With over 5900km of high-resolution bathymetric and magnetic survey lines in 32 days, DriX to set new standards in USV reliability in challenging conditions.

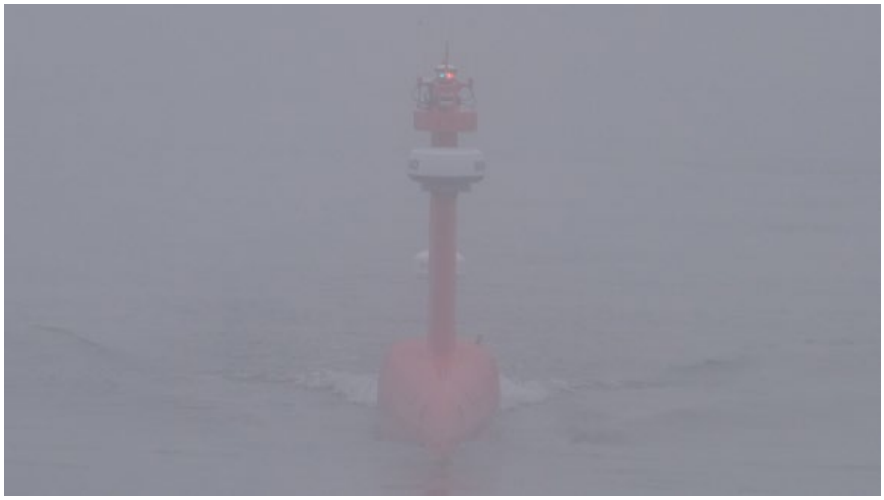
DriX was used to search a sunken fishing trawler, the Ravenel, covering an area ranging from the coast of Saint Pierre and Miquelon (France) to New Foundland (Canada).

CHALLENGE
DriX Operation in challenging weather conditions

SOLUTION
DriX equipped with a Kongsberg EM2040 04 multibeam echo sounder and an OFG SCM magnetometer, communication over the horizon via 4G/ satellite link.

RESULTS
5800km of bathymetric and magnetic survey lines covering the entire planned search area.

In June 2021, DriX performed a multibeam and magnetic survey to locate the wreckage of the French sunken fishing trawler "Ravenel", that disappeared in January 1962 with 15 people on board, and that, despite extensive research campaigns, was never found.



▲ DriX working in OTH with dense foggy conditions

Partners

Introduction : History of Ravenel and the search

On January 28th, 1962, in Saint Pierre-et-Miquelon, a French territory located on the western part of the Atlantic Ocean, South West from New Foundland (Canada), the fishing trawler "Le Ravenel" suddenly disappeared after 8 days at sea with 15 sailors on board. The wreck of the vessel was never found. In April 2021, the French minister of the sea announced the launch of a major research campaign, with the use of the DriX USV to map the seafloor of the French and Canadian coasts.

The project involved iXblue's Uncrewed Surface Vehicle (USV) DriX, with dedicated iXblue personnel to conduct the survey operation, in coordination with local authorities . The mission also included archeologists from the DRASSM (Departement des Recherches Archéologiques Subaquatiques et Sous-Marines) to analyze the data and inspect potential targets using ROVs.

DriX mobilisation started end of May 2021 in Saint Pierre and Miquelon. DriX was used in autonomous mode under the supervision of a remote operator, being monitored either from iXblue's remote control center in La Ciotat (South of France) using 4G connection or satcom depending on the working area, or from a support vessel when available.

A Kongsberg EM2040-04 was used as the multibeam echosounder system (MBES) for seabed mapping. It is the latest generation of MBES on the market which offers selectable frequencies from 200kHz to 700kHz with an angular coverage up to 170°. With an extended emitting antenna, the system provides a TX beamwidth of 0.4° at 400kHz. The multi frequencies mode allows to configure different frequency and swath width per ping. The dual swath option allows to get twice the sounding density of a standard MBES.

A SCM (Self Compensating Magnetometer) from Ocean Floor Geophysics (OFG) was also fitted inside the DriX gondola to log the magnetic data as the DriX USV was conducting the survey. The system is calibrated to compensate the magnetic noise generated by the carrier (DriX) highlighting the magnetic anomalies of objects on the seabed.

