

Direction des missions institutionnelles  
et des relations internationales  
Division relations extérieures

BREST, le 12 août 2024  
N° 058/Shom/DMI/REX/NP

## **NATIONAL REPORT**

**SUBJECT** : France national report to the 20<sup>th</sup> meeting of the Southern African and Islands Hydrographic Commission (SAIHC).

**APPENDIX** : one appendix.

### **1 HYDROGRAPHIC OFFICE: GENERAL**

Shom is pursuing the achievement of its different commitments based on the National Maritime & Littoral Strategy and the Strategic Review of Defence and National Security according to a 4-year target and performance contract between Shom and the French State. The current target and performance contract came into effect on January 1, 2021 for the period 2021-2024. The next contract for the period 2025-2029 is in preparation.

In addition to that, survey works are being conducted according to the prioritized 4-years survey plan for waterways under French jurisdiction.

Detailed information to update IHO Publication P-5 (Yearbook) has been submitted using the online system.

This national report is submitted by RADM Laurent Kerléguer, French national hydrographer and Shom's Director General ([laurent.kerleguer@shom.fr](mailto:laurent.kerleguer@shom.fr)).

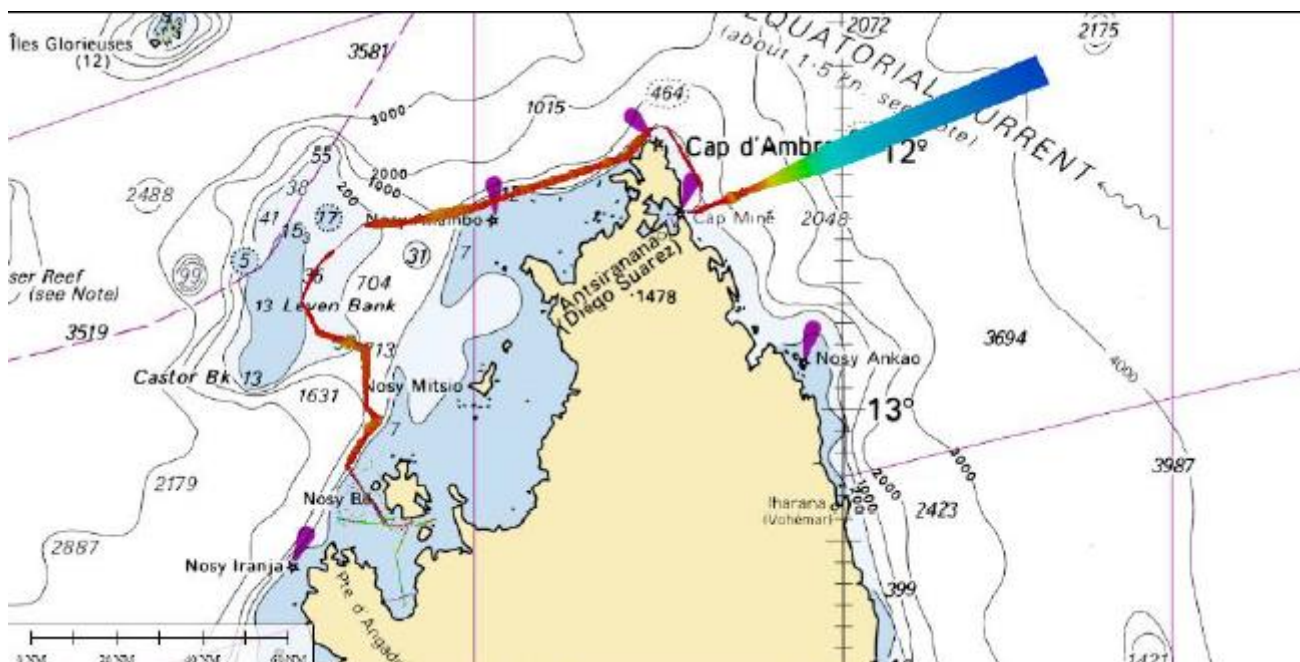
### **2 SURVEYS**

#### **2.1 COVERAGE OF NEW SURVEYS**

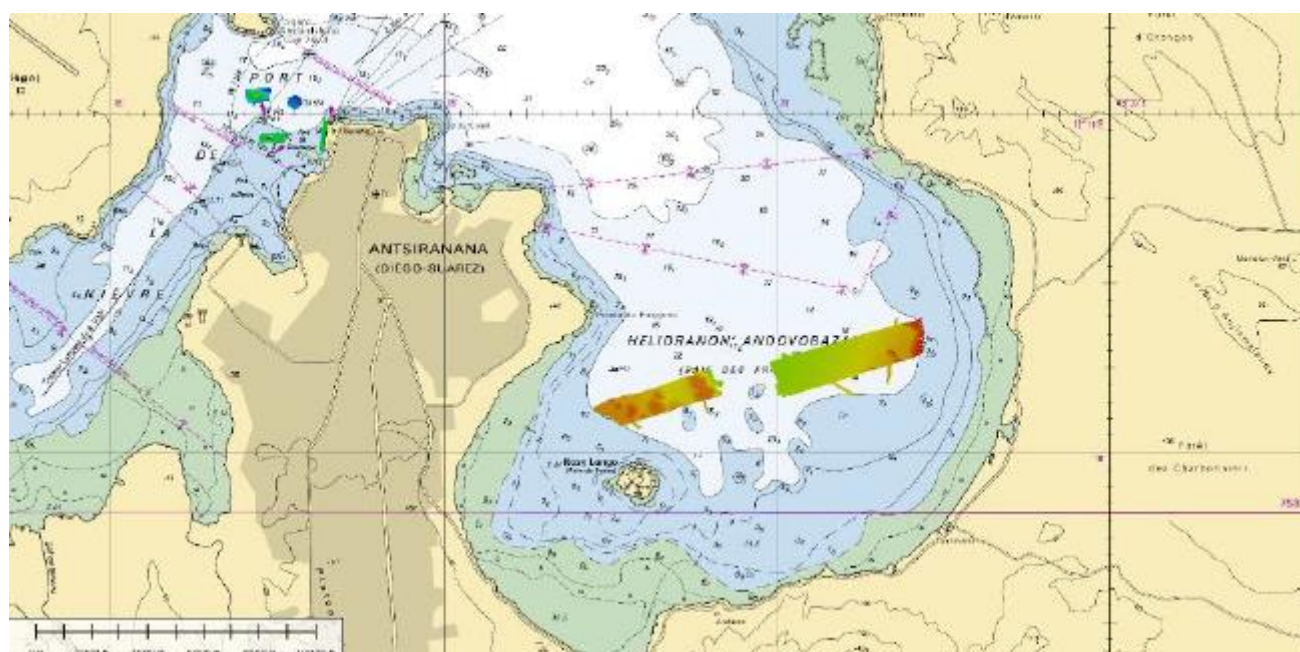
<https://www.shom.fr/fr/qui-sommes-nous/programme-national-dhydrographie-pnh>) details the long-term targeted objectives of CATZOC compliant hydrographic surveying in the Indian Ocean and the current surveys coverage for this area.

Survey campaigns are planned by Shom on a regular basis in French overseas territories and areas under French responsibility to update nautical charts. No survey from Shom has been carried out in the SAIHC area in 2022.

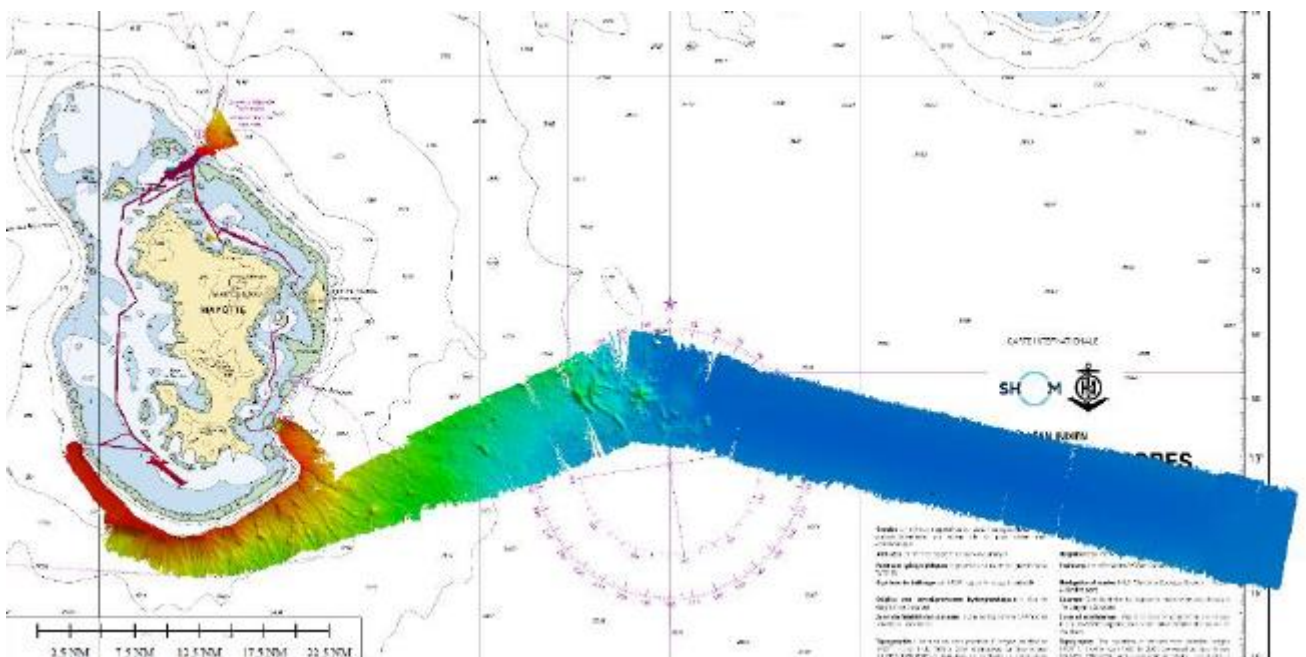
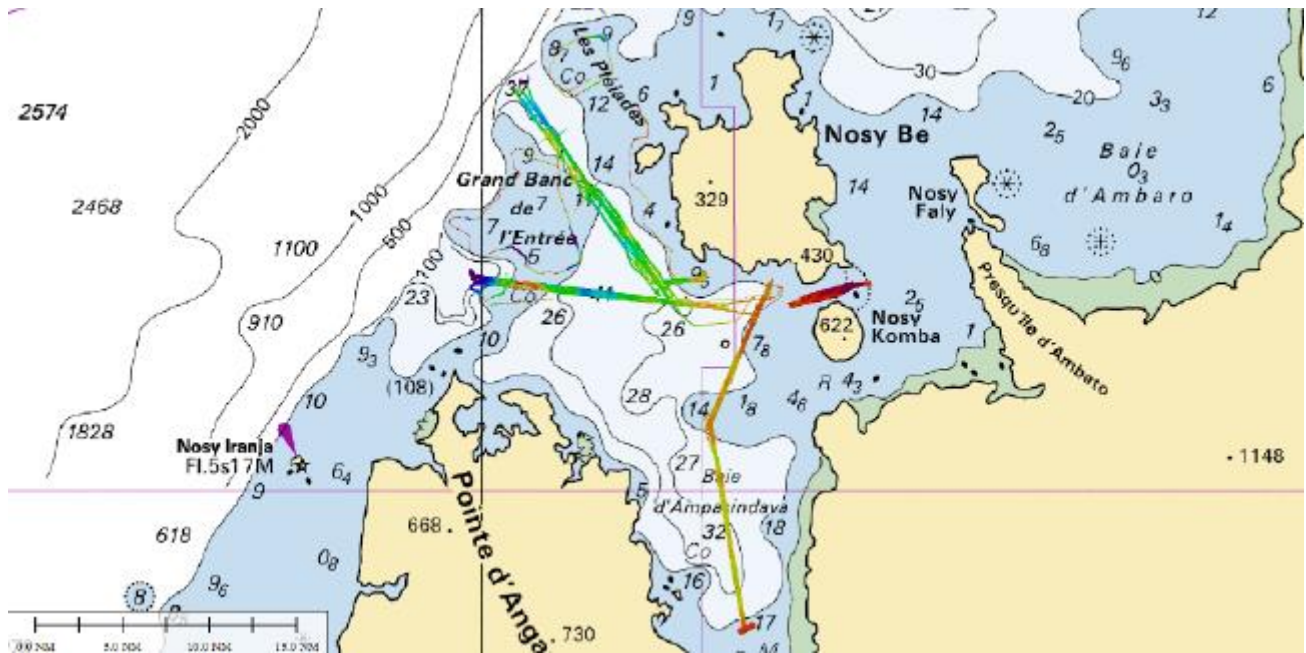
French hydrographic vessel *Beautemps-Beaupré* was deployed in the SAIHC Region in August 2023, in Mayotte and Madagascar.



