

IHO Capacity Building programme

TECHNICAL VISIT REPORT

The State of Hydrography and Nautical Charting in Bolivia



15-16 November 2022

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ABBREVIATIONS

ADCP	Acoustic Doppler Current Profiler
CBSC	IHO Capacity Building Sub-Committee
CIH	Intergovernmental Committee on the Paraguay-Paraná Waterway
DGIMFLM M	Directorate-General for Maritime, River and Lake Interests and the Merchant Navy
DHN	Directorate of Hydrography and Navigation (Brazilian Navy)
DHN	Directorate of Hydrography and Navigation (Peruvian Navy)
ENC	Electronic Navigational Chart
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IHO	International Hydrographic Organization
IMO	International Maritime Organization
MS	Member State
MSI	Maritime Safety Information
NHC	National Hydrographic Committee
NtM	Notice to Mariners
RHC	Regional Hydrographic Commission
RIBB	Bolivian International Vessel Register
ROCRAM	Operative Network of Regional Cooperation of Maritime Authorities of the Americas
SENAMHI	National Service of Meteorology and Hydrology
SEPRHC	South-East Pacific Regional Hydrographic Commission
SHN	Naval Hydrographic Service (Argentinean Navy)
SNHN	National Service of Naval Hydrography (Bolivian Navy)
SOHMA	Service of Oceanography, Hydrography and Meteorology of the Navy (Uruguayan Navy)
SWAtHC	SouthWest Atlantic Hydrographic Commission
SOLAS	[United Nations] Convention for the Safety of Life at Sea
UN	United Nations

EXECUTIVE SUMMARY [PREAMBLE]

The Naval Hydrographic Service of Bolivia (SNHN, for its Spanish acronym) was created by Supreme Decree N° 06780 dated 29 May 1964 and was initially referred to as National Department of Hydrography and Navigation. Since then, its organisational structure and functions evolved until reaching its current mission, which consists of "...planning, studying, researching, promoting, controlling and providing technical-scientific advice on hydrographic, navigation and water resource management activities carried out in the Plurinational State of Bolivia".

Its field of activities includes both hydrographic and topographic surveys, geodetic and hydrological studies, drafting of charts and nautical publications, as well as the implementation and maintenance of the nautical signalling within the jurisdictional areas of the Bolivian Navy. Its main office is located in the city of La Paz, but it also has two regional offices located in the cities of Trinidad (Department of Beni) and Suarez Port (Department of Santa Cruz).

Its participation in the Southwest Atlantic Hydrographic Commission (SWAtHC) goes back to its early stages, but despite its frequent assistance to the yearly calls, it has maintained its observer-State status, expressing during the last year, its will to join the IHO as member.

TECHNICAL VISIT

In 2020, the SWAtHC proposed to carry out a technical visit to Bolivia aimed at encouraging this country to become an IHO's full Member State (MS), the funding of which was approved at the meeting held by the CBSC in that same year. However, due to COVID-19 interruption, its performance was postponed for two years and finally, in the framework of the SWAtHC XVI held in August 2022, it was convened to be performed in November of this same year and composed of members from the Argentine and Uruguayan Hydrographic Services.

GENERAL AWARENESS IN BOLIVIA

Bolivia is a MS of the IMO since 1987 and a signatory to the Safety of Life at Sea Convention (SOLAS) since 2003. Although it has not joined the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), it applies its guidelines on the domestic nautical beaconing, both in the river and lake areas.

The SNHN is exclusively responsible for the charting and nautical publications within Bolivia's jurisdictional waters as well as the release of information affecting the safety in navigation. However, given the geographical characteristics of its waterways, the volume of its activity, as well as the low frequency of news affecting traffic on these waterways, the systems for immediate dissemination of news in the country do not require the degree of technological sophistication that is usual in maritime coastal States.

Despite of that, it could be confirmed that all the interviewed authorities are highly aware of the responsibilities inherent in the capacity as IMO's MS and eventually, of the OHI in the future.

IHO/RHC MEMBERSHIP OF BOLIVIA

Bolivia is an observer-State of the SWAtHC and has expressed its will to become an associate member in 2009 and 2018, modification not materialised due to the lack of subsequent ratification, through the internal procedures of the requesting State.

Since the XIV meeting held in Niterói - Brazil in March 2020, the different representatives of the SNHN have highlighted a positive scenario for the country's integration as a MS of the IHO, for which the high-level and technical visits were identified as essential to contribute to the necessary proceedings to achieve this objective.

INTERNATIONAL OBLIGATION OF BOLIVIA

In accordance with the obligations assumed by Bolivia in its capacity as MS of the IHO and a signatory to the SOLAS, the SNHN is the state body responsible for the drafting of charts and nautical publications necessary for the navigation in national waters. The Service is a decentralized public institution of the Ministry of Defence, under the Bolivian Ministry of Economy and Public Finance for administrative and accounting matters and under the General Command of the Bolivian Navy for technical and disciplinary matters. The members of the visiting committee of the SWAtHC believe that it was clearly seen, in all the hierarchical levels comprising the complement of the SNHN, a notorious awareness of the responsibilities involved in their daily labour, as well as pride in the role developed in favour of the Bolivian people and sovereignty.

