MESO AMERICAN – CARIBBEAN SEA HYDROGRAPHIC COMMISSION (MACHC)

23rd CONFERENCE OF THE MESO AMERICAN – CARIBBEAN SEA HYDROGRAPHIC COMMISSION (MACHC23)
St. Louis, Missouri, USA – November 29 to December 2, 2022

NATIONAL REPORT FROM BRAZIL

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.
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2. Surveys

a) Coverage of new surveys: from December 2021 to November 2022, the Brazilian Navy Hydrographic Vessels carried out surveys in the Amazon Basin, mainly in Madeira, Solimões and Amazon rivers, and in the São Pedro and São Paulo Archipelago contributing to the nautical chart production of these areas.

Vessel	Survey	Period
Aviso Hidroceanográfico Fluvial "Rio Xingu"	Amazon River - from Monte Alegre to Prainha, state of Pará	Oct to Dec 2021
Aviso Hidroceanográfico Fluvial "Rio Branco"	Madeira River - between Porto Curuçá and Costa Santa Rosa, state of Amazonas	Jan to Feb 2022
Aviso Hidroceanográfico Fluvial "Rio Solimões"	Solimões River - between Caeté Island and São Paulo de Olivença, state of Amazonas	Jan to Mar 2022
Aviso Hidroceanográfico Fluvial "Rio Negro"	Madeira River - between Igarapé-Açú and Porto Curuçá, state of Amazonas	Feb to Mar 2022
Aviso Hidroceanográfico Fluvial "Rio Xingu"	Amazon River - Fugitivo Bank in Macapá Bay, state of Amapá	Feb to Mar 2022
Aviso Hidroceanográfico Fluvial "Rio Xingu" and Aviso Hidroceanográfico Fluvial "Tocantins"	Straits Region - between Amazonas River and Pará River, state of Pará	Apr to Jul 2022
Aviso Hidroceanográfico Fluvial "Rio Xingu"	Pará River - between Bocas Bay and Tocantins River mouth, state of Pará	Jul to Sep 2022

Navio de Pesquisa Hidroceanográfico "Vital de Oliveira"	São Pedro and São Paulo Archipelago	Sep 2022

b) Coverage of new surveys carried out by private entities:
DHN is responsible for controlling the hydrographic surveys conducted in the Brazilian jurisdictional waters by Brazilian Navy survey vessels and private companies.
From December 2021 until November 2022, 57 hydrographic surveys were carried out in the Amazon Basin by private companies.

c) New technologies and /or equipment:
Two Unmanned Aerial Vehicle, model Dji Mavic 2 Pro PPK, were purchased. This model is equipped with a PPK module, which enables a kinematic post processing and a camera capable to achieve a 25 cm resolution.

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 the mouth of the Amazon River is still a challenge. The region known as "bump" has a high-speed current that makes it difficult to place a tide gauge.
Provision of trainings in hydrographic data analysis and charting production to the Regional Hydrographic Branches in Belém and in Manaus represents is a particular challenge due to the great distance and the difficulty to harmonizing DHN production 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 validation checks.

Two new ENC cells were produced since the last MACHC Conference:
BR54020A - Porto de Santarém
BR54051 - Da Ilha do Baixio à Ilha do Barroso

29 ENC cells were updated since the last MACHC Conference:
BR400303 - Do Cabo Maguari a Ilha Coroa Grande
BR400304 - De Mosqueiro a Vila do Conde
BR500321 - Porto de Vila do Conde
BR400412 - Baía de São Marcos - Prox. Do Terminal da Ponta da Madeira e Itaqui
BR500413 - Terminal da Ponta da Madeira e Porto de Itaqui
BR500830 - Porto de Cabedelo
BR221010 - Do Cabo Orange à Ilha de Cajutuba
BR321200 - Do Rio Calçoene a Ilha Sipioca