Madagascar Survey (general view) (Extract CM6673) – BHO Beautemps-Beaupré



Madagascar Survey (Diego Suarez area) (Extract CM7680) – BHO Beautemps-Beaupré



## 2.2 LIDAR SURVEYS

Most of the French overseas coasts in the Indian Ocean within the region have been surveyed at 1m horizontal resolution. Sea Land digital terrain models are freely available for Mayotte Island, Scattered Islands and La Reunion Island.

They can be downloaded from Shom's data portals:

- data.shom.fr (Shom catalog / Master data / Coastal altimetry);
- diffusion.shom.fr: <https://diffusion.shom.fr/donnees/altimetrie-littorale.html>



- For Mayotte Island: <https://diffusion.shom.fr/donnees/altimetrie-littorale/litto3d-mayot2012.html>;
  - For the Scattered Islands: <https://diffusion.shom.fr/donnees/altimetrie-littorale/litto3d-eparses2012.html>;
  - For La Reunion Island: <https://diffusion.shom.fr/donnees/altimetrie-littorale/litto3d-reunion2016.html>;
- French Government open platform for public data: data.gouv.fr.

## 2.3 NEW TECHNOLOGIES AND/OR EQUIPMENT

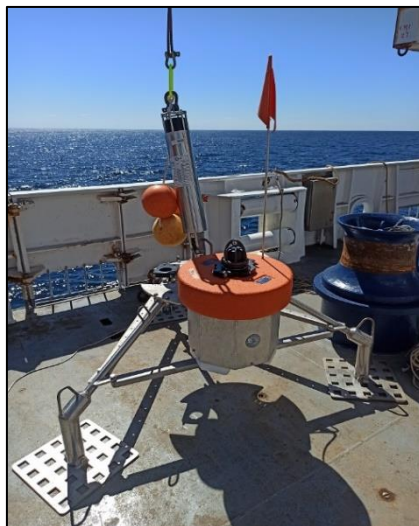
### Gliders

Following the preparatory phase for the replacement of the hydro-oceanographic fleet (CHOF project), Shom has invested in 2 gliders to increase its collected data. The first glider is mounted with CTD, O<sub>2</sub>, PAR, ADCP, Chlorophyll, CDOM and Backscattering sensors. The second glider is mounted with CTD and hydrophone sensors.

### New frame mooring

Involved in ecological issue, Shom developed a frame mooring called CATRINE with no loss of deadweight at the sea bottom. Usable until 150 meters depth, the frame mooring includes an acoustic release connected to a 200 meters Dynema rope stored in an aluminum canister during the deployment.

At the end of the deployment (after weeks or months at the bottom of the sea), the acoustic release is activated. The orange buoyancy goes up to the surface unwinding the rope stored in the canister. Arrived at the sea surface, operators need to recover the orange buoyancy and the Dynema rope. Using an electric winch on board, operators wire the 200 meters rope to recover the frame mooring and the instrumentation.



1.

*Fig. 4 – CATRINE frame mooring with its orange buoyancy above the canister*

### Deployable Hydrographic System

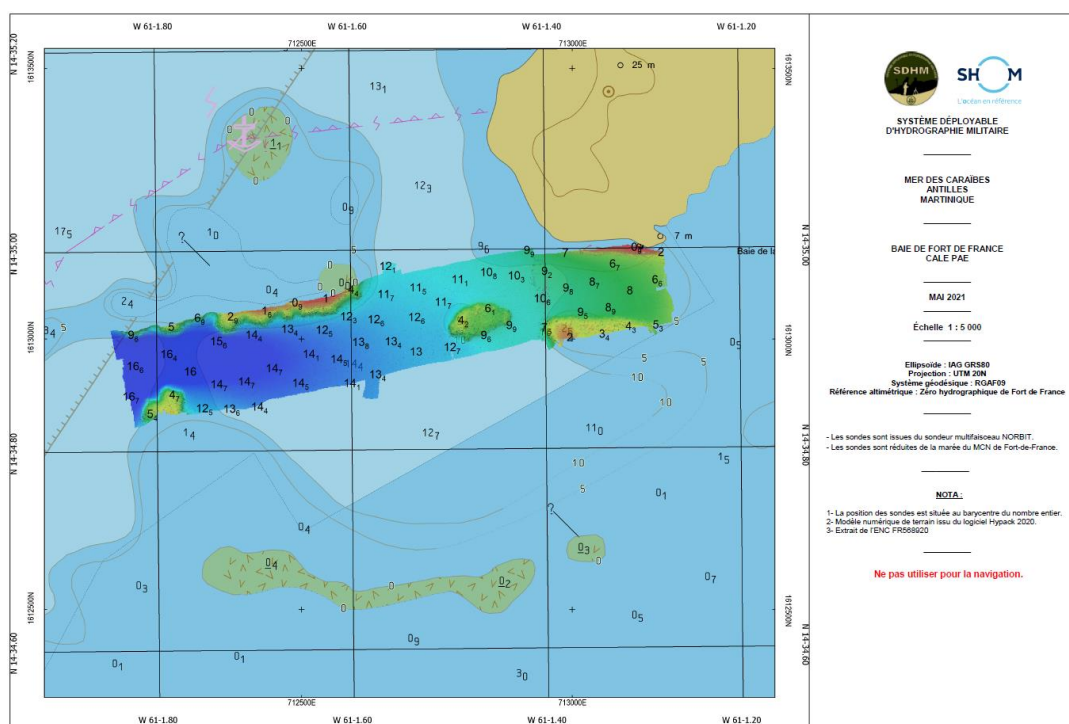
Taking advantage of the reducing size of multibeam echo sounder, Shom developed a portable Hydrographic system usable with small boats (inflatable).

The system is composed of 5 components: an electronic watertight case, an energy watertight case, a rugged computer powered with Hypack, a sidescan sonar and a multibeam echo sounder with integrated inertial and GNSS receiver.

This efficient system has a maximum range of 160 meters and a resolution of  $0.9^{\circ} \times 0.9^{\circ}$  at 400 kHz.



*Fig. 5 – Deployable Hydrographic System*



*Fig. 6 – Final Product obtained with the Deployable Hydrographic System - Fort de France Bay Martinique*

## 2.4 NEW SHIPS

NTR.

## 2.5 CROWDSOURCED AND SATELLITE-DERIVED BATHYMETRY - NATIONAL POLICY

### Crowdsourced bathymetry – CSB

In accordance with the IHO publication B-12, crowdsourced bathymetry is the practice of simultaneously recording the vessel's position and depth measurement, made **with standard navigation instruments, on board a non-specialist vessel during its routine maritime operations**. This recorded data is intended to be provided free of charge to the relevant organisation for consideration and, subject to validation, for public dissemination.

An instruction of the Prime Minister (published 22 November 2022) sets the French national policy regarding crowdsourced bathymetry.

Crowdsourced bathymetry is authorised in the waters under French sovereignty or jurisdiction, subject to the definition and constraints imposed by the instruction. Data from crowdsourced bathymetry in French waters have to be transmitted as a priority to the Shom, or alternatively to one of the following trusted third parties:

- the European Marine Observation and Data Network EMODnet, via its "Data Ingeneering" portal EMODnet, via its Data Ingestion Portal (<https://submission.emodnetingestion.eu/>);
- the IHO Data Centre for Digital Bathymetry (DCDB - <https://www.ngdc.noaa.gov/iho/>).