CERTIFIED PERSONNEL

Nowadays, there are three category "A" experts in hydrography (two of them trained in Brazil and one in Spain), a geographer engineer, two hydrologist engineers and five experts in topography. Besides, three members of the complement have been trained in hydrography in the framework of an internal training course held in the premises of the SNHN.

HYDROGRAPHIC SURVEY & NAUTICAL CARTOGRAPHY CAPABILITY

Bolivia has the capacity to carry out bathymetric surveys as well as producing cartography and nautical publications for the river and lake areas within the national jurisdiction.

MSI RESPONSIBILITY

Considering its characteristics as a Mediterranean country, navigation within the closed basin of Titicaca Lake as well as the river waterways of Plata and Amazonas basins, the country is not within the jurisdiction of any NAVARREA. However, it has been verified that the establishment of a regular system for the broadcasting of local warnings through VHF radio signal is still pending, a situation that was justified by the Bolivian naval authorities because the reduced frequency of events giving rise to such kind of reports.

REPORT OF TECHNICAL VISIT TO BOLIVIA (15-16 November 2022)

Reference(s):

- A. Letter SNHN N°034/22: Invitation to the SWAtHC Presidency to pay a technical visit to Bolivia during June 2022
- B. IHO CB Procedure 9: *Guidelines to Conduct Technical Visits*
- C. IHO Publication M-2 *The Need of National Hydrographic Services* - Version 3.0.7, June 2018

[Introduction]

The International Hydrographic Organization (IHO) is an intergovernmental organization comprising 98 MS. It is aimed at ensuring that all coastal States provide accurate relevant data, products and services ensuring safe navigation conditions in its territorial waters as well efficiency in the maintenance of a sustainable protection of the marine, lake and river environments. The UN recognizes the IHO as a competent authority for establishing regulations on hydrography and nautical cartography. Its headquarters are in the city of Montecarlo, Principality of Monaco.

The IHO has encouraged the establishment of a Regional Hydrographic Commissions (RHCs) to enable the coordination through them of the cooperation of regional hydrographic activities. They are mainly composed of IHO MS; However, other States can participate as associate members or observers, in accordance with the accession requirements or not to the RHC statute to which they are related. In the SWAtHC, Paraguay is included as an associate member, while Bolivia is an observer member, none of them being part of the list of IHO MS.

The SWAtHC was established in December 2006 with Argentina, Brazil and Uruguay as MS founders and single full members since then. Their meetings have been held in a yearly basis and uninterruptedly since 2007, serving as an environment for discussions and solution of mutual situations related to the hydrographic and marine cartography fields.

This report has been drafted under the express will of assisting the Plurinational State of Bolivia in the strengthening and development of its hydrographic and cartographic capacities, with the aim of maintaining the compliance of the mission of its national hydrographic office (SNHN) and the challenges of the evolution of the requirements of the safety in navigation. This document includes a description of the visit paid, main conclusions and a number of recommended actions to be considered by the main relevant organizations.

1. Background

In 2020 the SWAtHC has first proposed the financing through the CBSC a technical visit to Bolivia, which would be aimed at providing counsel to the SNHN as regards the implementation of policies and national plans aimed at hydrographic and cartographic activities as well as highlighting the benefits of becoming an IHO full MS. In that way, since the CBSC 18th meeting held virtually during June 2020, the financing for the SWAtHC was approved as a top priority matter in order for the technical visit be carried out, which was initially foreseen for November of that same year. Unfortunately, due to the Covid-19 pandemic, its performance was postponed during the following two years, but maintaining the previously stated priority.

Besides, since 2020, the SWAtHC performs an introduction to its meetings in an event called Seminar on Raising Awareness of Hydrography, which is aimed at highlighting the importance of hydrography to the representatives of the associated state and commission observer, Paraguay and Bolivia respectively. This event is also held virtually following the conditions of the subsequent 2021 meeting.

After a seminar's third edition held in person again, in the SwatHC XVI celebrated in August 2022 in Montevideo, Uruguay, it was established that in November of that same year the technical visit to Bolivia will finally be scheduled, for which purpose the hydrographic offices of Argentina and Uruguay were appointed responsible organizations for carrying up such mission. After the meeting, the IHO Director Counter Admiral Mr. Luigi Sinapi paid a high-level visit to Bolivia, which included meetings with the Ministers of Defence and Foreign Affairs of such country, and which served as introductory activities to the before-mentioned technical visit.

