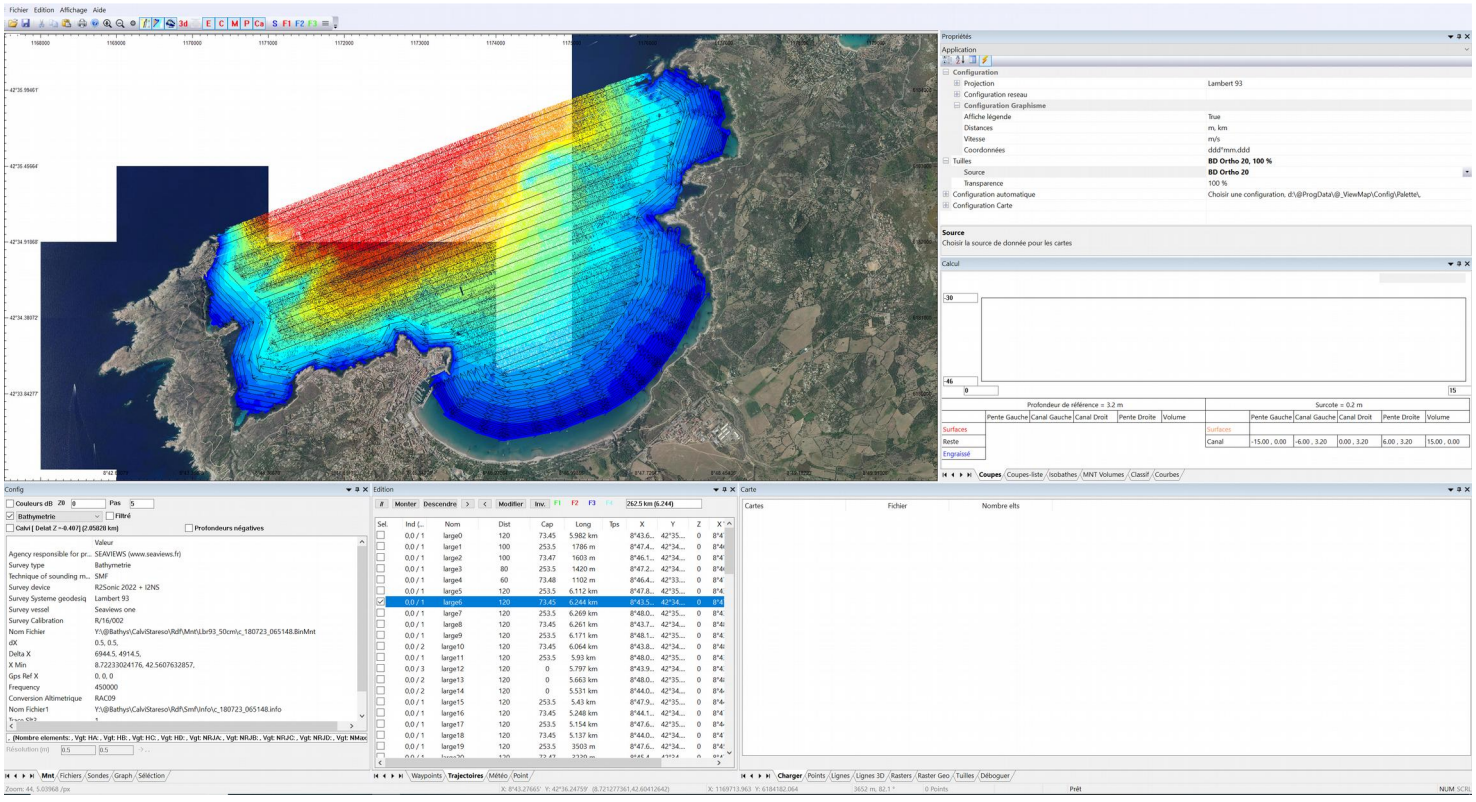
Software development




SEAVIEWS

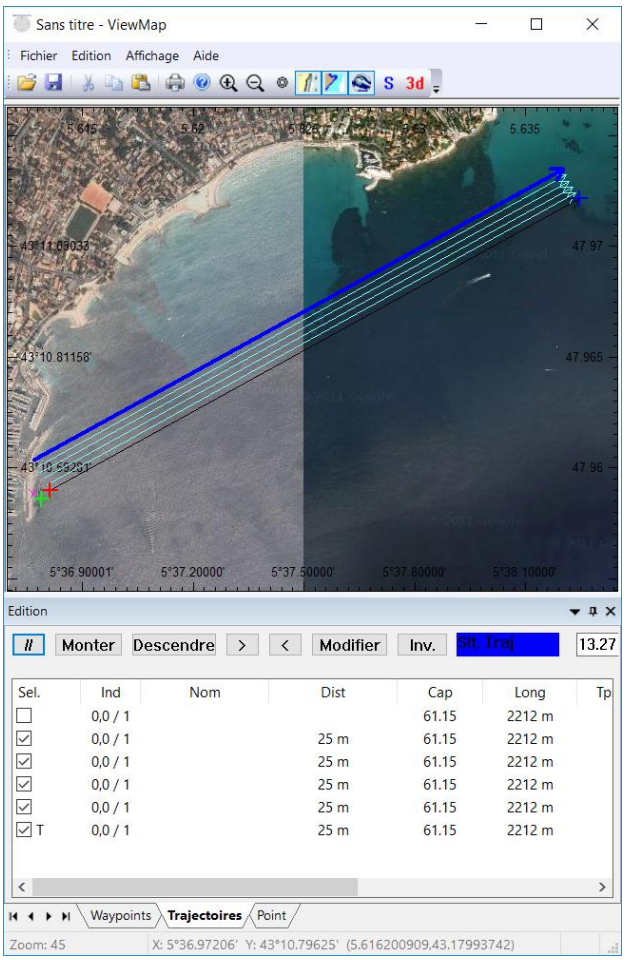
Seaviews is a French company created in 2015 dedicated to coastal and underwater remote sensing. It aims to offer innovative and cost-effective solutions to provide reliable spatial representations in two or three dimensions of underwater habitats.

Taking advantage of its advanced skills in programming and its experience in the field of underwater mapping, Seaviews offers services of software development, providing you with personalised solutions for your cartographic issues.

In addition to personalised software, Seaviews has developed a suite of computer programs supporting you from data acquisition and treatment to cartographic rendering. This suite is composed of three complementary, but independent, programs:

- **ViewMap Acq** for navigation and real time positioning
- **ViewSMF** for data acquisition and treatments
- **ViewMap Point** for map editing