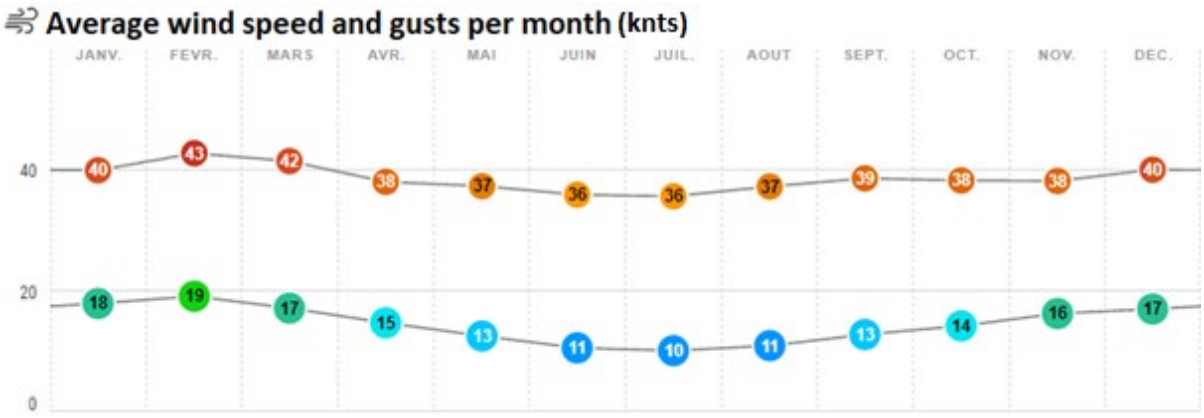
▲ KB EM2040-04 transducers in DriX gondola

1. Covering an extensive area in challenging conditions

The uncertainty surrounding the exact time of the sinking led to the definition of a large research area, from just outside the port of Saint Pierre and Miquelon, to the New Foundland coast.

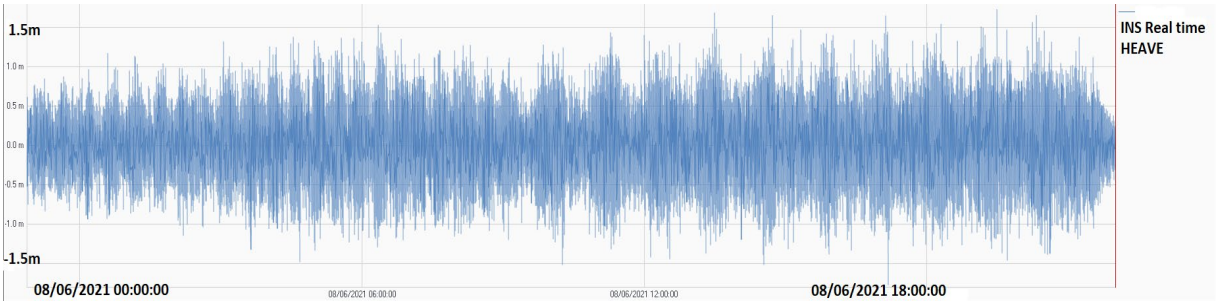
The area environmental conditions are known to be very challenging even in June. Typically, sea conditions with tidal current up to 2 knots, Wind gust up to 50knts, waves of 2.5m and Atlantic swell up to 3.5m are to be expected. The presence of dense fog is another challenge in terms of situational awareness and obstacles management.

Below is a presentation of statistics of wind (average wind speed in knots and gusts) per month for Saint-Pierre and Miquelon.