2. Composition of the Team

Name	Role
Commodore Valentín Alejandro SANZ RODRÍGUEZ, Director of the Argentine Naval Hydrographic Service (SHN).	Team Leader
Commander Marcelo Leonardo OLIVERA CARDOZO, chief of the Hydrography Department of the Oceanographic, Hydrographic and Meteorological Department of the Uruguayan Navy (SOHMA).	Assistant

The technical visit was carried out in the city of La Paz, Plurinational State of Bolivia from November 15 to 16 2022. During the first session, the premises of Naval Base “Guaqui” of the Fourth Naval District “Titicaca” on the coasts of the before-mentioned lake area were visited, including the Multi-purpose Vessel “Mosoj Huayna” and a navigation onboard one of the patrolling boats assigned to it. Later on, General Commander of the Bolivian Navy was interviewed in his offices in La Paz and the Bolivian Ship Register (RIBB, for its acronym in Spanish) was visited, organization which complies with the duties of the Flag State on behalf of such country.

During the second day, a visit was paid to the premises assigned to the SHNH and it was celebrated a meeting with the Director General of Maritime, River and Lake Interests and Merchant Marine (DGIMFLMM).

Flights: The CBSC Secretariat of the IHO booked the flight connections for the Argentine and Uruguayan delegates from Ezeiza International Airport (Buenos Aires) and General Cesáreo Berisso Airport (Uruguay) to El Alto International Airport as well as the relevant return tickets.

Accommodation: During the stay in La Paz city, the commission stayed in Hotel Calacoto in the southern area of such city.

Transportation: Transportation from and to the airport as well as all the movements related to the scheduled visits were organized by the staff and means of the SNHN.

Food: The SNHN offered lunch and snacks during the timeframe in which the foreseen protocolar activities took place.

PART A - OVERALL ASSESSMENT OF THE SITUATION IN THE REGION

3. Efficacy of the Technical Visit.

The commission found a highly receptive environment to the technical visit and the cooperation opportunities offered, so it is valued that the results of the visit were highly favourable to achieve the organizational will necessary for Bolivia to become an IHO MS and therefore, of the SWAtHC.

4. Cooperative Arrangements and Potential.

a. [Regional Organization].

During the years passed since the first meeting of the SWAtHC, the SNHN has participated randomly, although, particularly, since 2017 its assistance has been active and ongoing, which has also been evidenced by a strong boost for realizing a full accession to the IHO. Bolivia does not exclude considering an eventual participation in the South-East Pacific Regional Hydrographic Commission (SEPRHC), due to its ongoing will of recovering its seacoast in the Pacific Ocean. Furthermore, during the last years, the SwAtHC has considered uninterruptedly the possible inclusion of representatives of Bolivia in the financed courses held in the region, something which was not achieved so far.

b. Regional Organization.

Bolivia already has a coordination background in the performance of regional level tasks, especially in the Titicaca Lake, where joint surveys have been carried out and binational charts have been drafted with the Hydrography and Navigation Directorate (DNH) of the Peruvian Navy, a MS of the SEPRHC and the IHO. Within the scope of the SWAtHC, its greatest cooperation stage has been achieved by the Diretoria de Hidrografia e Navegação (DHN) of the Brazilian navy due to the joint used of Tameto Channel which provides Bolivia with an access to Paraguay river del Plata basin where joint works have been performed.

c. Defence and Security Arrangements.

Bolivia has instruments and procedures for cooperation in the fight against drug trafficking and smuggling with the Republic of Peru in the closed basin of Lake Titicaca and with the Federative Republic of Brazil in the various border waterways.

PART B – BOLIVIA ASSESSMENT

5. RHC Involvement.

Bolivia has served as an observer State in all SWAtHC meetings in which it has participated to date. The SNHN has informed before such RHC in two opportunities its will to become an associate member like Paraguay; during the 3rd meeting held in the city of Montevideo - Uruguay in March 2009 and during the 12nd meeting held in that same city nine years later; both requests were unanimously approved by the MS, however they were not ratified through internal procedures of the requesting State.

In the latest meeting of the SWAtHC held in Montevideo, Uruguay in August 2022, the SNHN was represented by its Director General Captain DAEN Alberto Torrez Alvarez and his Deputy Director Commander DEMN Miguel Angel Rodriguez Marquez. On the website

of the Regional Commission and, particularly, on the SWAtHC XVI one, there is a National Report of Bolivia for the activities of the SNHN during 2021-2022.

6. Preliminary Liaison.

All necessary previous coordination for the performance of the technical visit were carefully dealt with by the before-mentioned Director and Deputy Executive General Director of the SNHN, under the outstanding assistance and management of the SWAtHC representative before the CBSC, *Capitão de mar e guerra* (RM1) Helber Carvalho of the Brazilian Navy.

7. Points of Contact.

The data included in the Yearbook (IHO P-5 Publication) need updating, particularly as regards the name of the responsible person of the SNHN and the directorate of its website. Besides, in such document it is mentioned the existence of a hydrographic vessel, which in accordance with information provided by in the technical visit, it is currently out of service.