Here follows a description of these three standardized programs. All the functionalities described hereafter can be adapted to existing open source software and fully personalized software suites can be developed by the computer engineering service of Seaviews.



Trajectory drawing in ViewMap Acq through the graphical interface.

ViewMap Acq

Acquisition planning

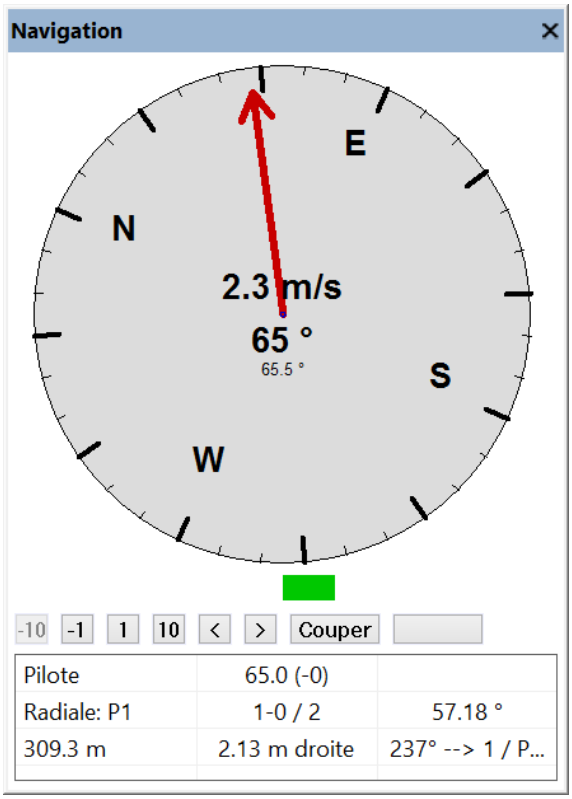
Prior to any field works and data acquisition, a proper preparation is mandatory in terms of sampling points and trajectories. Through an intuitive graphic interface, ViewMap Acq allows:

- to simply draw parallel and perpendicular trajectories for bathymetric surveys taking into account overlaps and nadir cover
- to calculate the total linear length of data acquisition
- to define coordinates of sampling points

Real time guide for data acquisition

ViewMap Acq includes a real time navigation mode taking the shape of a digital compass providing graphical and numerical display. This tool allows to improve navigation quality along the trajectories previously defined.