BR321400 - Do Machadinho a Ponta Quatipuru
BR321600 - Da Ilha Maiaú a Ponta Hazou
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
BR441012 - Da Ilha Cajari à Ilha Grande de Taiaçui
BR441021 - Da Ilha do Sarapoí a Almeirim
BR441022 - De Almeirim a Prainha
BR441031 - Da ilha do Mouraba a Costa do Ituquí
BR441032 - Do Paraná do Ituquí a Ilha do Meio
BR504411 - Da Foz do Rio Trombetas ao Lago Paru
BR540321 - Porto de Manaus
BR504211 - Da Foz do Rio Jari a Ilha Xavier
BR504215 - Da Ilha Xavier à Ilha Jupatituba
BR504217 - Do Paraguai à Fazenda Caiçara
BR504417 - Do Lago Aracuã ao Porto Trombetas
BR540261 - Paraná do Mocambo
BR540293 - Terminal Graneleiro
BR540292 - Da Ilha Panumã a Novo Remanso

b) ENC distribution method:
Brazilian ENCs are distributed by IC-ENC. Since 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.
513 RNC (77 in MACHC region) are currently available at no cost for the entire maritime community (https://www.marinha.mil.br/chm/dados-do-segnav/cartas-raster).

d) INT charts:
XXX

e) National paper charts:
Two new editions of Brazilian paper nautical charts were issued:
4020A - Porto de Santarém
4051 - Da Ilha do Baixio à Ilha do Barroso

f) Other charts, e.g. for pleasure craft:
DHN released 14 Inland ENCs for the Madeira River in 2021.

g) Challenges and achievements:
DHN provided trainings to the Regional Hydrographic Branches (Belém and Manaus) on hydrographic data analysis, validation of bathymetric and cartographic databases and

charting production. The internet connection problems were solved so they can now work directly in the databases stored at DHN, city of Niterói, state of Rio de Janeiro. Key technical personnel specialized in Hydrography and Cartography was allocated to those Regional Hydrographic Branches, aiming to improve their production capabilities and to create critical mass.

4. New Publications & Updates

a) New Publications:
International Charts Series INT 1 Symbols, Abbreviations and Terms used on Charts, 5th Edition, Brazil, 2022
Tide Tables DG6, 59th Edition, Brazil, 2022
Nautical Almanac DN5, 78th Edition, Brazil, 2022.

b) Updated publications:
List of Lights, 38th Edition, Brazil, 2022-2023
East Coast Sailing Directions, 14th Edition, Brazil, 2022-2026

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. Maritime Safety Information (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 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 2019	MSI 2020	MSI 2021	MSI 2022	Training Date	Training Date
Brazil (NAVAREA V)	Fulfilling all obligations	165	160	86	34	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	X	

d) Challenges and achievements: The implementation of an online form for issuing standardized maritime safety information is in its testing phase.

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

C-55 was updated with information from Brazil in February 2022.
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 which has never been systematically surveyed.

1 - Amazon Basin

	A	B	C
0 - 200m	83	17	0
Depths > 200m	-	-	-

2 - Brazilian Coast

	A	B	C
0 - 200m	35	65	0
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 ENCs meeting the standards in S-57.

1 - Amazon Basin

Chart coverage	Passage (%)	Coastal (%)	Port (%)
INT	-	-	-
RNC	-	-	90
ENC	-	-	100
Status of Paper Charts			
Paper charts with depths in meters (%)		100	
Paper charts referenced to a satellite datum (%)		89	

2 - Brazilian Coast

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:

COURSE	DESCRIPTION	DURATION
Basic in Hydrography	Aims to qualify the student to be a technician in Hydrography and Navigation issues.	42 weeks Jan – Nov
Intermediate in Hydrography (Recognized IHO Cat. "B")	Aims to increase the capability of the student to be a technician in Hydrography and Navigation.	35 weeks Apr – Dec
Advanced in Hydrography (Recognized IHO 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

b) Training received, needed, offered:

In December 2021, two representatives from the Senegalese Navy completed the Intermediate Course in Hydrography (IHO Cat "B") and the Advanced Course in Hydrography (IHO Cat "A").

In 2022, an Officer from Cameroon is taking the Advanced Course in Hydrography offered by DHN.

In January 2022, 2 representatives of DHN attended a virtual training, organized by UKHO, which covered the following subjects:
- Understanding ENCs,
- Introduction to S-57, and
- Compiling for Navigational Safety.

In October 2022, DHN carried out the "Port and Shallow Water Survey Course" funded by IHO CBSC. A representative from Guatemala attended this course. The students took theoretical classes, including e-Learning with Teledyne Geospatial (CARIS) professionals, and practical activities on the field with a hydrographic survey boat.

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 program at the University.
UFF has already purchased a hydrographic vessel to support this program.

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

For 2023 CBWP, Brazil submitted to the SWAtHC Capacity Building Coordination to CBSC the proposal of the Tides and Water Level Workshop with two places available for the MACHC. However, to date, this event has not had any financial resources allocated.