DESCRIPTION OF MARITIME ACTIVITIES

8. National Maritime Affairs.

During the technical visit, the following naval authorities provided useful information for the drafting of this report:

- Counter Admiral Juan Arnez Salvador / General Commander of the Bolivian Navy.
- Counter Admiral Ricardo Felix Morales Coronel, General Director of Maritime, River and Lake Interests and the Merchant Navy (DGIMFLMM).
- Captain DAEN Alberto Torrez Álvarez / Executive Director General of the SNHN.
- Captain DAEN José Ángel Carrasco Carrasco / Executive Director of the Bolivian Ship Register (RIBB).
- Commander DEMN Miguel Ángel Rodríguez Márquez / Deputy Executive General Director of the SNHN.

The Bolivian Navy, through the different interviewed authorities, has evidenced a clear awareness on the importance of hydrography and nautical charting as tools beneficial for the country, both as regards safety in navigation, economic growth and protection of water areas. Likewise, there was a clear enthusiasm and pride perception in the activities carried out at their respective levels by the personnel of the different visited organizations.

As a signatory to the SOLAS Convention, Bolivia complies with the assumed obligations pursuant to Chapter V, Rule 9, considering that it performs the collection and compilation of hydrographic data and the publication, distribution and maintenance of the necessary nautical information for safe navigation in national waters. To this effect, the SNHN,

- Performs bathymetric surveys and additional topographic measurements.
- Drafts paper format charts.
- Issues nautical publications such as sailing directions of the Titicaca Lake and river waterways of del Plata basin.
- Makes information on river and lake heights available for mariners on a daily basis.

As regards Rule 4 of the same chapter, the visiting commission noted that Bolivia has a need to study a possible implementation of transmission procedures for coastal news affecting navigation through radio VHF frequency, through the different Port Authorities scattered

along the country. The interviewed personnel expressed that upon the absence of a considerable amount of news justifying such actions there are no specific procedures established in the field.

Although it is not a member of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), Bolivia applies its guidelines in the domestic nautical marking, both in river and lake areas. This could be verified in Lake Titicaca during the navigation from “Guaqui” Naval Base. The maintenance of the domestic marking system is performed by the SNHN’s staff.

The maritime authority of the Plurinational State of Bolivia is the Director of the DGIMFLMM, who settles navigation policies in the country and the coordination with the RIBB, verifies the registration of ships and the issuance of endorsement certificates for mariners. Nowadays, almost 450 ships fly the Bolivian flag, while the State is an active member of different international agreements, including the Operational Network for Regional Cooperation of Maritime Authorities of the Americas (ROCAM, for its Spanish acronym), Latin American Agreement of Viña del Mar and the Intergovernmental Committee of Paraguay - Paraná Waterway (CIH), among others.

Finally, as regards the National Hydrographic Authority, this task is clearly represented by the Executive General Director of the SNHN. Hydrographic activities in the country are exclusively performed by such office enabling their centralisation and coordination. However, it is suggested to go ahead in the implementation of areas of coastal management and specially, the promulgation of a national hydrographic act, as explained later on.

9. Trade and Maritime Traffic.

a. Through Routes.

Bolivia has coasts on the Paraguay River for a 48-kilometre area in the south-eastern extreme of the country, where it is located the small town of Puerto Busch in which a terminal is expected to be built in order to export goods from the Eastern region , mainly iron and soybeans. Transit navigation mainly comes from small size ports and terminals located upstream, at the beginning of the Paraguay-Parana Waterway, coming from the Brazilian city of Corumbá located 200 km from the area.

b. Trans-shipment.

No terminals were identified with subregional port characteristics within Bolivia, which are mainly exit spots for the exportation of goods from the country to abroad.

c. Bulk Trades.

Bolivia uses the Paraguay-Parana Waterway as a very important route for bulk exports of products such as soy, sunflower and wheat. Its main terminals and particularly, its three international ports (Jennefer, Central Aguirre and Gravelal) are in Quijarro port in Tamengo channel, which enables the access to Paraguay river in front of the city of Corumbá (Federative Republic of Brazil).

d. Feeder, Coasting and Local Trade.

Besides its access to del Plata Basin, Bolivia has modest transportation activities of goods and passengers in the Lake Titicaca, mainly in transit to the neighbouring city of Puno in the Republic of Peru.

e. Offshore Supply and Support.

It does not apply to this case study.

f. Tourism Cruise Liners.

It does not apply to this case study.

g. Tourism Small Craft.

