à Codajás

BR404055 – De Codajás à Coari

31 ENC cells were updated since the last meeting:

BR221010 - Do Cabo Orange à Ilha de Cajutuba

BR321200 - Do Rio Calçoene a Ilha Sipioca

BR321400 - Do Machadinho a Ponta Quatipuru

BR322900 - Da Ponta Jucu a Ponta do Guriri

BR400204 - Das Ilhas Pedreira à Ilha de Santana

BR400221 - Barra Norte do Rio Amazonas

BR400244 - De Gurupá à Ilha Ituquara

BR400302 - De Salinópolis ao Canal do Espadarte (NE)

BR400303 - Do Cabo Maguari a Ilha Coroa Grande

BR400304 - De Mosqueiro a Vila do Conde

BR400305 - Da Ilha do Capim à Ilha da Conceição

BR400306 - Da Ilha da Conceição aos Estreitos

BR404021 - Do Lago Armaná à Ilha do Amador

BR404023 - De Óbidos as Ilhas do Caldeirão

BR404025 - Das Ilhas do Caldeirão à Ilha do Mocambo

BR404027 - Da Ponta dos Mundurucus à Parintins

BR404030 - Da Ilha Panumã a Novo Remanso

BR404032 - De Novo Remanso à Manaus

BR404051 - Da Ilha do Baixio à Ilha Periquitos

BR404055 - Da Ilha de Codajás à Ilha Trocari

BR441031 - Da Ilha do Mouraba a Costa do Ituqui

BR441032 - Do Paraná do Ituquí a Ilha do Meio

BR500321 - Porto de Vila do Conde

BR500830 - Porto de Cabedelo

BR54020A - Porto de Santarém

BR540231 - Paraná de Santa Rita

BR540261 - Paraná do Mocambo

BR540321 - Porto de Manaus

BR640321 - Plano Porto de Manaus

BR640323 - Terminais da Reman

BR400221 - Barra Norte do Rio Amazonas

b) ENC distribution method:

Brazilian ENCs are distributed by IC-ENC. In 2018, the Brazilian company EMGEPRON began working as reseller of VAR PRIMAR (<https://cartasnauticasbrasil.com.br/>).

c) RNCs:

DHN provides Raster Navigational Charts for NAVAREA V.

505 RNC (167 in MACHC region) are currently available at no cost for the entire community(<https://www.marinha.mil.br/chm/dados-do-segnav/cartas-raster> ).

- d) INT charts:  
XXX
  
- e) National paper charts:  
The paper charts new editions were:  
221 – Barra Norte do Rio Amazonas  
4052 – De Manacapuru à Ilha Periquitos  
4054 – De Anori a Codajás  
4055 – De ilha de Codajás à ilha Trocari
  
- f) Other charts, e.g. for pleasure craft:  
XXX.
  
- g) Challenges and achievements:  
DHN provide trainings to Navy local hydrographic branches focusing on hydrographic data analysis, upload and validation of bathymetric and cartographic databases and production of nautical charts. Key technical personnel specialized in Hydrography and Cartography was transferred to those branches, aiming to improve their production capabilities and to create critical mass.

#### **4. New publications & updates:**

- a) New Publications:  
Tide Tables DG6, 60th Edition, Brazil, 2023.  
Nautical Almanac DN5, 79th Edition, Brazil, 2023.
  
- b) Updated publications:  
XXX.
  
- c) Means of delivery, e.g. paper, digital:  
Accessible through paper format (EMGEPRON's website <https://cartasnauticasbrasil.com.br/>) and digital format (DHN's website - <https://www.marinha.mil.br/chm/dados-do-segnav/publicacoes> ).
  
- d) Challenges and achievements:  
XXX.

#### **5. MSI**

- a) Existing infrastructure for MSI dissemination:  
Brazilian Navy Hydrographic Centre is responsible for the reception, processing and promulgation of MSI for NAVAREA V, on behalf of DHN, in accordance with GMDSS Master Plan. Navigational warnings and meteorological information are broadcast by SafetyNET II service at scheduled times (0030 and 1230 UTC) twice a day. Meteorological information is broadcast at scheduled times (0730 and 1930 UTC) twice a day. Bad weather warnings are forwarded any time, whenever it's necessary. MSI is

also broadcast in VHF/HF by the Brazilian Navy Radio Station in Rio de Janeiro, at least twice a day. Local navigational warnings are broadcast only by VHF/HF.

b) Statistics on work of the National Coordinator

Country / Territory	PHASE 1. MSI STATUS	MSI 2020	MSI 2021	MSI 2022	MSI 2023	Training Date	Training Date
Brazil (NAVAREA V)	Fulfilling all obligations	160	86	34	30	Apr-2011	Oct-2018

c) New infrastructure in accordance with GMDSS Master Plan

SERVICE	YES	NO
MASTER PLAN	X	
A1 AREA	X	
A2 AREA	X	
A3 AREA	X	
NAVTEX		X
SafetyNET II	X	

d) Challenges and achievements:

Achievement of the full implementation of SafetyNET II.

