



exail

SUBSEA IMAGERY

Exail, at the forefront of sonar technology

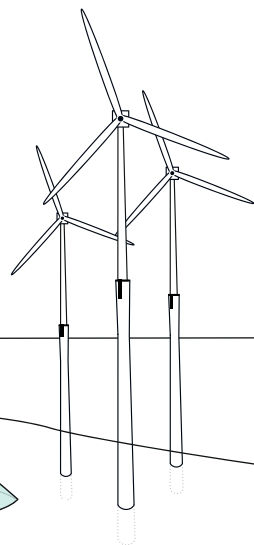
With only 24% of the ocean floor being mapped with a submetric resolution, the ocean's seabed is Earth's last frontier. Mapping the seafloor, protecting marine habitats, hunting for wrecks, studying underwater geo-hazards... Those are challenges for the years to come.

It is to help in that field, that Exail has developed a large range of sonars designed to address the full spectrum of subsea imagery applications, from sub-bottom profiling and seabed mapping to water column monitoring.

SOLUTIONS FOR SUBSEA IMAGERY

Biomass monitoring

DriX
Uncrewed Surface
Vehicle
+
Seapix-R
3D Multibeam
Echosounder

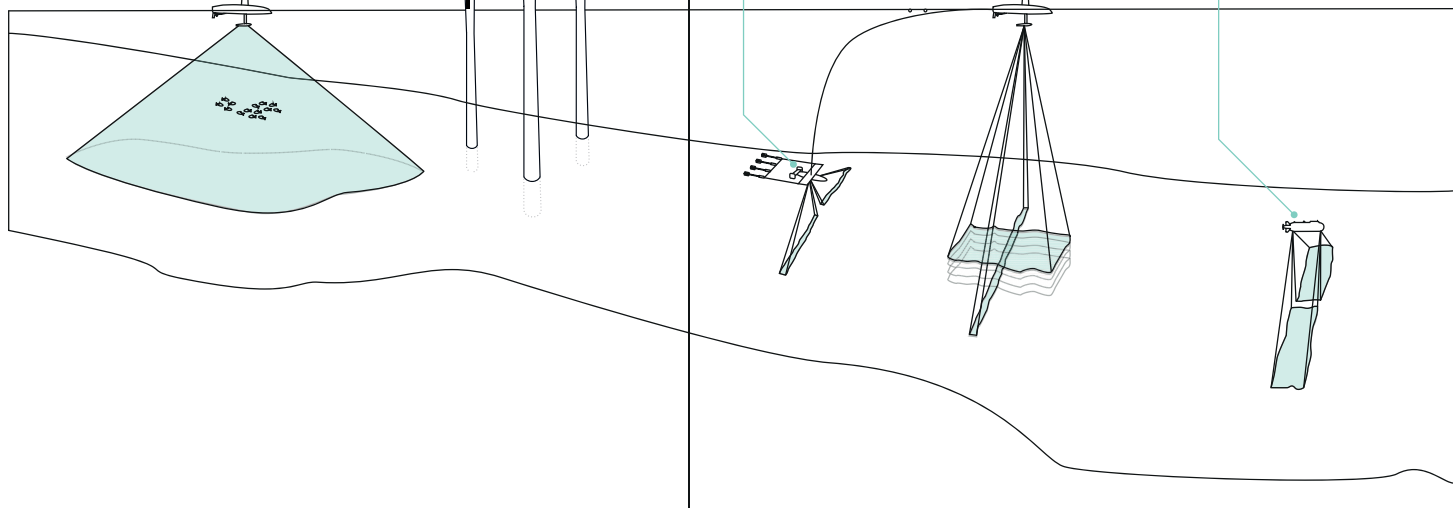
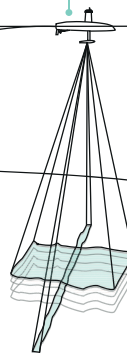
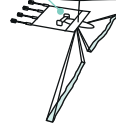


Seabed mapping

FlipiX
Remotely Operated
Towed Vehicle
+
Third-party
Side Scan Sonar
+
Third-party
Magnetometers

DriX
Uncrewed Surface
Vehicle
+
Third-party MBES
+
Echoes Series
Sub-Bottom
Profilers

Sams Series
Synthetic Aperture
& Mapping Sonars
+
Delph Geo
Geophysical
Software Suite



BIOMASS ASSESSMENT AND DISTRIBUTION

SeapiX-R multibeam echosounder

Fishery research

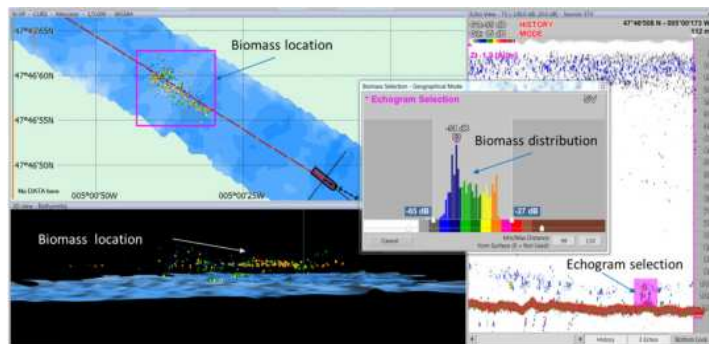
SeapiX-R is a solid-state 3D multibeam sonar that provides accurate water column coverage, biomass assessment and seabed mapping and characterization. Its multiple advanced modulation modes, including Chirp, combined with Doppler processing, are guarantees of the highest possible detection performance, even in difficult conditions. Using SeapiX-R, the scientific community gets new insights for the evaluation and the monitoring of marine environments.