The Bolivian Army in cooperation with the Vice Ministry of Tourism uses the multi-purpose vessel “Mosoj Huayna” for the promotion of navigation and tourism in the lake basin of Titicaca Lake, from its base port of Guaqui.

h. Fisheries

There exists an important fishing activity along the lake basin of Lake Titicaca, as well as the tributaries of del Plata Basin, specially from Suarez Port in Cáceres Lagoon.

i. Other information;

Two port and navigation development projects in the Bolivian territory are under study; in addition to the one mentioned in Puerto Busch, it is projected the creation of a new maritime access route through the so-called Ichilo - Mamoré Waterway, which will connect the centre of the country with the Atlantic Ocean through the Amazon River basin. The route begins in Villarroel Port linking the ports of Almacén, Siles, Mamoré and Sucre in the border with Brazil. The SNHN is already drafting the necessary nautical charts.

10. Responsibility for Safety of Navigation.

The SNHN is solely responsible for the national buoyage policy in Bolivian territorial waters as well as the preventive and correcting maintenance of the signs installed.

Besides, as it was previously mentioned there is no dissemination service for urgent notices to mariners (NtMs), due to the low frequency of news affecting the waterways in accordance with the information provided to the visiting commission. Final notices, under the conventional conception, are included in Notices to Mariners Booklets promulgated by the SNHN throughout the year but without a scheduled frequency and are published on the Service's website.

11. Defence Force Responsibilities.

The Bolivian Army through its different components is responsible for the safety and protection of the national sovereignty. The SNHN has performed themed charts and surveys upon request for the purpose of supporting such tasks.

12. Coastal Zone Management and Environmental Protection.

There is no detailed information on that regard.

OUTLINE C 55 ANALYSIS

13. Status of surveys within the National Maritime Zone.

The status of bathymetric surveys performed in areas under the jurisdiction of the Plurinational State of Bolivia is not fully detailed in the version in force of IHO C-55 Publication. However, the characteristics of the areas involved, only of river or lake nature, as well as the volume of the traffic and the draught of vessels navigating along them enable evaluating the existence of an acceptable number of available surveys, especially regarding Lake Titicaca, where in 2019, a new edition of binational chart N° 3000 was published with Peru including more recent bathymetric data.

14. Collection and Circulation of Nautical Information.

Cartography and nautical publications produced by the SNHN are widely spread and used in territorial waters, being used by different players within the navigation field. In Lake Titicaca, products are mainly binational, drafted with the direct participation of the hydrographic services of both nations involved, namely Bolivia and Peru, besides exclusively national charts in which the access to piers such as Guaqui Naval Base are detailed in a better scale.

15. Survey Capability.

The SNHN has the material means and provides training of sufficient human resources for the performance of relevant hydrographic surveys in an autonomous fashion for the waters of national jurisdiction. Although, it does not currently have hydrographic boats in service, it uses boats lent by other branches of the Bolivian Army for specific tasks, informing there is no assistance difficulty for their fulfilment.

16. Independent Chart Production Capability.

The charting division currently has a sole technician responsible for the drafting of products, either from the scratch or the edition of graphic corrections for their maintenance. Although this cannot be identified as a vulnerability matter, the demand for works and the size of the national charting plan enable to affirm its acceptability nowadays. Although the published nautical charts successfully comply with the production regulations under the in-force edition of the IHO S-4 Publication, they are drafted using Hypack and ArcGIS softwares, which have limitations to such effects.

The SNHN informed to be negotiating the acquisition of the license of CARIS Paper Chart Composer, which will provide it with specific tools for chart production.

PROPOSALS FOR COORDINATION AND CAPABILITY BUILDING

17. National Hydrographic Committee.

The Government of Bolivia, through different organizations and entities in the navigation field, is aware of the importance of hydrographic and nautical charts and its benefits for the economic growth of the nation. A NHC is yet to be formalized, so the SNHN expressed its interest to promote a National Hydrographic Act enabling the regularization of activities and the generation of long-term policies in the field.

18. Phase 1 Hydrographic Capability: MSI Organization and GMDSS.

As previously stated, the main difficulty this commission has highlighted is the need to establish procedures in the broadcasting of NtMs. In accordance with the Bolivian lake and river realities, a radio transmission network through the different Maritime Authorities of the Port and Navy Bases, centralized under the Bolivian Navy, could be enough to achieve a purpose in commensurate with the requirements.

a. MSI (Navigational Warnings).

Urgent navigational warnings are not broadcasted in Bolivia and final news are only informed in a Notices to Mariner Bulletin published throughout of the year from time to time. The SNHN does not publish a List of Lighthouses considering the reduced buoyage existent in the country. However, its characteristics are included in the relevant sailing directions of each area. Although there are not Tide, river heights and lake area tables, a daily status of limnometric records of the 52 hydrometric stations in the country is published on the SNHN web page, with a colour code that, according to the expected levels, indicates the tendency for the occurrence of extraordinarily high or low levels.

b. Information on Ports and Harbours.

Before a project, either state run or private, of implementation of Port installations, the Unit of Ports and Navigational Waterways (under the DGIMFLMM) serves as an intermediary authority with the SNHN to provide it with information necessary for the Service to issue certificates and grant authorizations for their running in accordance with their field of competence, with particular focus on the nautical buoyage to be indicated.

c. GMDSS Status.