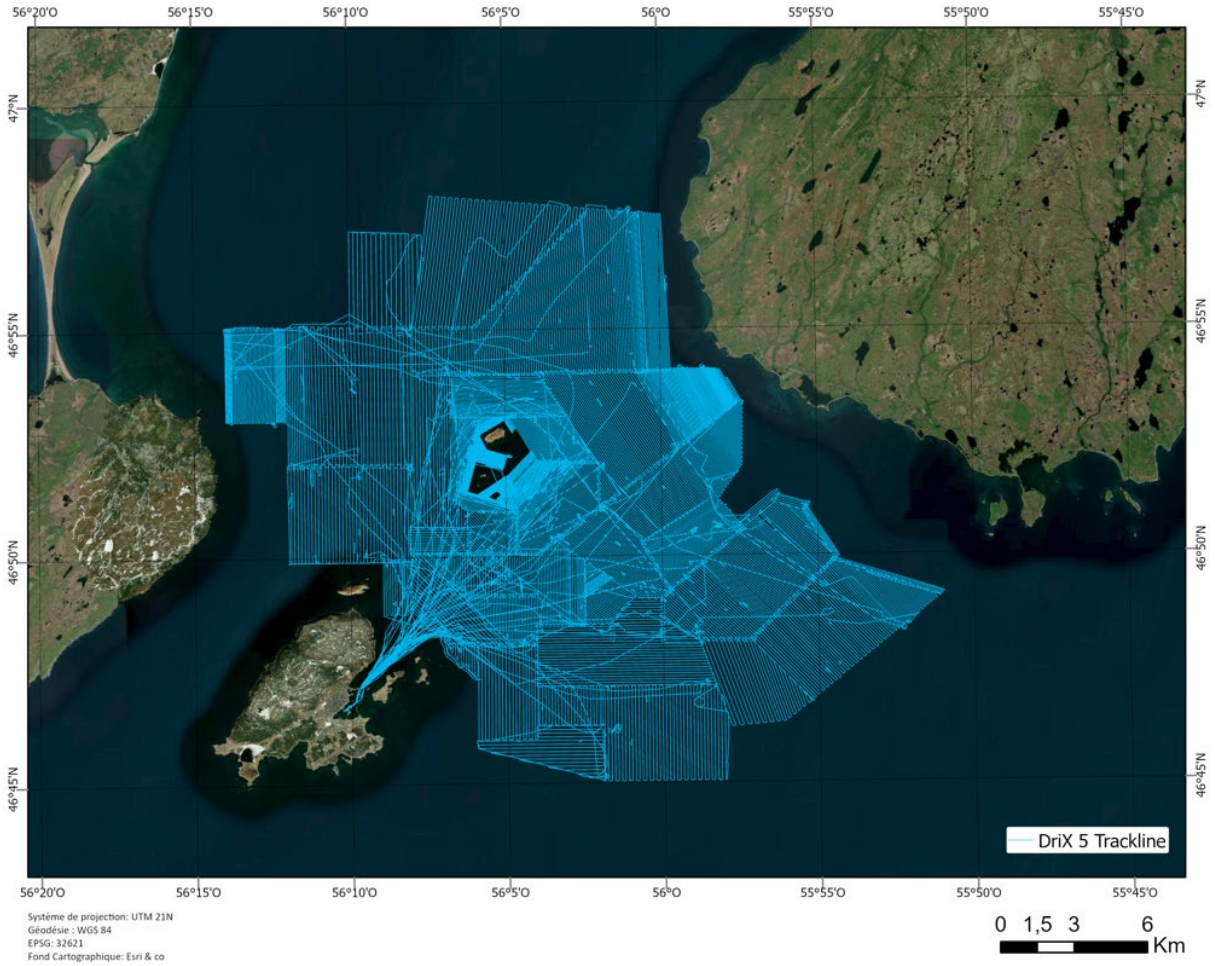
▲ Wind statistics for the Island of Saint Pierre and Miquelon
https://www.windfinder.com/windstatistics/saint-pierre-aeroport

Below is an example of Heave recorded by DriX Phins Inertial Navigation System during one of the acquisition days.



▲ iXblue Phins C7 real time heave recording

These difficult conditions did not prevent DriX from completing the full planned survey area within the allocated time frame. The map below shows the navigation lines performed by DriX during the mission. This represents more than 5865km.