The CSB data are licensed under the Attribution 4.0 International (CC BY 4.0) (<https://creativecommons.org/licenses/by/4.0/deed.fr>) or Attribution 3.0 IGO (CC BY 3.0 IGO) (<https://creativecommons.org/licenses/by/3.0/igo/deed.fr>), in accordance with the IHO Guide to Crowdsourced Bathymetry (IHO Publication B-12).

#### Satellite-derived bathymetry – SDB

The satellite-derived bathymetry (SDB) has been used since 1987 by Shom to complement traditional surveys (acoustic sounding surveys) initially to produce nautical charts in the Pacific region (available online

[https://services.data.shom.fr/geonetwork/srv/eng/catalog.search#/metadata/TRAITEMENT\\_I\\_MAGE\\_SPATIOCARTE\\_MARINE.xml](https://services.data.shom.fr/geonetwork/srv/eng/catalog.search#/metadata/TRAITEMENT_I_MAGE_SPATIOCARTE_MARINE.xml) ).

In 2019, Shom initiated a research and development project for a new SDB chain, the Bathysat project, aimed at updating the processing chain in service to improve its performance. In particular, by using algorithms based on physics rather than on statistical approaches, the aim is to decrease the need of bathymetric observations when carrying out reconnaissance surveys using SDB.

Initial production tests carried out in New Caledonia and French Polynesia have demonstrated that the solution is capable of generating consistent coastal bathymetric data without the need to carry out measurements or collect on site data. Because of their spatial and vertical resolution, these products are suitable for field reconnaissance (to support survey planning) and for forcing sea state models, when no data from conventional systems is available.

Another essential property for Shom is that this chain is not a 'black box' and is perfectly controlled internally, which is essential in particular for qualifying measurements. This new chain is currently being industrialised for operational use, scheduled for 2025.

## 2.6 CHALLENGES AND ACHIEVEMENTS

Following abnormal seismic activities since May 2018 off Mayotte Island, scientific surveys, analysis and monitoring have been organized by French authorities and scientific organizations. Shom has contributed to this monitoring with a timely bathymetric survey in July 2019. A new survey has been carried out in 2023 during the deployment of French hydrographic vessel *Beautemps-Beaupré*.

It is imperative, for the safety of navigation, that the data (*quays topography, harbor bathymetry and nautical information*) resulting from port redevelopment work as well as that resulting from

maintenance dredging be transmitted to Shom for updating of nautical charts and nautical documents (*in compliance with specifications A-402.1 and B-635.4 of standard S-4*).

### 3 NEW CHARTS & UPDATES

#### 3.1 ENC COVERAGE, GAPS AND OVERLAPS

As of 1st August 2024, Shom has produced 842 ENC's, of which 71 ENC's within region H.

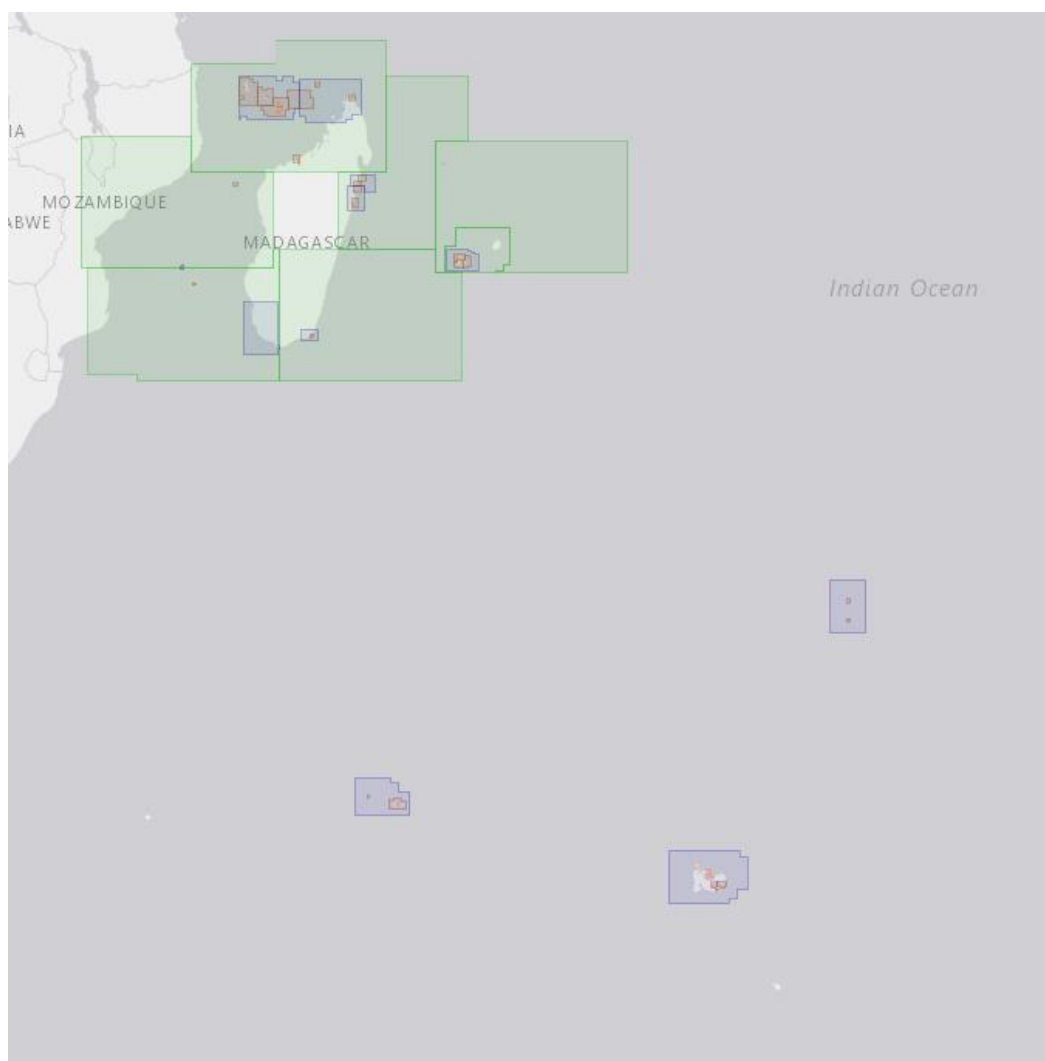
The full collection should eventually reach 900 ENC's.

In line with the WEND recommendations and guidelines, France produces its small scale ENC cells as closely as possible to INT chart schemes.

The current status of ENC production in the region H is detailed in the table below (*changes in red*):

Usage Band	Produced Cells	Planned Cells	Percentage
1	0	1	0%
2	7	10	70%
3	11	12	92%
4	24	30	80%
5	36	43	60%
6	9	14	64%
<b>Total</b>	<b>87</b>	<b>110</b>	<b>79%</b>

The following figure is extracted from the online PRIMAR catalogue (<http://www.primar.org>) showing Shom ENC coverage within the SAIHC (region H) area:



*Fig. 1 – Region H - Shom's ENC production*

ENC cells produced (new publication) since the last conference are detailed hereafter:

Number	Scale 1 :	Title
FR57828A	12 000	<i>Baie de l'Oiseau - Port Christmas</i>
FR57828B	22 000	<i>Port Edmond Perrier et Anse de l'Excursion</i>
FR57828C	22 000	<i>Anse du Jardin</i>
FR57828D	22 000	<i>Baie du Brise-Lames</i>
FR57828E	22 000	<i>Port Matha</i>
FR57828F	22 000	<i>Port Jules Girard</i>
FR57828G	22 000	<i>Ports Fallières et Fuller</i>
FR57828H	22 000	<i>Côte Nord-Est de la Presqu'île Joffre</i>
FR57828I	22 000	<i>Baie du Hopeful - Mouillage Bon-Abri</i>



FR67828J	8 000	<i>Baie du Hopeful - Cascade Lozère</i>
FR67828K	8 000	<i>Baie du Yacht Club</i>
FR57828L	22 000	<i>Baie Doumergue</i>
FR57828M	22 000	<i>Port d'Hiver</i>
FR57828N	12 000	<i>Port Élisabeth</i>
FR57828O	8 000	<i>Port Jeanne d'Arc</i>
FR67828P	12 000	<i>Fjord des Portes Noires</i>

ENC cells planned (new publications) for 2024/2025 are listed below:

Number	Scale 1:	Title
FR27900	700 000	<i>Approches Sud-Est de l'île de la Réunion</i>
<b>Îles Kerguelen</b>		
FR47823A	45 000	<i>Baie d'Audierne</i>
FR47823B	45 000	<i>Baie des Swains</i>
FR478240	45 000	<i>Côte Ouest des Kerguelen – Du Cap Poincaré au Cap Marigny</i>
FR57824A	22 000	<i>Port Curieuse</i>
FR57824B	22 000	<i>Baie de Douarnenez</i>
FR478250	45 000	<i>Nord-Ouest des Kerguelen - Du Cap Marigny aux îles Davis</i>
FR478270	45 000	<i>Golfe des Baleiniers – De l'île du Veau Marin au Cap Rouge</i>
FR57827A	22 000	<i>Bras de la Fonderie</i>
FR67827B	12 000	<i>Port Couvreux</i>
FR57827C	22 000	<i>Baie du Hopeful</i>

### 3.2 ENC DISTRIBUTION METHOD

French ENCs (in S-63 encrypted format) are made available to distributors through the PRIMAR RENC. Shom participates, along with other hydrographic services, in the coordination work of the RENC (IC-ENC and PRIMAR).

France supports the work plan of the WEND working group to improve the implementation of the WEND principles.

### 3.3 RNC

NTR.