Summarize the status of GMDSS in local waters, and any advice offered to local authorities (Table 1).

Table 1: Status of GMDSS in local waters.

Master Plan	A1 Area	A2 Area	A3 Area	NAVTEX	SafetyNet	Notes
No	No (VHF)	Not applicable (MF)	Not applicable	Not applicable	Not applicable	See below

Notes:

Considering the geographic characteristics of a country not directly connected to the sea, the only applicable characteristics of the GMDSS are the transmission through VHF frequency signals, which, as previously stated, are not carried out.

d. Other Services.

Both does the SNHN neither create nor issue forecasts of meteorological warnings as the National Meteorological and Hydrographic Service (SENAMHI) is responsible for this task.

19. Phase 2 Hydrographic Capability: Survey.

The SNHN autonomously carries out the bathymetric surveys required to fulfil its mission, deploying its commissions of campaigns in different parts of the country as appropriate, from the closed lake basin in the western Andean region to the Amazon and Plata river basins in the centre and east of the country.

a. Provision of Survey Data.

There exist cooperation instruments between Bolivia and Peru in Titicaca Lake survey, which has enabled the publication of six binational charts, with data collected during joint campaigns and processing of registrations entered with the participation of representatives from both hydrographic offices.

b. Survey Capability.

The SNHN equipment for the performance of bathymetric and topographic studies facilitate a sufficient versatility for the different scenarios representing the three basins that divide the territory.

As regards echo Sounders, two Single and Teledyne Odon single beam are used, with maximum detection features of 300 and 600 metres respectively, values above the maximum sounding known of Lake Titicaca. The horizontal control for the ship is performed with an Atlas Ling GNSS with submetric accuracy, while the registration is carried out with a Hypack software because there exists a license.

For field measurements, the Service uses a total of nine Overall Stations of different origin, six Levels and five topographic GNSS equipments.

Finally, as regards the acquisition of limnigraphic parameters, there is a Valeport sound profiler, two La Motte PH, salinity and dissolved solids meters, a currentometer for current speed and fifty-three stations for measuring the variation in water level, one of them is a pressure station installed at the Guaqui Naval Base in Lake Titicaca, and the remaining fifty-two are limnimeter-type stations, which constitute the network of national hydrometric stations.

As it can be seen, the SNHN has an appropriate equipment for its studies, and hopes to receive an ADCP in the nearer term which enable them to become involved in the analytic study of tide behaviour.

c. Potential for Regional Activity.

Bolivia cooperates with the other members of the CIH, specially with neighbouring nations, in the performance of bathymetric, charting and provision of hydrometric registrations for the navigation in such river waterway.

20. Phase 3 Hydrographic Capability: Chart Production.

The SNHN has a Cartographic division responsible for the production of paper-format charts. It has not been possible to draft ENCs so far. Nowadays, only one crew member from the Service is responsible for the task, using a procedure involving Hypack and ArcGIS softwares to produce the final product, which is partially in accordance with the IHO S-4 standard. The commission was informed of the SNHN's intentions to acquire a specific CARIS software for the production of nautical charts.

21. Summary of the Assessment of the National Hydrographic Capability

Table 2 summarizes the assessment of the national hydrographic capability.

Table 2: Assessment of National Hydrographic Capability.

IHO Member	RHC	NHC	Phase 1 Capacity	Phase 2 Capacity	Phase 3 Capacity	Notes
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No	Observer	No	No	Yes (Self)	Partial	1 to 3.
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Notes:

1. Hydrographic and nautical charting activities are almost exclusively carried out by the staff of the SNHN.
2. The Service drafts special themed charts as supplementary elements for the understanding and fostering of navigation in national waters.
3. The accomplishment capacity of Phase 4 is identified as “Partial” due to three factors; the limitation of qualified personnel, the failure to fully comply with charting production standards (IHO S-4) and the absence of production of electronic nautical charts in S-57 format or InlandENC instead.

PROPOSALS FOR ASSISTANCE

22. Training

As regards the size of tasks and integration of its complement, it is recommendable that the SNHN maintain a hydrographer's Category A or B training plan during alternate periods between two or three years, so that to keep an organizational continuity in the substitution and changes of position in the office's organic scale.

As regards the charting area, the accession to the IHO would enable the SNHN to apply to training courses on nautical charting impaired in the UK with the sponsorship of the Nippon Foundation. Having at least two trained technicians in the area would allow Bolivia to achieve the highest possible degree of compliance of standards under IHO S-4 Publication.

Finally, the CBSC coordinates the requirements for training courses among the countries in the region, to which Bolivia shall access once acquiring a SWAtHC MS status. Training courses such as MSI, surveys with multi-beam Echo Sounder and analysis of tides could significantly contribute to the professionalization of the staff of the SNHN.