Final implementation phase of the new online system, based on a web interface, to support MSI dissemination.

## 6. Status of Hydrographic Surveying and Nautical Charting Worldwide (C-55)

C-55 was updated with information from Brazil in October 2023.

C-55 Region B was subdivided in 3 regions: Amazon Basin, Brazilian Coast, and São Pedro and São Paulo Archipelago.

a) Status of hydrographic survey:

Survey coverage, where:

A - Percentage which is adequately surveyed.

B - Percentage which requires re-survey at larger scale or to modern standards.

C - Percentage EEZ which has never been systematically surveyed.

1 - Amazon Basin

	A	B	C
0 - 200m	88	12	0
Depths > 200m	---	---	---

2 - Brazilian Coast – Brazil – INT Region B

	A	B	C
0 - 200m	84	13	3
Depths > 200m	85	0	15

### 3 - São Pedro and São Paulo Archipelago

	A	B	C
0 - 200m	0	100	0
Depths > 200m	100	0	0

#### b) Status of nautical charting:

Coverage of charts published by your organization, where:

A - Percentage covered by INT series/paper chart series meeting the standards in S-4.

B - Percentage covered by Raster Navigational Charts (RNCs) meeting the standards in S-61.

C - Percentage covered by ENC's meeting the standards in S-57.

#### 1 - Amazon Basin

Chart coverage	Passage (%)	Coastal (%)	Port (%)
INT	---	---	---
RNC	---	---	100
ENC	---	---	100
Status of Paper Charts			
Paper charts with depths in meters (%)		100	
Paper charts referenced to a satellite datum (%)		89	

#### 2 - Brazilian Coast – Brazil – INT Region B

Chart coverage	Passage (%)	Coastal (%)	Port (%)
INT	100	100	100
RNC	100	100	100
ENC	100	100	100
Status of Paper Charts			
Paper charts with depths in meters (%)		100	
Paper charts referenced to a satellite datum (%)		100	

#### 3 - São Pedro and São Paulo Archipelago

Chart coverage	Passage (%)	Coastal (%)	Port (%)
INT	100	100	---
RNC	100	100	---
ENC	100	100	---
Status of Paper Charts			
Paper charts with depths in meters (%)		100	
Paper charts referenced to a satellite datum (%)		100	

## 7. Capacity Building

### a) Offer of Capacity Building:

The following courses are offered annually by DHN at no cost to MACHC Members and friendly Navies:

<b>COURSE</b>	<b>DESCRIPTION</b>	<b>DURATION</b>
C-Esp-HN	Aims to qualify the student to be a technician in Hydrography and Navigation issues.	42 weeks Jan – Nov
C-Ap-HN (Recognized by IBSC-IHO as Cat. “B”)	Aims to increase the capability of the student to be a technician in Hydrography and Navigation.	35 weeks Apr – Dec
CAHO (Recognized by IBSC-IHO as Cat. “A”)	Aims to provide the student with the capability to plan, to conduct and to execute the activities related with the Hydrographic Service.	50 weeks Jan – Dec

- CAHO - Course in Hydrography for Officers.
- C-Ap-HN - Course in Hydrography and Navigation for Petty Officers.
- All courses are in Portuguese and students must be fluent in the language.
- These courses are usually offered free of charge to MACHC member countries, with the availability of meals throughout the week, however, there is no possibility of offering accommodation.
- Interested countries must send their requests through the military Attaché of the Brazilian embassy.

### b) Training received, needed, offered:

In 2022, at DHN, an Officer from Cameroon have completed the CAHO, course recognized by IBSC/IHO as Cat “A”.

In 2023, at the DHN, an Officer from Cameroon and Bolivian is also performing the CAHO.