In order to feat the best with programmed trajectories, navigation informations provided by ViewMap Acq can be coupled with ships' autopilots thanks to a servo-control mode specially developed by Seaviews and using a NMEA183 or NMEA2000 interface. The mean navigation error measured using this system is about 50 cm. The sequence of trajectories can be automatically followed and manually edited during the survey through the ViewMap Acq graphical interface.



Real time digital compass provided by ViewMap Acq during data acquisition.

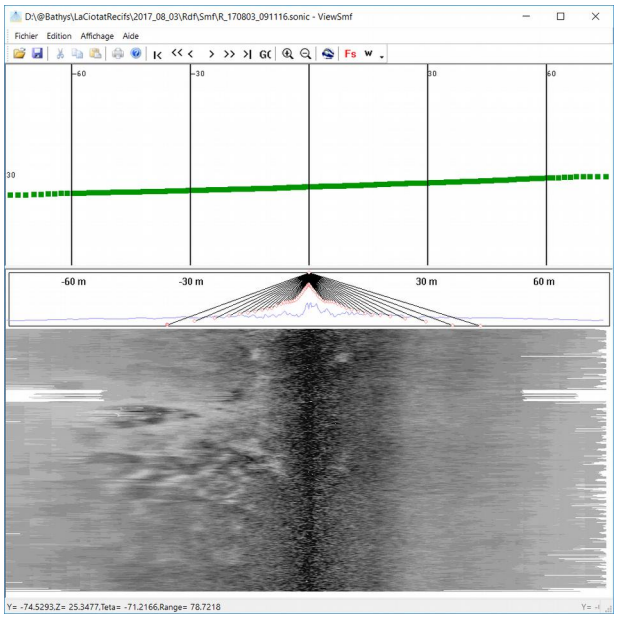
Real time display of celerity data

When using sound velocimeters during hydrographic surveys, ViewMap Acq displays and records celerity data

ViewSMF

Real time display of acoustic data acquisition

Data from acoustic probes are displayed in real time by ViewSMF. In the case of multibeam echo sounders able to provide several types of acoustic outputs, it is possible to simultaneously display bathymetric sounding and backscatter imagery. By being interfaced with the MBES, ViewSMF allows to change acquisition parameters with its graphical display.

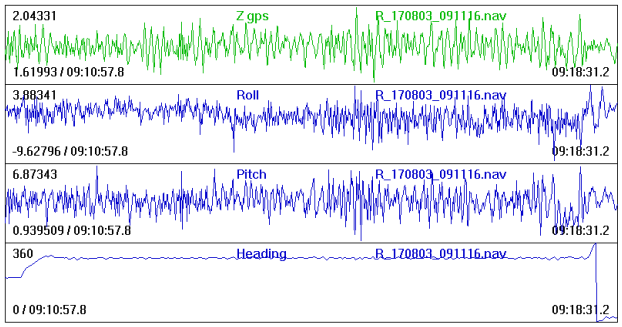


Simultaneous display of bathymetric soundings (green) and backscatter data in ViewSMF.

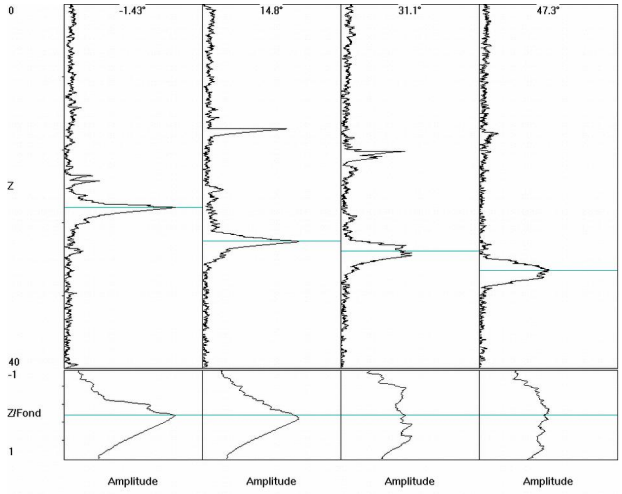
Data visualization

ViewSMF provides a graphical interface to visualize and treat acoustic data from multibeam echo sounders:

- bathymetric soundings
- backscatter images
- water column data with bathymetric soundings
- impulse response through the display of energy along the water column for each beam
- acquisition metadata



Metadata visualization (here GNSS data) in ViewSMF.