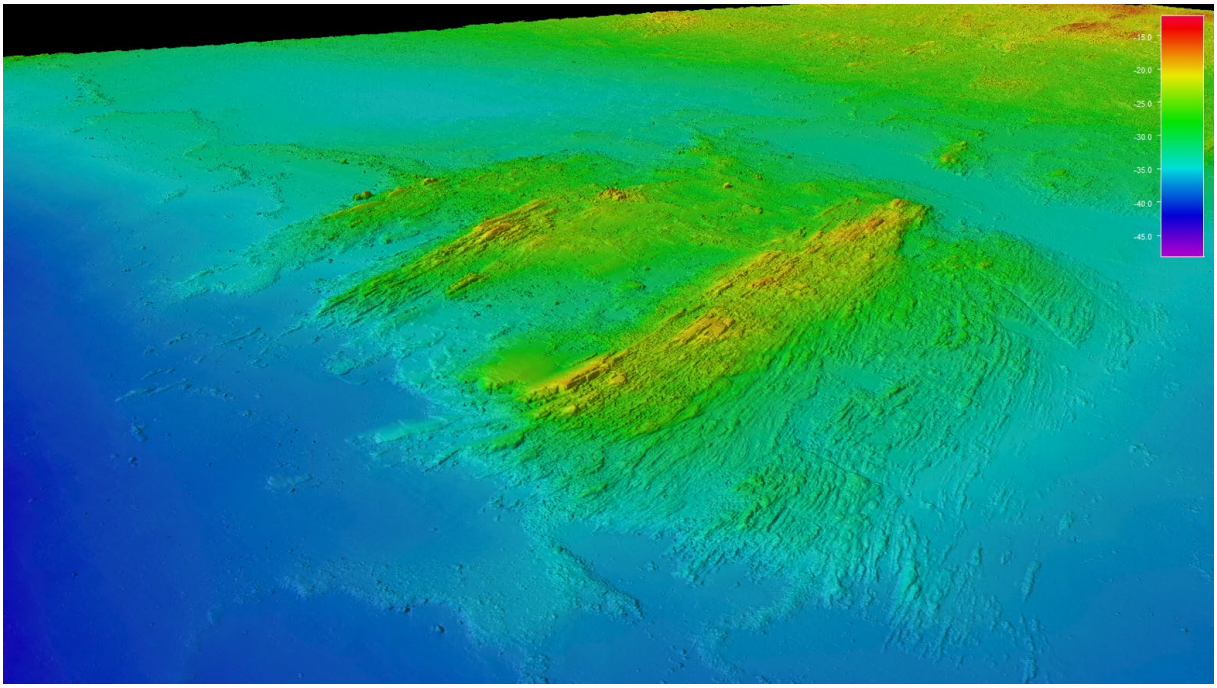
▲ DriX trackline during the project

2. Unprecedent bathymetry data quality

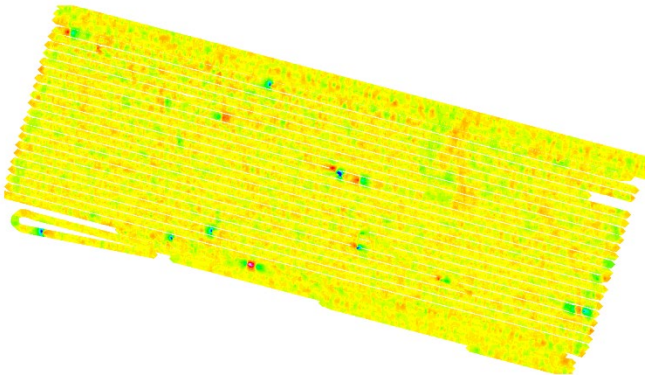
2.1 Resolution at its best

Despite the rough weather conditions, owing to the DriX best in class stability and EM2040 data acquisition, the quality of the acquired multibeam data led to a resolution of the bathymetric surveys up to 5 times better than previous survey in the same area. The optimised data gathering environment allowed to record very clean data. Over the 5000km of survey line acquired, the post processing phase did not require the use of any bathymetric automatic data filter or any manual despiking. This led to a tremendous gain in processing time and fast tracked the data delivery to the archaeology team.

Finally, the very low noise acoustic signature of the DriX gondola allows to maintain high frequency recording and an optimised swath even in deeper waters. Therefore, the 400kHz MBES frequency was used from 5m to 250m depths, the deepest section of the survey area.



▲ 3D data view of DriX MBES survey data using Kongsberg EM2040-04 MBES



The magnetometer data from the OFG's Self Compensating magnetometer provided key information in addition to the bathymetric data to allow detection of anthropic objects on the seafloor.

The magnetic survey data was indeed critical in water depths below 35m when discrimination between ferrous and non-ferrous targets from the MBES was necessary.