8. Oceanographic Activities

a) General:
Brazilian Navy Ships deployed XBTs in international waters, maintained 8 (eight) moored metocean buoys of the PIRATA Moored Array Project, deployed 7 (seven) moored metocean buoys (four along the Brazilian Coast and three in the Antarctic Peninsula region) and launched 41 drift buoys in the Drake Passage.

b) GEBCO/IBC's activities, GEBCO Seabed 2030 activities:
Brazilian Navy Survey Ships collected bathymetric data during transits of hydrographic and oceanographic cruises. These data will be delivered in due course to IHO DCDB and to support GEBCO Program and Seabed 2030 Project.

c) Tide gauge network:
222 active tide gauges are distributed throughout the Brazilian territory (October 2022), including a permanent tide gauge in Fernando de Noronha Archipelago. 24 active tide gauges are installed in the MACHC Region.

d) New equipment:
XXX

e) Challenges and achievements:
XXX

9. Spatial Data Infrastructures

a) Status of MSDI:
DHN is creating and storing metadata using Geonetwork. Data sharing and visualization with Geoserver was implemented to support the Brazilian Marine Spatial Data Infrastructure (IDEM-DHN). An open source solution to a Geoportal viewer is available at the link https://idem.dhn.mar.mil.br. DHN will continue to improve and develop IDEM-DHN.
The Digital Terrain Model of Brazilian Continental Shelf with a resolution of 1 km x 1 km, the raster version of the Brazilian nautical charts and several other layers and metadata are available according to the DHN Data Access Policy (NAD-DHN).

b) Relationship with the NSDI:
IDEM-DHN is a node of the Brazilian National Spatial Data Infrastructure (INDE) managed by the Brazilian Institute of Geography and Statistics (IBGE).

c) Involvement in regional or global MSDI efforts:
DHN participates in IHO MSDIWG, UN-GGIM WGMGI and OGC Marine DWG meetings.

d) National implementation of the Shared Data Principles:
All DHN data is shared according to DHN Data Access Policy (NAD-DHN) issued in 2018.

e) MSDI national portal:
Brazil has a national portal for all government geospatial data (Brazilian National Spatial

Data Infrastructure - INDE), which is general geospatial data portal. The IDEM-DHN contributes with marine data and information as a node of INDE.

f) Best practices and lessons learned:
Metadata extraction can be a challenging effort, especially when not using proper spatial ETL tools or when data lacks coherent structure. Collaboration in the context of the Brazilian Spatial Data Infrastructure (INDE) with the Brazilian Institute of Geography and Statistics (IBGE), specially through online courses offered by IBGE, has proved highly beneficial, in contribution to IDEM-DHN.

g) Challenges and achievements:
Allocation technical resources dedicated to implement and keep the spatial data infrastructure and qualified raw data is challenging.

10. Innovation

a) Use of new technologies:
- Brazilian Marine Spatial Data Infrastructure (IDEM-DHN)
- Marine Environmental Forecast system (PAM)
- Oracle Exadata Service

b) Risk assessment:
XXX

c) Policy matters:
XXX

11. Other activities

a) Participation in IHO meetings:
IHO Council, SWAtHC, HCA, IRCC, HSSC, HSPT, S-100WG, S-101PT, ENCWG, NCWG, NIPWG, DQWG, TWCWG, ABLOS, WWNWS-SC, WENDWG, 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 satellite service; the Brazilian Network of Coastal Stations (in VHF and HF); the Brazilian Navy Radio Station in Rio de Janeiro (ERMRJ) in HF; the webpage (https://www.marinha.mil.br/dhn/?q=en), and the "Boletim ao Mar" application for tablets and smartphones.

c) Geospatial studies:
DHN released the Marine Environmental Forecast system (PAM) which includes forecasts of oceanographic and meteorological numerical models.

Both systems have mobile device applications available 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 Marine Protected Area (MPA) layer in 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 nautical 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
DHN is responsible for the publication of all AtoN products, as well as actively represent Brazil's interests at IALA.

h) Magnetic and gravity surveys:
DHN conducted magnetometry surveys related to Brazil's submission to the United Nations' Commission on the Limits of the Continental Shelf.

i) International engagements:
DHN actively participates in working groups, committees and commissions at IMO, IALA, IOC and WMO. It also contributes with other organizations dealing with areas related to those mentioned (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.