23. Equipment.

The SNHN has appropriate equipment for its tasks, both as regards quality, age and quantity. It is recommended to incorporate additional technologies such as a side scan sonar for shallow waters and eventually recover the autonomy of having a hydrographic boat of its own. In a subsequent stage, the Office could target the use of multibeam echo sounders for surveys in port areas.

24. Funding.

The technical visiting commission explained during its interviews with the Commander General of the Bolivian Navy, the Executive Director General of the RIBB and the Director of the DGIMFLMM, the annual contributions made by the MS to the IHO based on the tonnage of their national fleet, the allocation of these funds and the intangible recovery tools that their members acquire through the courses and activities financed by the CBSC. The authorities showed interest and knowledge regarding the information in IHO M-2 Publication, about the importance of national hydrographic offices and the commitments to which the IHO's MS adhere to once they become members.

FOLLOW-UP ACTIONS

25. Encouragement of Formation of an NHC, Development of a National Hydrographic Strategy, and RHC Membership.

The technical visiting commission performed the relevant recommendations to the SNHN and the interviewed naval authorities on the significance for Bolivia to become an IHO MS and it also made all supporting elements available for the next stages to be followed towards the achievement of such purpose.

26. Encouragement of Effective and Timely Collection and Promulgation of Hydrographic Information.

The SNHN is absolutely aware of its responsibilities and commitments inherent to its status as Bolivia's national hydrographic office. The technical visiting commission has only made recommendations as regards the implementation of a system for broadcasting nautical warnings, making the SWAtHC member's expertise in the field available to cooperate with possible local implementation.

27. Encouragement of Development of Hydrographic Capability.

The commission highly valued the cooperation and experience of the SNH in the performance of hydrographic and cartographic data collection and publication tasks in a binational level with the DNH of Peru in Lake Titicaca, besides the exclusive national products existent in its river basins. It was recommended to consider the acquisition of complementary equipment such as a side scan sonar, to recover the capacity of an own hydrographic vessel and to focus, at a later stage, on the use of multibeam echosounders.

CONCLUSIONS

28. Cooperative Opportunities.

The visiting commission evaluates there is a favourable scenario in the organization for internal negotiations in Bolivia to end successfully as regards the accession as an IHO MS. The State has an organizational structure that enables the satisfaction of a great quantity of requirements and commitments that the country must assume to accomplish the requirements of a MS. Furthermore, and without considering the governmental authorities who were interviewed on the occasion of the high-level visit of IHO Director Luigi Sinapi, the various naval authorities with whom the commission had the opportunity to meet showed a clear awareness of the importance of hydrography in the development of navigational safety and for the benefit of the country.

The SWAtHC, through this proceeding, has made all the institutional supporting tools available so that the Bolivian Navy, through the SNHN, can fulfil this project and it also highlighted the direct benefits that the accession to the Organization will bring.

29. National Hydrographic Committees (NHCs).

The existence of a NHC of Bolivia is not formalized, which could occur after the accession to the IHO. The interviewed Naval authorities expressed that the promulgation of a National Hydrographic Act could be beneficial as an intermediate stage for the purpose of regulating the activities in the field and generating state policies in the long term.

Besides this, the SNHN has shown the following strengths:

- Fully autonomous instrumental capacity to perform bathymetric, topographic surveys and appropriate hydrology studies in its navigational lake and river environments.
- Trained staff in the obtention of hydrographic data in the field, its processing and elaboration of final products, such as paper-format nautical charts and supplementary publications.
- It has a background for the performance of works coordinated with the MS of the IHO both in joint campaigns as well as in the drafting of binational charts.

Among the main points to pay attention to with the expectation of keeping or improving its current capacities, it is highlighted that:

- There exists a potential limitation of human resources in the charting production, nowadays centralized in a crew member.
- The lack of a hydrographic vessel of its own, although it was stated that it did not imply an operational limitation so far, could be considered as a material aspect to be addressed.
- It is believed that it is necessary to support an improvement in the broadcasting of interesting information for mariners that can affect safety in navigation in river and lake traffic, including the radio transmission of meteorological warnings and extraordinary hydric levels in comparison to its frequent values.

Recommendations

30. Urgent Actions.

It is recommended to consider a viability implementation study of a system of information radio transmission related to safety in navigation.

31. RHC Follow up Actions

SWAtHC MS should support the personnel of the SNHN through their knowledge and experience in the implementation and improvement of the aspects related to the technical activity detailed below. Furthermore, considering the possible participation of Bolivian representatives in training courses financed by the CBSC related to them.

- Surveys in shallow waters, including the use of side scan sonar and single-beam echo Sounders.
- Tide and water level studies.
- Drafting of electronic nautical charts (S-57/S-101 or Inland ENC).
- Appropriate maritime Information systems for river and lake environments in the country.

Besides, the support that SWAtHC MS can provide in terms of scholarships for the training of Bolivian hydrographic officers is considered to be of great value for the technical support of the SNHN.