From the 10th to the 21st of July, 2023, a course on theoretical and practical fundamentals on multibeam system operation was held by DHN. This course had the participation of 16 students. The following topics were covered, with emphasis on practical activities on board a hydrographic boat: communication protocols between equipment; data processing; data acquisition tools and procedures; practice of acquiring and processing bathymetric data.

In September 5th, 2023, a Symposium on “Manoeuvring and Navigation: teaching in a simulated environment” was carried out by DHN. This Symposium was attended by approximately 90 professionals related to Maritime Power activities. The following topics were covered:

- Technical aspects of the development of a manoeuvring simulation center;
- Practical applications of bridge simulation in the security of port activities;
- Ship manoeuvring, from the beginnings of Newton and Euler to the 21st century; and
- The flexibility of using the navigation simulator as an educational resource.

In November, 13 – 17th, 2023, the MACHC will carry out a Workshop on tides for Spanish speakers, with the collaboration of the Intergovernmental Oceanographic Commission (IOC), the International Maritime Organization (IMO) and the National Oceanic and Atmospheric Administration (NOAA). This Workshop will take a place in Puntarenas, Garabito, Costa Rica, and the IHO Capacity Building Fund (CB Fund) will pay for the accommodation and travel costs. Brazil, DHN, will support this Workshop with an instructor, Lieutenant Commander Cesar Henrique de Oliveira BORBA.

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

DHN undertakes to carry out activities together with other National Hydrographic Services. In this way, it is possible to optimize efforts and expand the potential to promote technical training.

DHN continues to support The Fluminense Federal University (UFF), in the implementation of a hydrography training at the University.

The University has a hydrographic vessel to support the practice of the program, which remains moored with the other DHN survey vessels.

d) Description of proposals and requests to the IHO/CBSC:

For 2024, Brazil has sent to the SWAtHC Capacity Building Coordination and to the CBSC a submission to carry out a MSDI and Data Assessment Workshop, which was accepted by the President of the SWAtHC and intend to invite two representatives from MACHC. However, to date, this event has not had the financial resources approved from CBSC program.

## 8. Oceanographic activities

a) General:

Deployment of XBTs by Brazilian Navy Ships in international waters, maintenance of 8 (eight) moored buoys of the PIRATA Moored Array Project by Brazilian Navy Survey Ships. Mooring of 12 (twelve) metoceanographic monitoring buoys: 9 (nine) in the Brazilian Coast, and 3 (three) in the Antarctic Peninsula. Furthermore, it has been cast 15 drift buoys in Drake Passage.

b) GEBCO/IBC's activities, GEBCO Seabed 2030 activities

GEBCO surveys are performed by the Brazilian Navy Survey Ships during all hydrographic and oceanographic surveys. DHN continues its effort to provide reliable data to Seabed 2030 initiative

c) Tide gauge network:

222 active tide gauges are distributed throughout the Brazilian territory (October 2023), including a permanent tide gauge in Fernando de Noronha archipelago. 24 active tide gauges are placed in the MACHC region.

d) New equipment:



- Slocum Glider unit was acquired and tested.

- e) Challenges and achievements:  
XXX.

## 9. Spatial data infrastructures

- a) Status of MSDI:

Our Marine Spatial Data Infrastructure (acronymous in portuguese: IDEM-DHN, Infraestrutura de Dados Espaciais Marinhos da DHN) is implemented, albeit in constant improvement, using Geonetwork for the insertion of metadata and Geoserver for the insertion of the geoinformation layers. It's widely available, at no cost, for the general public at <https://idem.dhn.mar.mil.br> .

In the current year, new data and metadata were inserted into IDEM-DHN, mainly nautical charts and oceanographic commissions, amounting to hundreds of updates. There has been progress in the development of the viewer - IDEM-DHN GeoPortal - which now has layer management tools, layer transparency, display of data information and a tool for measuring distances. Other tools and resources are being developed gradually, according to the needs observed, in order to better serve users.

- b) Relationship with the NSDI:

The IDEM-DHN (our MSDI) became a proper node of the Brazilian National Spatial Data Infrastructure (acronymous in portuguese: INDE - Infraestrutura Nacional de Dados Espaciais) managed by the Brazilian Institute of Geography and Statistics - IBGE, of the Brazilian Government (<https://inde.gov.br/>), which means that now all data inserted in IDEM-DHN is automatically updated at INDE.

- c) Involvement in regional or global MSDI efforts:

DHN continues its active participation in all relevant working groups related to IHO MSDIWG.