### 3.4 INT CHARTS

The table below contains the INT charts produced since the last conference:

INT	Scale 1:	Title	Comment
7735	175 000	La Réunion	NE (2023)

Besides, the following INT charts are planned for the 2024-2025 period:

INT	Scale 1:	Title	Comment
7730	350 000	De la Réunion à Maurice (Mauritius) - Ile Tromelin	NE (2025)

The overall INT chart production status for the region H (*changes in red*) is provided below:

Scale	Produced INT charts	Planned INT charts	Percentage
Small (<1/1 000 000)	6	6	100%
Medium	7	7	100%
Large (>1/100 000)	5	5	100%
<b>Total</b>	<b>18</b>	<b>18</b>	<b>100%</b>

### 3.5 NATIONAL PAPER CHARTS

Since the last SAIHC conference, the following charts have been edited:

National	Scale 1:	Title	Comment
7828	div.	Îles Kerguelen (16 cartouches)	NC (2023)

Following charts are planned to be issued in 2024/2025:

National	Scale 1:	Title	Comment
7492	35 000	Île de Mayotte - Partie Nord	NE (2024)
7493	35 000	Île de Mayotte - Partie Est	NE (2024)
7494	35 000	Île de Mayotte - Partie Ouest	NE (2024)
7823	div.	Îles Kerguelen – Baies d’Audierne et des Swains	NC (2025)
7824	div.	Îles Kerguelen – Du Cap Poincaré au Cap Marigny – Port Curieuse et Baie de Douarnenez	NC (2024)
7825	60 000	<i>Nord-Ouest des Kerguelen - Du Cap Marigny aux îles Davis</i>	NC (2025)
7827	div.	Îles Kerguelen – Golfe des Baleiniers – De l’île du Veau Marin au Cap Rouge	NC (2023)

### 3.6 OTHER CHARTS, E.G. FOR PLEASURE CRAFT

Shom provides georeferenced marine charts in GeoTiff and S-57 format. These digital marine charts are available through Shom's online store "<http://diffusion.shom.fr>" under various licenses<sup>1</sup> according to the purpose of use. These data can be used with GIS or cartographic software for commercial or private purposes.

A S-57 license<sup>2</sup> allows unlimited download of updated versions for 12 months from the date of purchase.

### 3.7 CHALLENGES AND ACHIEVEMENTS

Shom has set up a dedicated team working on the implementation of the S-101 (with the aim of switching all production to this new format by the availability of the first ECDIS S-100 expected in 2026). In particular, the "S-100 across the Channel" project, in partnership with the UKHO, from S-101 ENC production to sea trials, is a risk assessment on the dual fuel mode of ECDIS.

The Shom project "Unified Cartographic Source" will review methodology (including automation) to produce French charts with a data-centric approach and the principle of "single charting scale per area". This project will include a homogenisation of chart scales by Usage Band and a review of all the French charts to eliminate discontinuities between products: Shom plans to start its production (by France) with this new method mid-2024. From there Shom will consider on a case by case approach the benefit of switching toward a regular scheme for ENCs.

## 4 NEW PUBLICATIONS & UPDATES

### 4.1 NEW PUBLICATIONS

Since July 2023, the coverage of French nautical publications (list of lights, radio signals, sailing directions) has been reduced to the Shom's cartographic areas of responsibility. This consistency enables us to develop our relations and knowledge of navigation zones in mainland France, overseas and foreign countries, some of which we have bilateral arrangements with.

### 4.2 UPDATED PUBLICATIONS

Sailing directions, light and fog signal books and radio signal books are no longer published in print form. They are updated on a weekly basis and distributed via the online Shom distribution portal ([diffusion.shom.fr](http://diffusion.shom.fr)). Mariners who subscribe to these books are alerted of corrections by e-mail and by the Notice to Mariners (GAN).

### 4.3 MEANS OF DELIVERY

Nautical publications are available in digital format (pdf files) on Shom's online shop (<http://diffusion.shom.fr>).

### 4.4 CHALLENGES AND ACHIEVEMENTS

NTR.

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<sup>1</sup> Internal reuse, commercial reuse, documentary use or end user.

<sup>2</sup> Each license allows internal reuse of the data for up to 5 workstations. For more information, contact [bps@shom.fr](mailto:bps@shom.fr)

## 5 MSI

### 5.1 EXISTING INFRASTRUCTURE FOR MSI DISSEMINATION

Shom's notices to mariners (GAN) are exclusively available under digital formats on Shom's website: <http://diffusion.shom.fr/gan>.

MSI Point of contact at Shom:

Head of Regional Team - oversea area  
French Hydrographic Office  
13, rue du Chatellier – CS 92803 - 29228 BREST CEDEX 2 – FRANCE  
Tel : + 33 (0) 256 31 23 06  
Email: [infonaut-zre@shom.fr](mailto:infonaut-zre@shom.fr)

### 5.2 STATISTICS ON WORK OF THE NATIONAL COORDINATOR

See Appendix.

Shom controls and coordinates local and coastal warnings issued by its national delegated coordinators (maritime zone commands mentioned in Appendix).

### 5.3 NEW INFRASTRUCTURE IN ACCORDANCE WITH GMDSS MASTER PLAN

There is no NAVTEX station cover for French overseas territories, MSI warnings are broadcast through SafetyNet network.

Hereafter are listed the coordinates of the French overseas territories POCs for NAVAREA VII and VIII:

AREA	COUNTRY	NAME	TELEPHONE	FACSIMILE	EMAIL
VII & VIII	French Areas (La Reunion, Mayotte, French Southern and Antarctic lands)	Commandant de Zone Maritime Sud Océan Indien	+262 (0)2 62 93 53 54		<a href="mailto:emia-saint-denis.permanence-ops@intradef.gouv.fr">emia-saint-denis.permanence-ops@intradef.gouv.fr</a>

### 5.4 CHALLENGES AND ACHIEVEMENTS

#### French national nautical information platform - PING

France has been operating its national nautical information platform called PING (<https://portail.ping-info-nautique.fr/>) since April 10, 2024 in mainland France and in NAVAREA II area.

This platform aims to digitize nautical information as much as possible to promote wide dissemination and integration into user systems (ship navigation systems, shore services systems, user systems, etc.).

The platform has a portal for humans and programming interfaces (API) for systems, with 3 functional modules:

- production and distribution of navigational warnings,
- transmission of source information by maritime services and users to contribute to nautical information,
- production and dissemination of maritime geo-regulations in a spatialized form.

A mobile application named Nav&Co is also associated with the platform.



The production and digital dissemination of navigation warnings will use the IHO S-124 Navigational warnings standard, when the firsts S-100 ECDIS will be available, while ensuring compatibility with the current NAVTEX and EGC systems.

The project is supported by the European Maritime Affairs and Fisheries Fund and the navigation warnings module has been developed and tested in the framework of the European Interreg MED OSMOSIS project.

For the time being, PING is based on the draft S-124 standard. It will be aligned with the first edition of the S-124 standard in the next future.

PING will be deployed in the French overseas territories in 2025.

The source code of PING will be open source as soon as PING is aligned with the S-124 ed. 1.

- nautical information,
- production and dissemination of maritime geo-regulations in a spatialized form.

A mobile application will also be associated with the platform.

The production and digital dissemination of navigation warnings will use the IHO S-124 Navigational warnings standard under development, while ensuring compatibility with the current NAVTEX and EGC systems.

The project is supported by the European Maritime Affairs and Fisheries Fund and the navigation warnings module has been developed and tested in the framework of the European Interreg MED OSMOSIS project.

For the time being, PING is based on the draft S-124 standard. It will be aligned with the first edition of the S-124 standard when it is published.

PING will be deployed operationally end of 2023 in metropolitan France and end of 2024 in the French overseas territories.

The source code of PING is open source and its interoperability has been successfully tested.

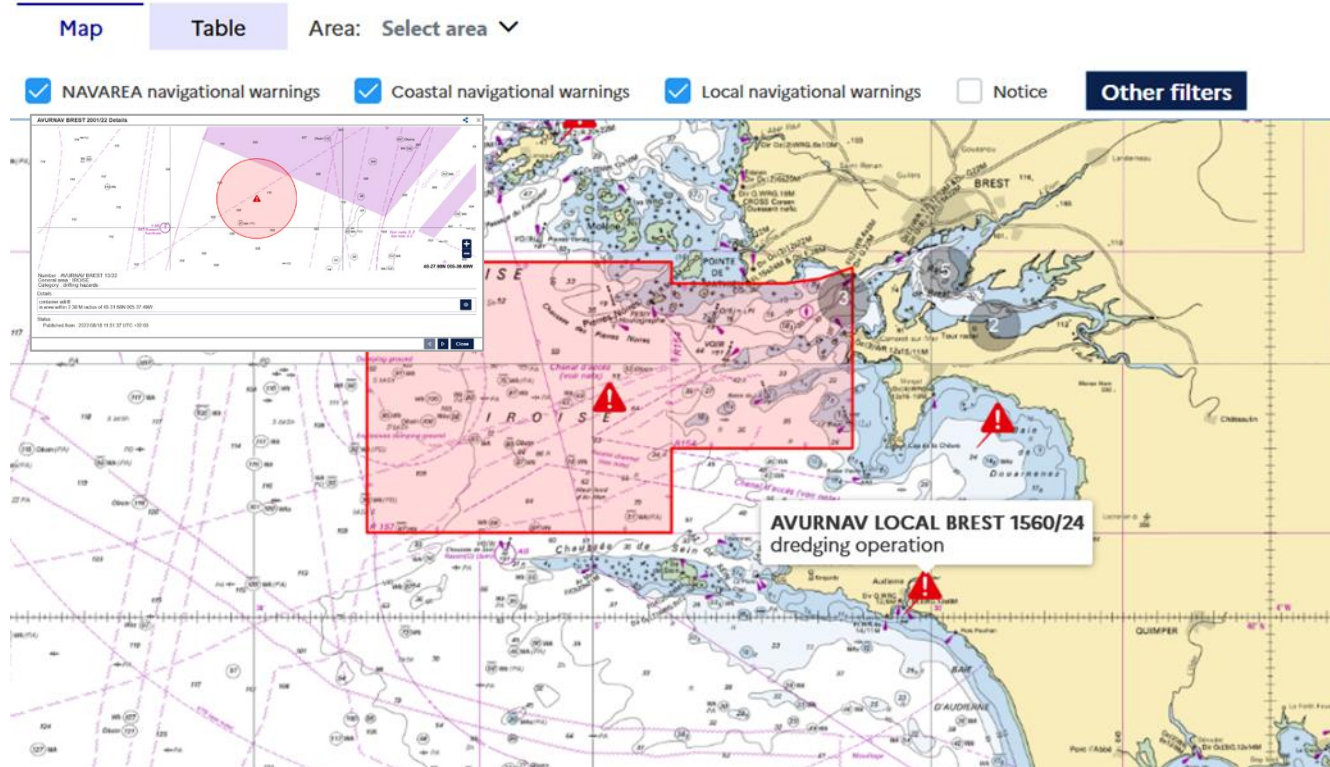


Fig. 2 – Views of the PING portal - Viewing navigation warnings

## 6 C-55 – LATEST UPDATES

The table with the latest information to update IHO Publication C-55 (Status of Hydrographic Surveying and Charting Worldwide) regarding region H area have been provided using the online system on 25 May 2023:

Survey Status		Depth < 200m			Depth > 200m		
Updated: December 2023		A	B	C	A	B	C
H	Iles Éparses - France (Bassas de India, Europa et Juan de Nova)	14.9	80.9	4.2	23.5	0.2	76.3
	Mayotte et Glorieuses - France	24.3	73.0	2.7	59.3	0.5	40.2
	La Réunion et Tromelin - France	55.7	43.5	0.8	29.7	0.0	70.3
	Terres Australes françaises (Crozet, Kerguelen, Amsterdam, Saint-Paul)	2.3	33.2	64.5	26.0	0.7	73.3

Comores (Union des)	26.1	7.8	66.1	34.9	0.0	65.1
Madagascar (République de)	1.3	8.8	89.9	18.8	0.3	80.9

Charting Status Updated: August 2024		Small (<1 M)			Medium (1M < / < 100 000)			Large (> 100 000)			Metric	WGS84
		A	B	C	A	B	C	A	B	C		
H	Illes Éparses - France (Bassas de India, Europa et Juan de Nova)	100	0	NA	100	0	100	100	0	100	100	100
	Mayotte et Glorieuses - France	100	0	100	100	0	100	75	0	75	100	100
	La Réunion et Tromelin - France	100	0	NA	100	0	100	100	0	100	100	100
	Terres Australes françaises (Crozet, Kerguelen, Amsterdam, Saint-Paul)	100	0	NA	100	0	100	81	0	81	100	100
	Comores (Union des)	100	0	100	100	0	100	20	0	20	100	100
	Madagascar (République de)	100	0	100	100	0	100	80	0	80	100	100

C-55 values for survey status (top table) and charting status (down table). Updated values are highlighted in red

## 7 CAPACITY BUILDING

### 7.1 OFFER OF CAPACITY BUILDING

Shom school offers FIG-IHO-ICA (category B) courses in hydrography and marine cartography. These courses are given in French and are open to French-speaking foreign candidates (depending on available places). The training offer is presented on the Shom website:

<https://www.shom.fr/fr/nos-activites/formation>

Some training modules are provided within the framework of the French-speaking hydrography association (AFHy: <http://www.afhy.fr/>) and are open to its members.

A training course in hydrography accredited in category A FIG-OHI-ACI is provided by ENSTA Bretagne (<https://www.ensta-bretagne.fr/index.php?option-hyo-hydrographie-et-oceanographie/>).



Fig. 3 – Courses and training provided at the Shom hydrographic school (source: shom.fr)

## 7.2 TRAINING RECEIVED, NEEDED, OFFERED

Shom's school is welcoming for the 2024 FIG-IHO-ICA category B hydrography course session two students from the Union of Comoros.

## 7.3 PROJECT MANAGEMENT ASSISTANCE FOR THE CONSTRUCTION OF HYDRO-OCEANOGRAPHIC VESSELS

Shom has a recognized know-how in the construction of hydro-oceanographic vessels (from 8m launches to 100m vessels). It masters the entire process from the expression of needs to the implementation of systems. It puts its expertise at the service of shipyards, within the framework of new constructions or modernizations for:

- Studies to define, on the basis of an expression of need, the complete specifications in terms of hydro-oceanographic equipment (including computers), as well as the fitting out of premises and scientific spaces of hydro-oceanographic ships. Shom provides intellectual services such as the drafting of the metrological survey essential to the proper integration and control of the systems, the specification of the batches of spare parts adapted to the ship's missions, the interface plans, the acceptance book and the ship's logbook (in its field of competence).
- Equipment acceptance and integration: supervision of equipment integration (mechanical, interfacing, metrology, etc.), acceptance tests in the factory, in port and at sea.
- Training and assistance: training of personnel who will implement the equipment, but also of personnel who will maintain the systems, transfer of skills, handling of warranty calls after delivery of the vessel to the end customer.





*Fig. 4 – Nigerian hydrographic ship Lana built by the French shipyard OCEA with the support of Shom (Source: OCEA)*

#### 7.4 STATUS OF NATIONAL, BILATERAL, MULTILATERAL OR REGIONAL DEVELOPMENT PROJECTS WITH HYDROGRAPHIC COMPONENT

For the countries benefiting from Shom support to meet their hydrographic services obligations spelled out by the SOLAS convention, France fosters a mechanism of gradual transfer of responsibilities through State-to-State administrative arrangements. This mechanism relies on training at Shom facilities and the formalisation of the respective responsibilities for maritime safety information, hydrographic and charting activities.

#### 7.5 DEFINITION OF PROPOSALS AND REQUESTS TO THE IHO CBSC

NTR.

### 8 OCEANOGRAPHIC ACTIVITIES

#### 8.1 GENERAL

NTR.

#### 8.2 GEBCO/IBC'S ACTIVITIES

In the waters under French jurisdiction of the SWPHC region, Shom's bathymetric data are accessible:

- through the *EMODnet Bathymetry* portal (<http://www.emodnet-bathymetry.eu/>)
- in the form of bathymetric DTMs for the coastline and the shoreline on Shom's dissemination space (<http://diffusion.shom.fr/pro/risques/bathymetrie.html?p=1>)

- as bathymetric batches on Shom's dissemination space (<http://diffusion.shom.fr/pro/amenagement/bathymetrie/lots-bathy.html>)

Data on transits in French and international waters were provided to IHO DCDB and for integration into the GEBCO grid in 2018.

The survey coverage and associated metadata available on the IHO DCDB site are provided via the *EMODnet Bathymetry* portal supported by the European Union. The last update of all these bathymetric resources was performed in December 2022.

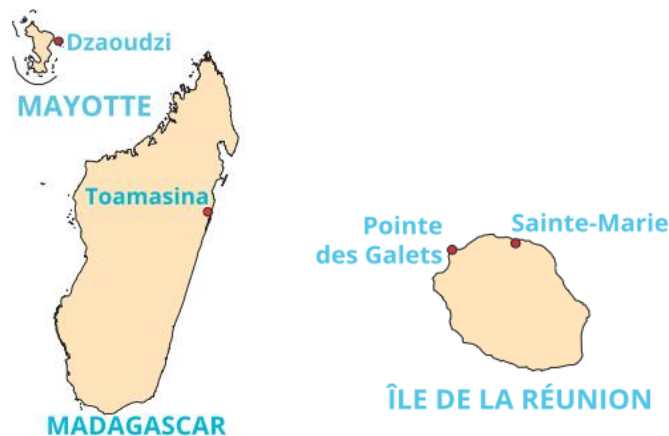
### 8.3 TIDE GAUGE NETWORK

Shom is the national coordinator and reference authority for the observation of the sea level, managing and issuing the resulting data. This mission is carried out under the REFMAR programme. All real time and processed tide gauge measurements collected under that programme are freely accessible on the web <http://data.shom.fr/#donnees/refmar> for all areas under French jurisdiction. Shom itself operates and maintains a large tidal network reporting in real time, RONIM, which is a major contribution to REFMAR.

This network is recognized as an important tool for coastal operational oceanography, risk assessment, studies on the evolution of the mean sea level, etc.

The RONIM network is covering the SAIHC region:

- La Reunion Island: Pointe des galets & Sainte-Marie ;
- Mayotte Island : Dzaoudzi ;
- Madagascar: Toamasina (owned by Madagascar Met. Office and operated by Shom);
- Kerguelen Islands: Port-aux-français (LEGOS/ROSAME).



*Fig. 5 – Tidal gauges of RONIM network covering the SAIHC region (source: shom.fr)*

Shom's tidal predictions are available through an online service named [maree.shom.fr](http://maree.shom.fr). This service provides free access of 10 days of tidal predictions from over 1,000 harbours worldwide.

### 8.4 NEW EQUIPMENT

Since 2021, the RONIM tide gauge network is being renovated: data loggers, transmission equipment and supervision software are renewed. The expected results are: better reliability, improved transmission rates and reduced maintenance needs. In the SAIHC region, the tide gauges of Dzaoudzi, Pointe des Galets and Sainte Marie have been renewed.

Due to port development work, the tide gauge of Toamasina has been dismantled without any prospect of reinstallation for the moment.

## 8.5 CHALLENGES AND ACHIEVEMENTS

### Consequences of the seismic activity off Mayotte

Since May 2018, the island of Mayotte has been undergoing a "seismic crisis". Several dozen earthquakes, some of which were felt by the population, have been recorded since that date and located in an area about 50 km east of the island. These earthquakes have been associated with the appearance of an underwater volcano in the zone of origin of the seismic activity.

As a consequence of this seismic crisis, a significant subsidence of the island of Mayotte occurred. The surface displacements measured since the beginning of the crisis by the GPS stations of Mayotte indicate: a) an overall displacement of the GPS stations of Mayotte towards the east of about 21 to 25 cm; b) a subsidence of about 10 to 19 cm depending on their location on the island. A slowing of the movements has been observed since April-May 2019.

The phenomenon of subsidence results in a mechanical apparent rise of the mean sea level. Nonetheless, the absolute level (i.e. measured in relation to a fixed reference) does not vary significantly.

In the current state of the phenomenon, which is still ongoing, it is too early for Shom to reassess its tidal predictions. This will have to be done after a sufficiently long stabilisation period and on the basis of new observations.

In the meantime, it is recommended to add the value of sinking to Shom's tidal predictions. In April 2022, this value is estimated at around 20 cm.

### Evolution of the tidal services

The products called "Annuaire des marées", " Horaires de marées (calculés pour 100 ports)" and " Prédiction à la carte (disponibles pour 1000 ports) ", which were previously available on the portal [diffusion.shom.fr](https://diffusion.shom.fr), have been merged into a single service called "Marées à la carte".

This service, which calculates tide predictions, can be accessed at the following address: <https://diffusion.shom.fr/marees/horaires-des-marees.html>.