- Easy to deploy (pole, hull, boy mounted)
- 120° x 120° volume coverage
- Target strength split beam measurement in all beams (TS)
- Volume backscattering strength measurement (SV)
- In-situ calibration on a standard target (tungsten carbide 22 mm)
- Backscattering strength measurement (BS) and bathymetry (IHO special order)



SeapiX-R

Bandwidth	150 kHz / 10 kHz
Aperture	120° x 120° Angular aperture (256 beams per swath)
Resolution	1.6° angular / 75 cm range
Gyrostabilisation	TX/RX
Metrology	Calibrated SV/BS/TS
Calibration tool	In-situ calibration tool
SW export	3 rd part SW export such as Echowiew

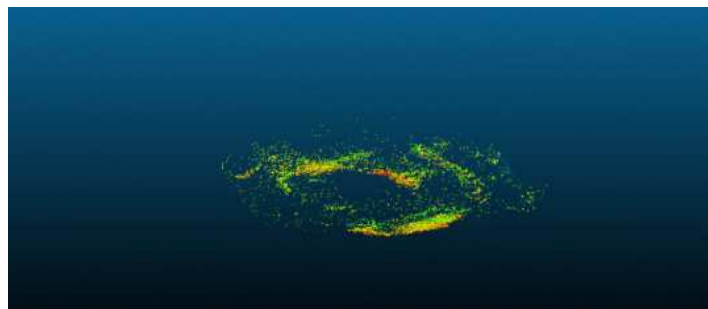


Biomass monitoring for offshore renewable energy

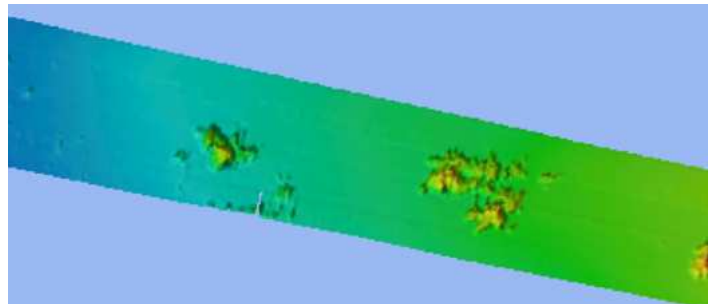
SeapiX-R is a high-resolution multibeam echosounder (MBES), ideally suited for biomass monitoring in offshore wind farm areas. Thanks to its steerable symmetric Mills Cross array operating at 150 kHz, SeapiX-R enables the mapping of two- and three-dimensional biomass distributions around wind turbines using spiral and straight-line transect patterns. This cutting-edge MBES provides high-quality water column and seabed images in both athwartship and fore-and-aft directions. Its steering capability in transmit and receive modes allows for a wide volume coverage of 120° x 120° under the platform, with a 1.6° x 1.6° beam aperture on the antenna axis. Thanks to its capability to be calibrated in situ, the SeapiX-R data is compatible with historical single-beam echosounder time series.

The SeapiX provides unique and valuable data such as:

- 3D structure and shoal morphological characteristics
- Shoaling avoidance behavior, at the approach of a monitoring ship
- 3D bathymetry profile and type of sediment
- Evaluation of the bias on density estimation from single beam echosounder



3D representation showing the spatial position of fish around a turbine during a wind farm survey off the U.S. East coast



Bathymetry data obtained using the SeapiX-R sonar. Meeting IHO Special Order when coupled with external high quality motion sensor.

SEABED MAPPING

Echoes Series Sub-Bottom Profilers (SBP)

The Echoes Series provides a complete solution for acquiring, processing and interpreting high quality geological data thanks to its integration with the Delph Seismic software. Based on advanced Chirp technology and transducers' wide aperture, the Echoes Series has unique capabilities for object detection and a maximum penetration whatever the seabed topography. It covers the full range of applications, from very shallow (1 m) to deep waters (6,000 m), including physical oceanography, sedimentology, geo-archaeology, oceanographic survey, as well as industrial & geotechnical survey.