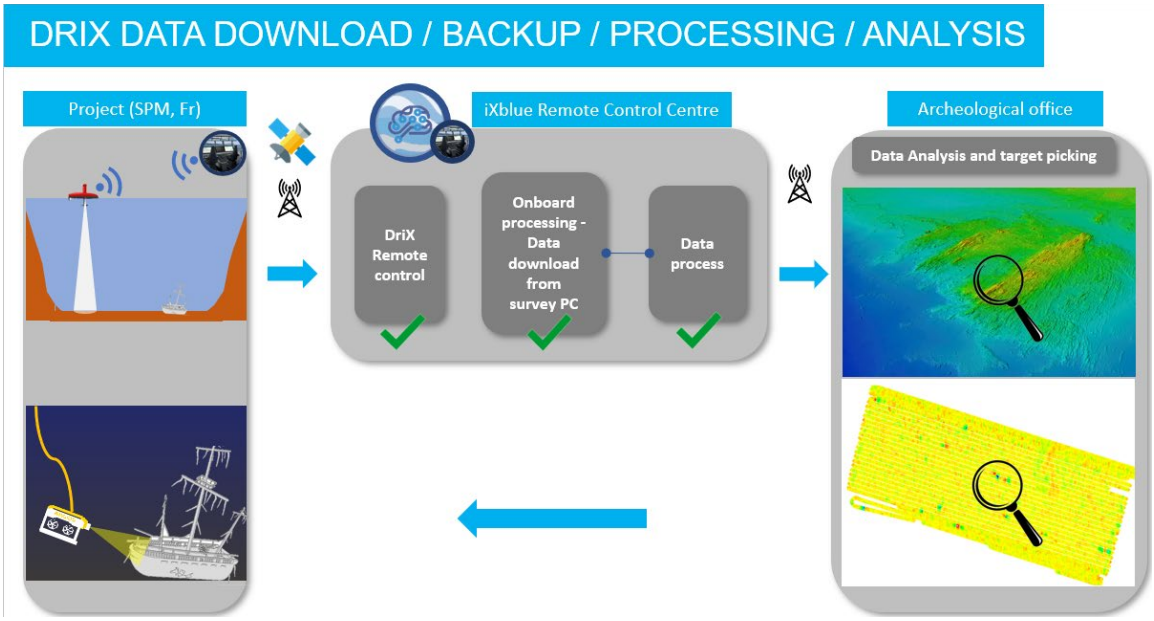
▲ Total Magnetic field grid visualization of the mag data recorded

2.2 Optimised acquisition and delivery

The survey was conducted between 7 and 8 knots, which provides the best compromise between sounding density vs. area coverage efficiency for a given time objective.

Another operating challenge was the coordination in between the organisation involved. iXblue was conducting the survey in Saint Pierre and Miquelon while the DRASSM was performing target identification and the ROV Inspection. The DRASSM operation was fully dependent on the bathymetry interpreted from the DriX measurement. As the ROV Inspection started before the end of the survey project, the bathymetric results needed to be delivered within 2 days after acquisition for review.

The DriX data was downloaded directly from the survey PC to the control centre where the data was checked, processed and delivered to the DRASSM so that analysis and target picking could be performed.

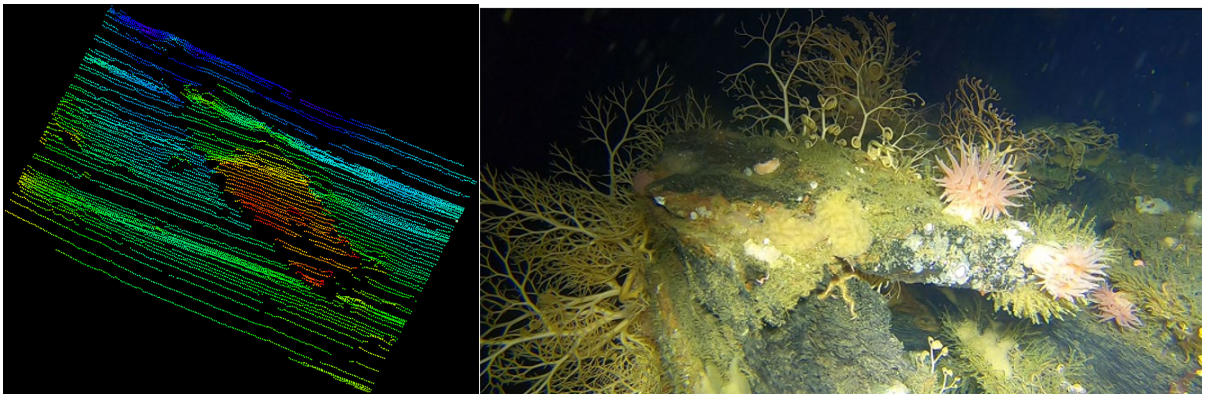


▲ DriX data workflow management

3.Two wrecks discovered

This really high detailed bathymetric mapping of the area allowed the DRASSM to identify two high potential targets, both in French waters.

If the identification confirmed that the two targets were indeed shipwrecks, visual inspection confirmed that they were not the Ravenel. Both wrecks were laying on the seabed at around 110m depths. The first one, around 40m long, the second one (image below), approximately 24m long. Both are wooden made and seem to be from the end of the 19th century / beginning of the 20th.



▲ Identified shipwreck located at 110m depth, seen from the EM2040 data and extracted from the visual inspection

Conclusion

With over 5850km of navigation and completing the full scope of work, DriX showed it was able to provide a reliable and high-quality survey solution, for challenging survey conditions.

Unfortunately, the completion of the search area inspection did not allow to provide information regarding the sinking of the Ravenel. The Mystery still stands ...