The functions available are:

- Calculation of the times and heights of high and low tides, combined with coefficients (Annuaire des marées). The coefficients are calculated for French Channel and Atlantic ports only;
- Calculation of water level at a given time step (1, 5, 10, 15, 30 and 60 minutes);
- Threshold calculation (search for time slots where a water level is above or below a given threshold).

The results are available in two formats:

- XML: standard exchange format, intended for programming or use on the Web. This format is available for calculating the times and heights of high and low water;
- TXT: simple text format in columns. Format available for calculating times and heights of high and low water, water levels at a given time step and thresholds.

A user guide describing the various functions and settings of the service is available on the service's home page by clicking on the "More details" link.

## 9 SPATIAL DATA INFRASTRUCTURES

### 9.1 STATUS OF MSDI

Shom develops and maintains a MSDI covering all maritime areas under French jurisdiction. The information thus compiled is accessible through 3 portals:

- data.shom.fr
- diffusion.shom.fr
- maritimelimits.gouv.fr

### 9.2 RELATIONSHIP WITH THE NSDI

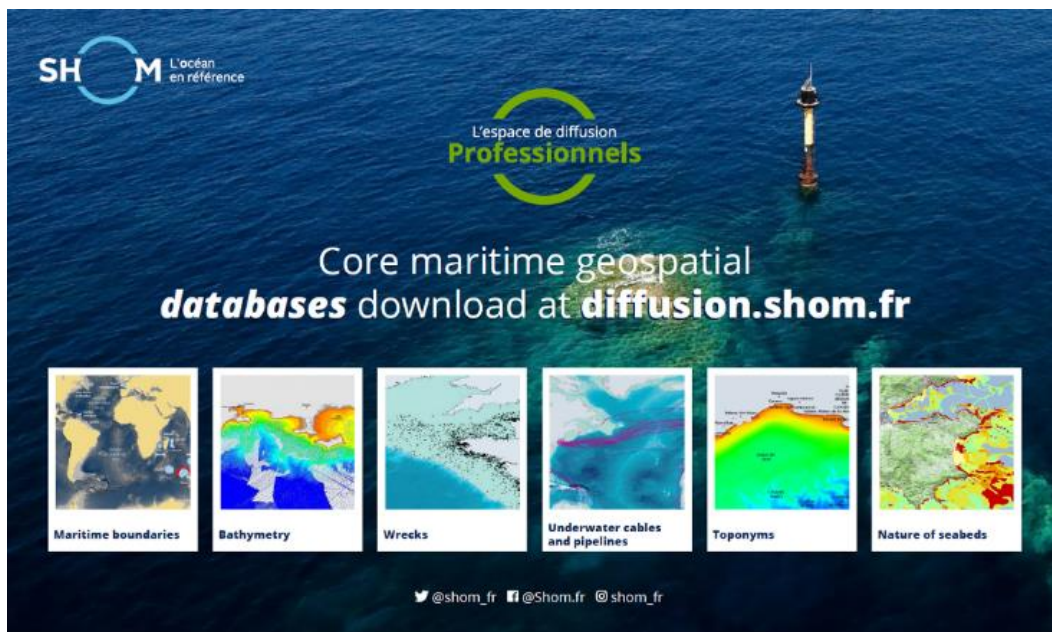
The various maritime geographical information produced by Shom are referenced on the French NSDI (<https://www.data.gouv.fr/>).

### 9.3 INVOLVEMENT IN REGIONAL OR GLOBAL MSDI EFFORTS

Shom contributes to the IHO MSDIWG.

### 9.4 NATIONAL IMPLEMENTATION OF THE SHARED DATA PRINCIPLES – INCLUDING ANY NATIONAL DATA POLICY AND IMPACT ON MARINE DATA

In accordance with France open data policy, Shom has opened access to its basic data: bathymetric data, wrecks, cables, seabed types, maritime limits & boundaries, toponymic databases, port information, and maritime regulations, etc. These data are distributed under a Creative Commons "CC-BY-SA 4.0" license or an open license, depending on the case.



*Fig. 6 – Access to Shom's open data (diffusion.shom.fr)*

### 9.5 MSDI NATIONAL PORTALS

Data on data.shom.fr portal are organised according to the following topics:

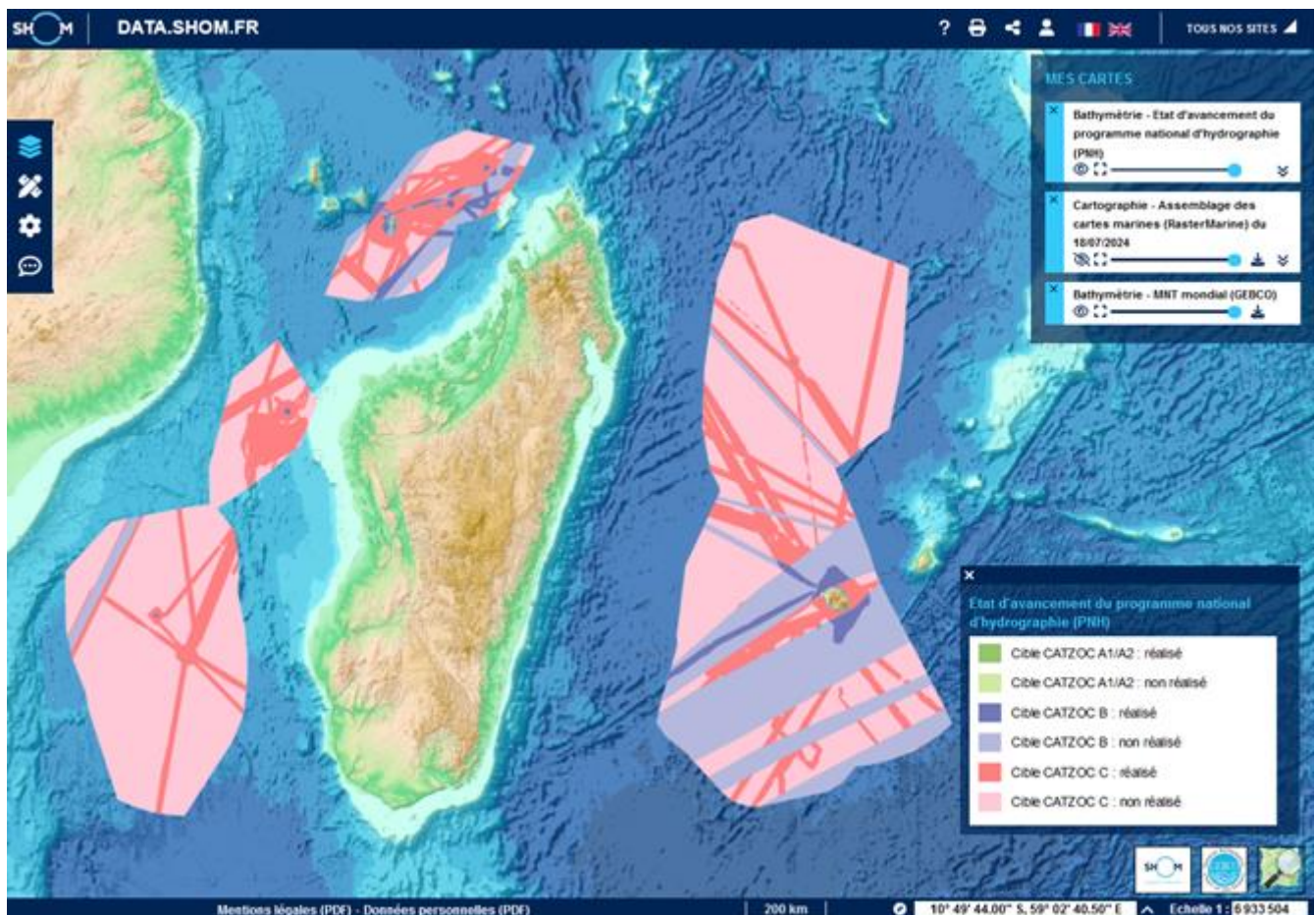
- Master data: cartography, maritime boundaries, maritime and coastal database, coastal altimetry, bathymetry, vertical datums, sedimentology, geophysics, tides, currents and historical data;



- Oceanographic forecasts: waves, meteorology, water level, hourly surface hydrodynamic, daily mean 3D hydrodynamic and oceanogram;
  - Coastal observations: sea level (REFMAR), sea surface current and sea bottom turbidity.
- Not all this information is available on the SAIHC region.

Hereafter are listed some of the latest evolutions:

- Aids to Navigation (AtoN) (edition);
- Coastal altimetry (Litto3D): data display improvements;
- National hydrography program: current status (new);
- Maritime altimetric references (edition);
- Global coastline (edition);
- GEBCO worldwide bathymetric DTM (edition);
- On demand tidal table calculation (update);
- Tidal tables calculation (edition).



*Fig. Z – New layer: National hydrography program: current status (data.shom.fr)*

A detailed description of the portal functions and contents is available on Shom's website (<https://services.data.shom.fr/support/fr>).

## 9.6 BEST PRACTICES AND LESSONS LEARNED

NTR.

## 9.7 CHALLENGES AND ACHIEVEMENTS

NTR.

# 10 INNOVATION

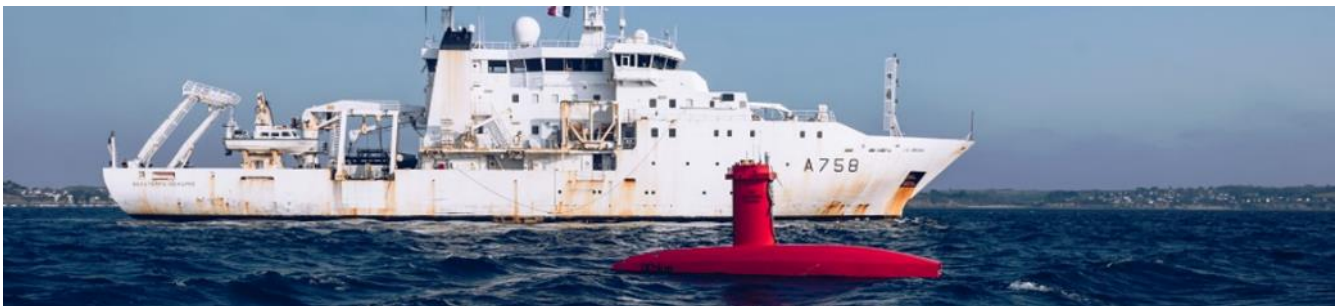
## 10.1 USE OF NEW TECHNOLOGIES

As part of the preparatory phase for the replacement of the hydro-oceanographic fleet (CHOF project), a three-year agreement was signed with the procurement agency of the French DoD (DGA) to conduct experiments and modernize hydrographic data processing techniques.