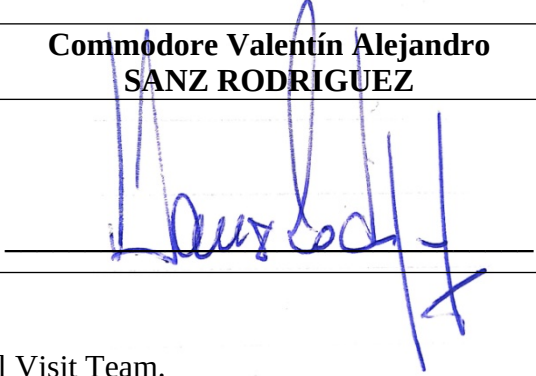
Finally, the suggestion to update the information in IHO P-5 and C-55 Publications is considered appropriate.

32. Follow up Opportunities.

There are no aspects to inform.

33. Preparations for Next RHC Conference.

It is considered necessary to inform the remaining SWAtHC Ms in the XVII meeting to be held virtually in 2023 the results of this technical visit and to request to the SNHN to inform the degree of progress in the proceedings related to the accession to the IHO before the Plurinational State of Bolivia as well as the eventual existence of supplementary supporting requirements.

DATE	28th November 2022
RHC Technical Visit Team Leader	Commodore Valentín Alejandro SANZ RODRIGUEZ
SIGNATURE	

Annex List:

- A. Terms of Reference of the RHC Technical Visit Team.
- B. Summary of Events

DISTRIBUTION: Chair RHC
INFORMATION: IHO Secretariat / visited coastal State



Technical visit to the Naval Hydrographic Service (SNHN) of the Plurinational State of Bolivia

Reference Standards

Delegation members

1. Commodore Valentín Alejandro SANZ RODRÍGUEZ, Director of the Argentine Naval Hydrographic Service (SHN-Argentina) and SWAtCH Chair - Team leader and Commander Marcelo Leonardo Olivera Cardozo, Chief of The Hydrography Department (SOHMA-Uruguay).

Preparation.

2. The members of the team, with the direction of its leader and the assistance of the staff, shall plan the technical visit after obtaining access to the provided information (Preliminary Questionnaire) and available material of the Argentine Naval Hydrographic Service (SNHN) and following Procedure 9 (IHO).

WORK Purpose

- Discuss issues of mutual interest;
- Provide guidelines for the development of local hydrographic skills;
- Improve the understanding of SOLAS obligations;
- Provide counsel on technical issues related to hydrographic projects; and
- Clarify the advantages and benefits of becoming a SWAtHC and IHO Full Member.

3. The team must:

A. Gain access to the governmental decision-making bodies in each visited country and liaise with high rank officers highlighting the importance of hydrography for the States, and thus, the need of including hydrographic and charting activities associated to National Plans;

B. Evaluate the national skills to plan and execute the acquisition, processing, interpretation and presentation of hydrographic data to enable the production of charts and publications both in a domestic level as well as the provision of data to the Hydrographic Services with international nautical charts;

C. Consider and provide counsel regarding the measures to be taken to improve the nations’ capacity to fulfil the previous point;

D. Emphasize the basic importance of a national system for the collection of data, as well as engineering maps and local Notices to Mariners which have an effect on mariners’ interests;

E. Provide counsel regarding the assistance to be obtained from a close relationship with the IHO Secretariat, the IMO and funding organizations to enable the maintenance of a feasible and sustained capacity

Report

4. Finish a report of the team's activities and recommendations before _____ of _____ 2023 and it shall be sent to the IHO.



**TECHNICAL VISIT TO THE NAVAL HIDROGRAPHIC SERVICE OF THE
Plurinational State of Bolivia**

AGENDA

14/XI/06:45	Arrival of Commander Marcelo Olivera (SOHMA-Uruguay)
14/XI/20:00	Arrival of Commodore Valentín Sanz Rodríguez (SHN-Argentina)
15/XI/09:30	Visit to Guaqui Naval Base.
15/XI/10:00	Reception of Multi-purpose vessel “Mosoj Hyana”.
15/XI/10:30	Navigation in Patrolling Boat in Lake Titicaca.
15/XI/12:30	Protocolar Visit to Counter Admiral Counter Admiral Juan Arnez Salvador, General Commander of the Bolivian Navy
15/XI/15:50	Visit to the Bolivian Ship Register (RIBB).
16/XI/08:45	Visit and exposition at the SNHN headquarters.
16/XI/10:45	Visit and exposition at the SNHN Technical Building.
16/XI/14:30	Visit to the Bolivian Maritime Authority (DGIMFLMM)
17/XI/07:25	Departure of Commodore Valentin Sanz Rodriguez (SHN - Argentina).
17/XI/22:05	Departure of Commander Marcelo Olivera (SOHMA - Uruguay).