Energy of impulse response displayed for four beams in ViewSMF.

False echo filtering

ViewSMF provides tools to "clean" MBES bathymetric data through the use of a set of filters:

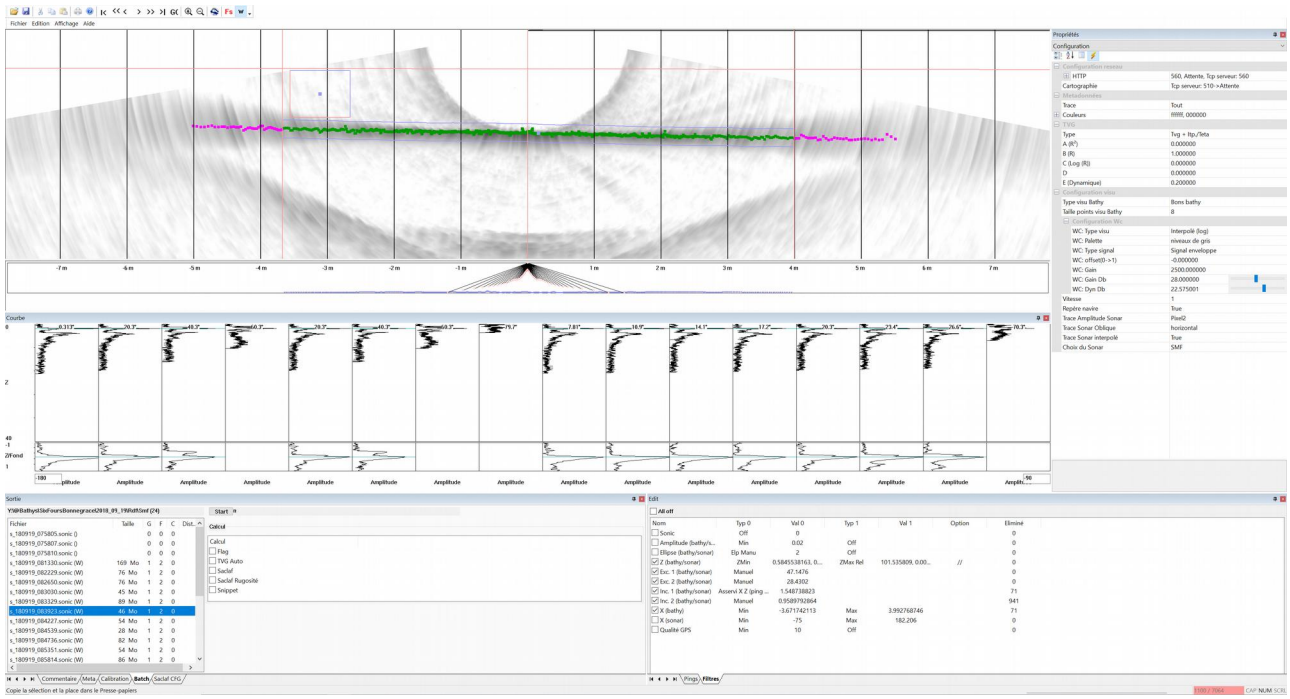
- an elliptic filter on the acoustic source which removes surface reverberation
- a filter for reflected signals
- a horizontal gate (with possible slope) to keep echoes of a specific depth range
- a vertical gate to remove lateral soundings
- exclusive areas manually configured
- a filter concerning GPS quality

Data computing

Following treatment steps, several algorithms are available for deeper analysis of the seafloor and water column characteristics:

- the echo integration on each ping and each swath. It mainly concerns the cumulated energy before and after the sea bottom for the classification of seafloor nature
- a roughness surface index (BATCLAS) for the identification of marine habitats
- an index of acoustic biomass using the water column data to generate maps of fish accumulation

Calculation can be performed simultaneously for several datasets thanks to the batch computation mode. The calculation process can be lunched as a background task, requiring no additional human intervention.