- d) National implementation of the Shared Data Principles:

All DHN data is shared according to its Open Data Access Policy, published in 2018 (NAD-DHN), available at <https://www.marinha.mil.br/dhn/sites/www.marinha.mil.br.dhn/files/Port13-2018-DHN-Aprova-NAD-DHN.pdf>

- e) MSDI national portal:

The IDEM-DHN contributes with marine data and information as a proper node of the NSDI.

- f) Best practices and lessons learned:

It's noteworthy to register the continuous collaboration with the Brazilian Institute of Geography and Statistics (IBGE), which provided fundamental capacitation, via online courses, to four of our staff members during the current year.

- g) Challenges and achievements:

The current biggest challenges are: to insert the maximum possible amount of layers/metadata, in reference to our Open Data Access Policy (NAD-DHN); and the continuous improvement of the GeoPortal's resources.

## 10. Innovation

- a) Use of new technologies:
  - Brazilian Marine Spatial Data Infrastructure (IDEM-DHN)
  - Marine Environmental Prediction system (PAM)
  - Oracle Exadata Service
  - Tests with an Autonomous Underwater Vehicle (AUV)
  - Slocum Glider unit
  - Studies about Global Ensemble (public) with AI and data to improve predictions
  - Using of drones to collect topo-geodesics information
- b) Risk assessment:  
XXX.
- c) Policy matters:  
XXX.

## 11. Other activities

- a) Participation in IHO meetings:  
IHO Assembly, IHO Finance Committee, IHO Council, SWAtHC, HSSC, IRCC, HSWG, S-101PT, ENCWG, ABLOS, WWWNWS, WEND-WG, MSDIWG and SCUFN.
- b) Meteorological data collection:  
Meteorological data are collected with fixed meteorological stations placed all over Brazil and along the coast, by ships and are also received from other institutions through internet links. All data are used for the Brazilian Marine Meteorological Service products, broadcast at no cost along and offshore the Brazilian coast and available at internet.  
The transmission of the products of the Brazilian Marine Meteorological Service is carried out through several channels, such as: the INMARSAT SafetyNET II satellite service; the Brazilian Network of Coastal Stations (in VHF and HF); the Brazilian Navy Radio Station in Rio de Janeiro (ERMJR) in HF; the webpage (<https://www.marinha.mil.br/chm/banner/servico-meteorologico-marinho>), “Previsão Ambiental Marinha (PAM)” and the “Boletim ao Mar” applications for tablets and smartphones.
- c) Geospatial studies:  
DHN has consistently updated its application the Marine Environmental Forecast system (PAM), which exhibits forecasts of oceanographic and meteorological numerical models in a dynamical way. The system is available at a website and for mobile devices, for Android and iOS.
- d) Preparation for responses to disasters:  
DHN provides a 24/7 service with telephone and e-mail.
- e) Environmental protection:  
DHN created a segregated MPA layer at its cartographic database where all informed protected areas are coded. It’s been prepared for future S-100 needs. This information is represented at paper charts and ENCs.

- f) Engagement with the Maritime Administration:  
The Brazilian Maritime Administration is under the Brazilian Navy structure. DHN maintains straight collaboration with the Brazilian Directorate of Ports and Coasts, an important body of the Brazilian Maritime Administration.
- g) Aids to Navigation matters  
From May 29 to June 3, the 2023 IALA Conference took place in Rio de Janeiro, representing a vital technical event featuring presentations on the latest technological advancements in maritime and inland waterway aids to navigation. With 80 technical presentations and more than 540 delegates from up to 73 countries, this conference provide great knowledge exchange. Additionally, a 2,000 square-meter Industrial Exhibition featured key players in the aids to navigation industry showcasing cutting-edge solutions. The event emphasized international cooperation and knowledge sharing to enhance maritime safety, reduce risks, and preserve the marine environment. Overall, the 2023 IALA Conference played a significant role in advancing navigation technology in Brazil and worldwide.
- h) Magnetic and gravity surveys:  
DHN conducted magnetic surveys related to Brazil's submission to the United Nations' Commission on the Limits of the Continental Shelf.
- i) International engagements:  
DHN actively participates of workgroups and commissions at IHO, IMO, IALA, IOC and WMO. It also contributes with smaller organizations that discuss adjacent topics to the previously mentioned ones (e.g. IEHG, IC-ENC).
- j) Others: XXX.

## **12. Conclusions**

DHN reassures its commitment with MACHC and plans continuous hydrographic activities so as to keep its nautical charts updated, as stated in regulations V and IX of the SOLAS Convention.