An initial experiment was carried out in September 2020 with 2 DriX unmanned surface vehicles equipped with an MBES and a sediment echo sounder, and was repeated in October 2023. From 2021 onwards, numerous other experiments were carried out with Exail's AUV A18D and Kongsberg's AUV HUGIN 6000 Superior to acquire the autonomy required for their use and knowledge of high-resolution seabed mapping.

Shom possesses since 2024 two gliders. The first operate the following equipments: CTD, O2, PAR, ADCP, Chlorophyll, CDOM and Backscattering. The second one has: CTD and hydrophones.

In addition, after several years of operational use of airborne Lidar, experiments are planned in the coming years to test UAVs equipped with bathy Lidar in conditional operations.



*Fig. 11 – Experiment of USV DriX deployed from BHO Beautemps-Beaupré (Source: iXblue, 2020)*



*Fig. 12 – Experiment of AUV HUGIN deployed from BHO Beautemps-Beaupré  
(Source: Marine nationale, 2021)*

## 10.2 RISK ASSESSMENT

Shom completed in 2020 the development of an experimental tool called "Deseason platform". It is a multi-criteria decision tool for hydrographic risk assessment and cost-benefit analysis. It will be used in the coming years to improve the national hydrographic survey program.

## 10.3 POLICY MATTERS

NTR.

# 11 OTHER ACTIVITIES

## 11.1 PARTICIPATION OF IHO MEETINGS

Due to its overseas territories and primary charting responsibilities, France, represented by Shom, is a member or associate member in 9 regional hydrographic commissions.

The detail of Shom's involvement in other IHO activities is listed in the table hereafter:

Name	Chair / Vice chair	Member	Observations
Council		✓	IHO Council
CBSC		✓	Capacity Building Sub-Committee
NCWG		✓	Nautical Cartography Working Group
ENCWG		✓	ENC Standards Maintenance Working Group

DPSWG		✓	Data Protection Scheme Working Group
DQWG		✓	Data Quality Working Group -Last meeting in 1996
EAtHC		✓	Eastern Atlantic Hydrographic Commission
FC		✓	Finance Committee
GEBCO		✓	Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of Oceans (GEBCO)
HCA		✓	Hydrographic Commission on Antarctica
HDWG		✓	Hydrographic Dictionary Working Group
HSSC	✓	✓	Hydrographic Services and Standards Committee
IENWG *	✓	✓	IHO-European Union Working group
IRCC		✓	Inter-Regional Coordination Committee
MACHC		✓	MESO American & Caribbean Sea Hydrographic Commission
MBSHC	✓	✓	Mediterranean and Black Seas Hydrographic Commission
MSDIWG		✓	Marine Spatial Data Infrastructure Working Group
NIOHC		✓	North Indian Ocean Hydrographic Commission
NIPWG		✓	Nautical Information Provision Working Group
NSHC		✓	North Sea Hydrographic Commission
RSAHC		✓	ROPME Hydrographic Commission
S100WG		✓	S-100 Working Group
SAIHC		✓	Southern Africa and Islands Hydrographic Commission
HSWG		✓	Hydrographic Surveys Working Group
SWPHC		✓	South-West Pacific Hydrographic Commission
TWCWG		✓	Tidal, Water Level and Currents Working Group
WEND		✓	World-Wide Electronic Navigational Chart Database
WWNWS		✓	World-wide Navigational Warning Service Sub-Committee

#### \* Representation of SAIHC at IENWG:

France represents the SAIHC at IENWG since its creation. Although the main topic of the IENWG is to deal with European Union policies, activities and processes of HO's interest, the impacts of these activities go beyond Europe. As an illustration, the EMODnet EU initiative, provides a worldwide data index (CDI) and a Bathymetry World Base layer produced in cooperation with the GEBCO. It should be noted that Shom pilots the bathymetric part of the EMODnet programme.

## 11.2 METEOROLOGICAL DATA COLLECTION

NTR.

## 11.3 GEOSPATIAL STUDIES

NTR.



## 11.4 PREPARATION FOR RESPONSES TO DISASTERS

France may have Navy ships in the SAIHC region ready to provide support in case of an emergency. France also provides technical support and has a rapid response capacity for environmental data in case of a disaster.

The point of contact at Shom in case of a marine disaster is the head of the maritime safety information division. This division can be reached 24/7 by fax +33 298 221 665 or email [coord.navarea2@shom.fr](mailto:coord.navarea2@shom.fr).

### - Tsunami alert

Shom is maintaining a large real time tide gauge network RONIM, an important tool for coastal operational oceanography, risk assessment, studies on the evolution of the mean sea level, etc. By having tide gauges in Europe and in the French overseas territories, Shom is contributing to Tsunami warning in Pacific Ocean, Indian Ocean, Caribbean Sea and Mediterranean Sea.

Some of these sea-level observatories are part of the IOC GLOSS system for a global monitoring of sea level change.



*Fig. 13 – Cooperation areas on tsunami warning system (source COI; UNESCO)*

### - Coastal flooding

Shom is associated with Météo-France in the provision and improvement of an alert system to prevent from storm surges and tides named Vigilance Vagues Submersion (VVS). This allows for a better anticipation of flooding and protection of the populations living in the littoral area of Metropolitan France. An extension of that alert system towards French overseas departments is currently under work.

Shom provides the tidal predictions, development and expertise on coastal hydrodynamic and wave models, real time tide gauge observations as well as information relative to extreme sea levels and bathymetry. Météo-France's marine forecasters perform a comprehensive analysis of observation and model outputs to produce a forecast, summarized on a map depicting the level of awareness to adopt along French departments.

This capacity was recently upgraded for storm tide warning on Mayotte and La Réunion islands to make the most of the full forecasts systems of sea state and storm surge, developed and

implemented at Météo-France as an outcome of the HOMONIM partnership project with Météo-France.

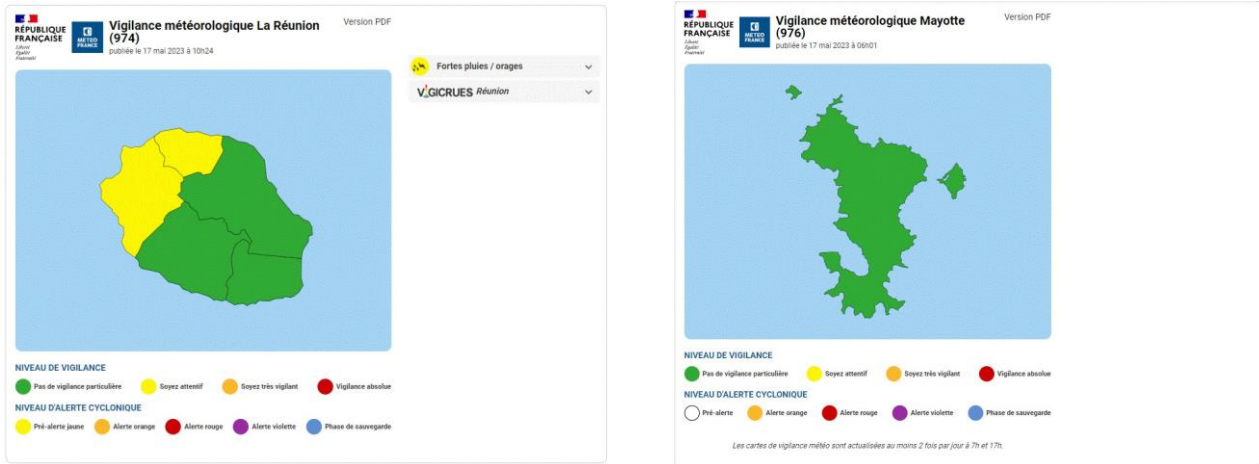
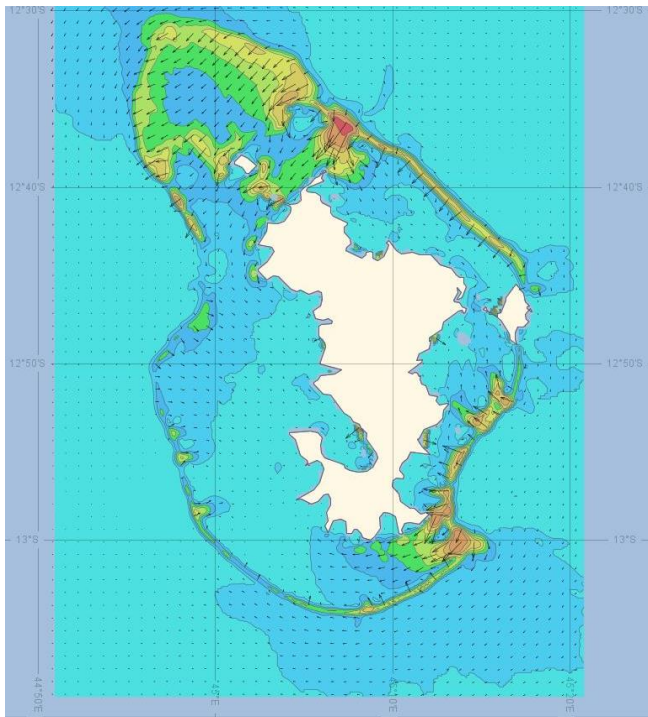


Fig. 14 – Example of “traffic light” maps issued by Météo-France on La Réunion (left) and Mayotte (right) for meteorological risks, including storm tide (when active warning ongoing). © Météo-France.