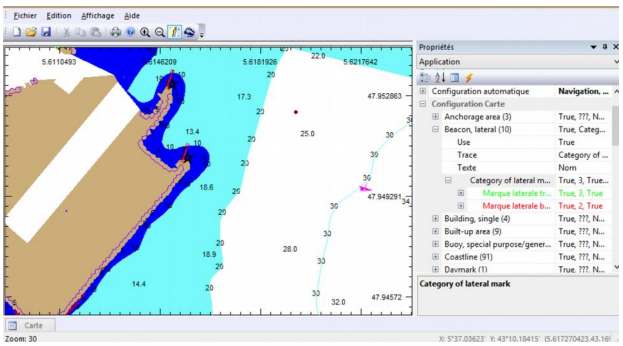
Acoustic data treatment with ViewSMF using its various filters and water column displaying.

ViewMap Point

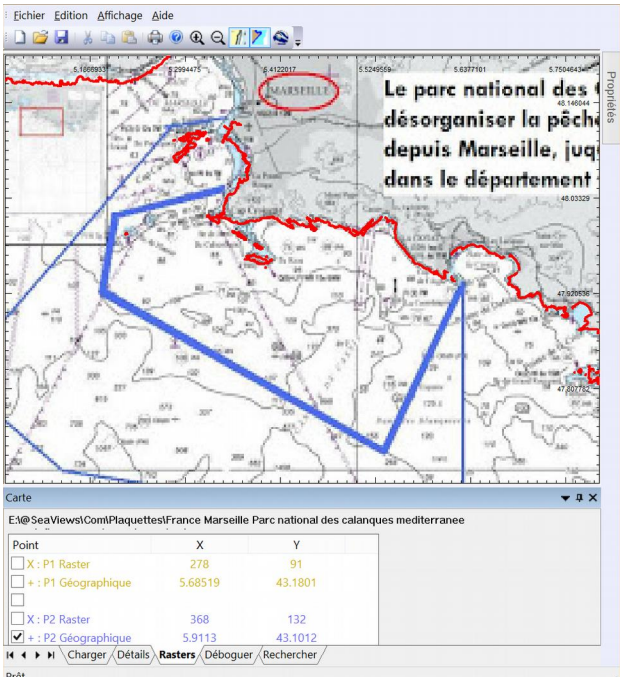
Visualization of cartographic data

ViewMap is able to open a wide range of vectorial and raster cartographic data formats.

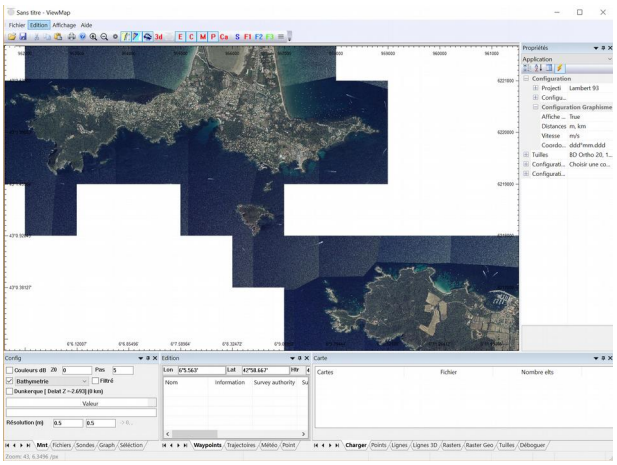
Vectorial datasets such as IHO S57, midf-mif, kml, dfx and ascii can be edited in ViewMap and calculations such as isobathymetric lines and DEM generation can be performed. Geographic projection can we directly edited or recalculated.



Georeferenced rasters such as geotfif, kml, mid-mif, bsb and images (png, jpg, gif, tif) are easily imported and edited. Images without georeferencement can be positioned thanks to a geoprocessing mode using manual entries.



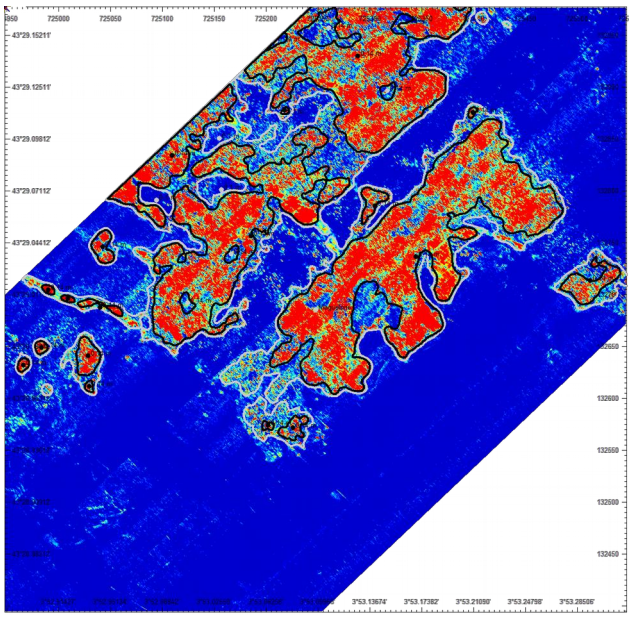
ViewMap is also able to display MTS (Map Tile Service) images as cartographic sources of data.



Tile image display in ViewMap

Segmentation tools

In order to draw borders of marine habitats or simply delineate areas of interest, ViewMap offers various drawing tools to easily generate and classify polygons as well as to edit their attributes. Automated segmentation tools are also available using iso-lines of bathymetric data.

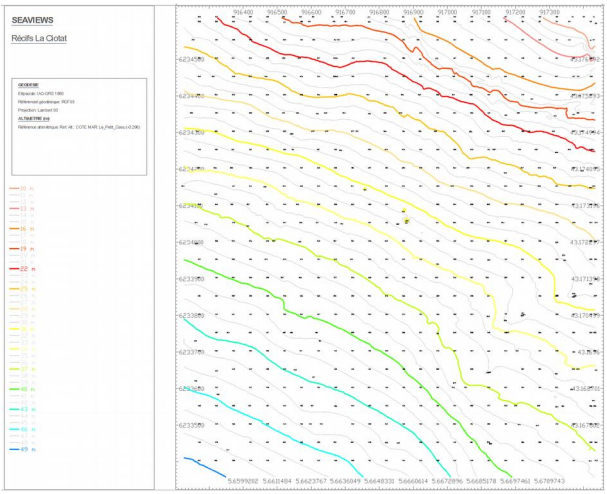


Automated segementation of marine habitats using batymetric data of the BATCLAS index in VIewMap.

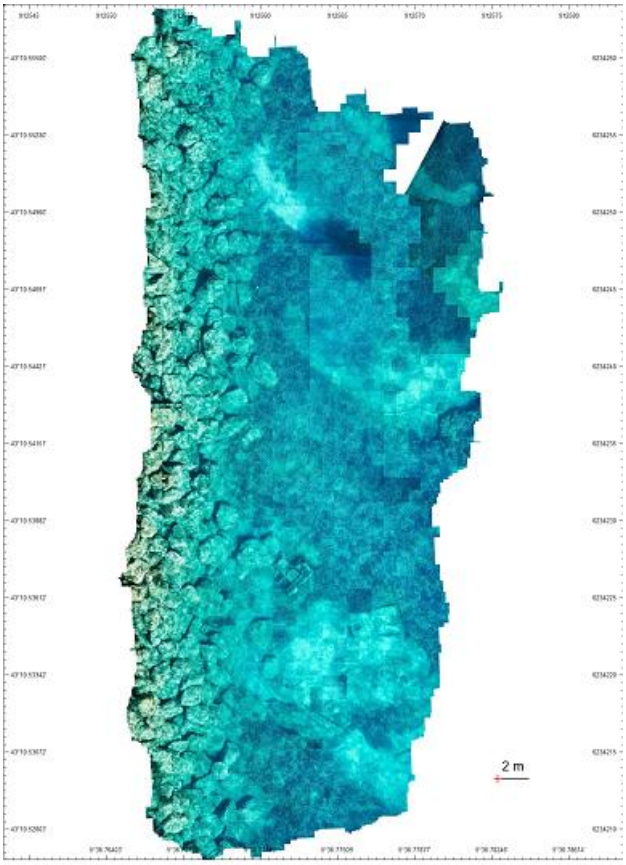
Cartographic products

After data visualization and editing, ViewMap allows to export various types of cartographic products in a wide range of formats such as:

- coloured DEMS
- isobathymetric lines
- depth soundings
- backscatter images
- georeferenced underwater ortophotographs from photogrammetry
- classification of marine habitats
- biomass accumulation maps



Bathymetric lines and depth soundings edited under ViewMap.



Underwater ortophotograph tiles generated in ViewMap from photogrammetric measures.