<https://vigilance.meteofrance.fr/fr/la-reunion> - <https://vigilance.meteofrance.fr/fr/mayotte>

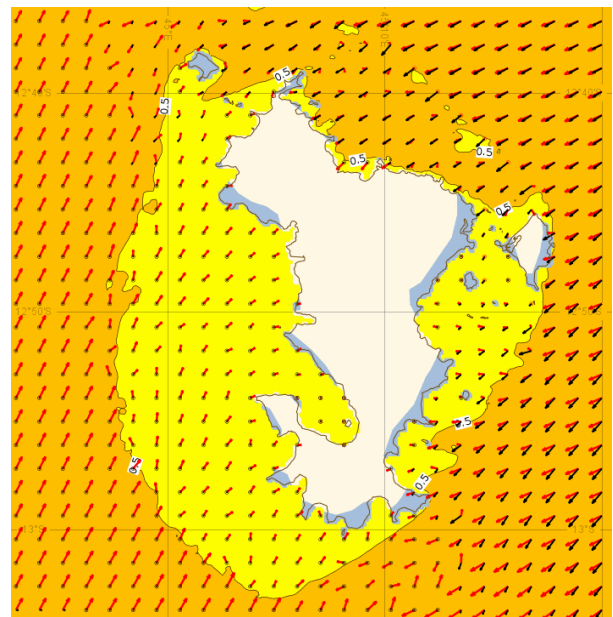
As a reminder, the digital forecast capacity is currently defined as:

- two nearshore wave forecast chains (based on WaveWatch-III model), with a 200m-resolution unstructured grid around La Réunion and Mayotte islands, forced at open boundaries with outputs from the regional wave model MFWAM of Météo-France, and with sea level and barotropic currents from the highest resolution storm surge model (which largely improved the wave forecast inside the Mayotte lagoon);
- a downscaling suite of 3 nested configurations (based on Shom’s Hycom 2D barotropic model) with a 3km-resolution grid at regional scale down to 800m and 200m resolution around La Reunion and Mayotte islands respectively, including specific updated bathymetric DTM, to forecast storm surges and nearshore currents.



*Fig. 15 – Example of 24-hour forecast of 2D-barotropic currents on Sept. 10<sup>th</sup> 2019 00UTC around Mayotte Island*

*(source HOMONIM project. © Météo-France).*



*Fig. 16 – Example of 36-hour forecast of full sea state height (shading) and direction (black arrows), and wind-driven waves direction (red arrows), on Nov 23<sup>rd</sup> 2017 00UTC around Mayotte Island (source HOMONIM project. © Météo-France).*

## **- Oil spills**

Shom is an active member of the inter-agency drifting committee which is activated by the maritime authorities every time there is an oil spill. The POLMAR safety plan for the sea was signed on 23<sup>rd</sup> November 2004 and aims at enabling France to face in a reactive manner a potential wide spread of marine pollution, by ensuring the efficient coordination of national operations and support from public services.

### **11.5 ENVIRONMENTAL PROTECTION**

Shom is a player in the national implementation of the European Union Marine Strategy Framework Directive (MSFD). Shom is the scientific lead for the descriptors "Hydrographic changes" and "Noise" and coordinates the associated monitoring programs. Shom is also a monitoring operator for these descriptors. It is involved in European projects on this issue, such as the JONAS project on the assessment of noise from maritime traffic on the Atlantic coast.

2019 and 2020 were mainly devoted to the revision of monitoring programs. The years 2021 and 2022 were focused on the calculation of indicators and assessments of Good Ecological Status. These indicators will then be reported to the EU by France, based on the scientific reports delivered by the different institutions in charge.

### **11.6 ENGAGEMENT WITH THE MARITIME ADMINISTRATION**

NTR.

## 11.7 AIDS TO NAVIGATION MATTERS

NTR.

## 11.8 MAGNETIC AND GRAVITY SURVEYS

NTR.

## 11.9 INTERNATIONAL ENGAGEMENTS

Within the SAIHC area, a bilateral arrangement of cooperation regarding hydrography, oceanography and nautical charting is concluded between France and the Union of Comoros (updated on November 11<sup>th</sup> 2019), and one is under discussion with the Republic of Madagascar.

An arrangement for the exchange and reproduction of nautical products, in accordance with IHO Resolution 7/1919 as amended (former A3.4) has been concluded with the National Hydrographic Office of India (INHO) on March 8th 2018 (updated on June 3<sup>rd</sup> 2021).

As part of the IHO's capacity building policy, Shom conducted a technical visit to Comoros in October 2022 and another to Madagascar in February 2023. The corresponding reports are available online

([https://iho.int/uploads/user/Capacity%20Building/Reports%20Assessments/Assessment\\_Reports\\_final.pdf](https://iho.int/uploads/user/Capacity%20Building/Reports%20Assessments/Assessment_Reports_final.pdf)).

## 12 CONCLUSIONS

Shom supports any initiative aimed at improving hydrographic knowledge and navigation safety, insofar as the data collected benefit the cartographic authorities and the updating of the nautical documentation of this region.

## ANNEXE I À LA NOTE N°058/SHOM/DMI/REX/NP DU 12 AOÛT 2024

### NATIONAL MSI SELF-ASSESSMENT

Country: FRANCE

Organization: Shom

#### 1 MARITIME AREA

*[Describe maritime area including details of the geographic boundaries]*

The maritime area includes coastal waters (up to 250 NM) of La Reunion Island, Mayotte Island, Scattered Islands, Saint Paul and Amsterdam Islands, Crozet archipelago and Kerguelen Islands.

#### 2 OPERATIONAL POINTS OF CONTACT FOR THE NATIONAL COORDINATOR

INSTITUTION	TELEPHONE	FACSIMILE	EMAIL
Shom, overseas office of the "Information and Nautical publication" department of the "Maritime Products and services" division	+33 2 56 312 192 +33 2 56 312 306	/	<a href="mailto:infonaut-d@shom.fr">infonaut-d@shom.fr</a> infonaut-zre@shom.fr

#### 3 GMDSS MASTER PLAN

*[Report on the status of the GMDSS Master Plan: Is it up to date? When was the last update?]*

The French GMDSS Master Plan is compiled in the Shom publication "Maritime radiocommunications" reference n°924-RNC available on-line:

<https://diffusion.shom.fr/ouvrages/radiosignaux/rsx-92-4-radiocommunications-maritimes-systeme-mondial-de-detresse-et-de-securite-en-mer-smdsm.html>

The publication is regularly updated (last version June 21<sup>st</sup> 2023).

*[Specifics of equipment used and software version with date up-dated]*

Equipment Type for Ports and Local Area	Software Version	Date of Up-date
No NAVTEX station in French overseas territories within the SAIHC region. Coastal warnings broadcasted through SAFETYNET	NTR	NTR
Terrestrial radiocommunications HF, MF and VHF means	NTR	NTR

*[Detail the number of warnings identified as immediate priority (requiring transmission within 30 minutes) and the average elapsed time for passing to NAVAREA coordinator, as reported to the last RHC meeting]:*

Year Y-2		Year Y-1		Year Y	
Total	Average elapsed time	Total	Average elapsed time	Total	Average elapsed time
NTR	NTR	NTR	NTR	NTR	NTR



## 4 NAVTEX COVERAGE

*[Diagram of NAVTEX stations and service areas within maritime area; Contact details for NAVTEX Stations; Confirm operational status has been validated.]*

Not applicable.

Coastal warnings broadcasted by SafetyNET in French overseas territories.

## 5 OPERATIONAL ISSUES

*[New infrastructure in accordance with GMDSS Master Plan; Problems encountered?]*

NTR.

## 6 CONTINGENCY PLANNING

*[Provide information regarding contingency plans that have been established and future plans where appropriate. Also report on any testing of the plan that has been conducted]*

The mutual support process between NAVAREA II and VII coordinators was successfully tested in June 2018.

## 7 CAPACITY BUILDING

*[Demands for Capacity Building, Training requested or received, any offered, status of national, bilateral, multilateral or regional development projects with MSI component]*

Not applicable.

## 8 OTHER ACTIVITIES

*[Participation in other IHO or IMO Working Groups, Regional Hydrographic Commissions, regional conferences related to MSI over past year]*

Shom participates to IHO and IMO Working Groups, Regional Hydrographic Commissions and the regional conferences related to MSI over past year (SMAN12, NCSR7, DRWG19).

## 9 NATIONAL MARITIME WEBSITE

*[(Address, statistics (if permitted by national legislation; how often is the information on your web site updated? Do you display the date and time of the last update on your web site?)]*

French overseas territories POCs for NAVAREA X and XIV:

AREA	COUNTRY	NAME	TELEPHONE	FACSIMILE
VII and VIII	French Areas (La Reunion, Mayotte, French Southern and Antarctic lands)	Commandant de Zone Maritime Sud Océan Indien	+262 (0)2 62 93 53 54	
		EMAIL	<a href="mailto:emia-saint-denis.permanence-ops@intradef.gouv.fr">emia-saint-denis.permanence-ops@intradef.gouv.fr</a>	
VII	HYDROSAN	Coordinator NAVAREA VII South Africa	<a href="mailto:hydrosan@iafrica.com">hydrosan@iafrica.com</a> (07h30 to 16h30 LT from Monday to Friday) <a href="mailto:ncc@sanavy.co.za">ncc@sanavy.co.za</a> <a href="mailto:navcomcen.cape@gmail.com">navcomcen.cape@gmail.com</a> (24/24h 365/365)	
VIII	MSIS (Maritime Safety Information Services)	Coordinator NAVAREA VIII India	<a href="mailto:msis-inho@navy.gov.in">msis-inho@navy.gov.in</a> or <a href="mailto:ncdm-inho@navy.gov.in">ncdm-inho@navy.gov.in</a> (for navigation warning)	

## **10 RECOMMENDATIONS**

*[If any]*

## **11 SUMMARY**

*[Please provide a short summary of this paper which will be included in the final report of the meeting.]*

Shom, as French national MSI coordinator, do not transmit MSI within the SAIHC region.

Shom controls and coordinates the warnings issued by its national delegated coordinators.

## LISTE DE DIFFUSION

### DESTINATAIRES :

- SAIHC CHAIR (UKHO)
- IHO SECRETARIAT

### COPIES INTÉRIEURES :

- DG
- DMI (D-REX)
- ARCHIVES (DMIDSD 2.009)