- Wide spectrum coverage (150 Hz-15 kHz Transducers)
- Efficient Chirp technology with large transducer beams
- Easy to deploy and operate (USV/AUV/pole mounted)
- Real-time monitoring, optimized processing and data interpretation software



Echoes 3500 T1

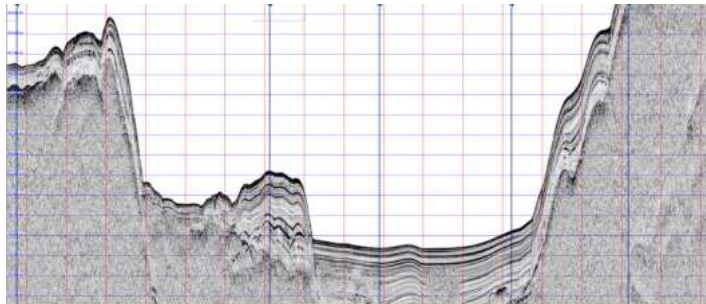


Echoes 5000



Echoes Compact

Frequency Bandwidth	1.8 - 6.2 kHz	1.7 - 8.5 kHz	5 - 15 kHz
Source level re.1µPa@1m	195 dB	190 dB	194 dB
Vertical resolution	17	11	7.5
Angular aperture	45°	Omni	30°
Autonomous platform compatibility	USV	AUV	USV



High-resolution seismic profile from Lake Aiguebelette (France, Banjan et al. 2022)

Sams Series Synthetic Aperture Sonars (SAS)

The Sams Series enables highly accurate and efficient mapping of vast areas down to centimetric accuracy. By integrating positioning, navigation and built-in motion compensation capabilities, and by conducting real-time SAS processing, it delivers high-quality and high-resolution geo-referenced maps in real-time. The Sams Series can be mounted on assets such as AUVs, ROVs, and ROTVs, or towed behind a traditional surface vessel down to 6,000 m.

- Optimal range/resolution ratio in comparison to traditional side-scan sonars
- Resilient to harsh operational conditions and platform motions
- SAS technology benefits while offering the ease of use of a sidescan sonar
- Fine coupling between acoustic data, inertial navigation and acoustic positioning



Sams-150



Sams-50

Central frequency	150 kHz	55 kHz
Frequency bandwidth	30 kHz	15 kHz
Swath	500 m	1,600 m
Along-track/ Across-track resolution	6 cm x 2.5 cm	50 cm x 5 cm
Coverage rate	Up to 5 km ² /h	Up to 6 km ² /h
Interferometry capability	Built-in	Optional



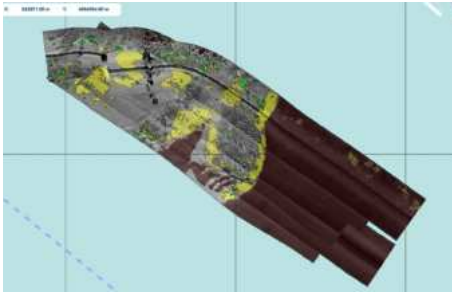
Sams: Mosaic of high-resolution SAS images from multiple survey lines using the Sams sonar

GEOPHYSICAL SOFTWARE

Delph Geo Seabed mapping software suite

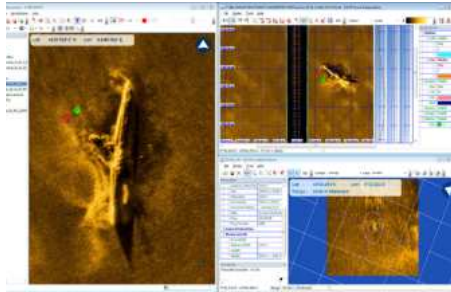
Delph Sonar

Delph Sonar is a complete acquisition, processing and interpretation software package designed to easily conduct accurate and productive side-scan sonar surveys. Providing efficient QC at any stage and relying on Delph powerful workflow and ease-of-use, side-scan sonar mapping has never been so fast.



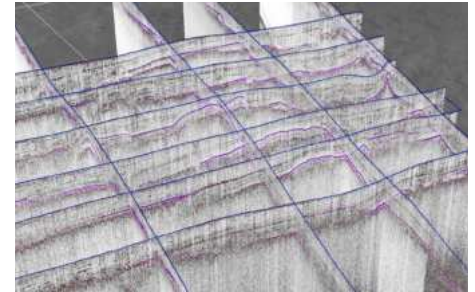
Delph SAS

Delph SAS streamlines synthetic aperture sonar processing within Delph Sonar software. Advanced side-scan sonar processing, mapping and analysis now shares common tools with regular side-scan sonars and benefits from Delph Series optimized workflow.



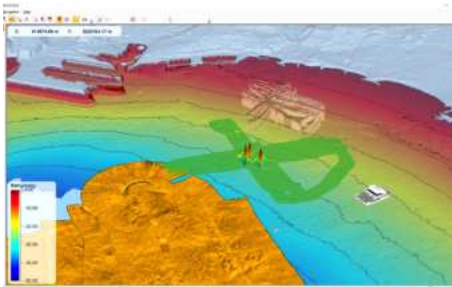
Delph Seismic

Delph Seismic is the most complete acquisition, processing and interpretation software package. It has been designed to provide geologists and geophysicists easy access to all data collected from high-resolution seismic systems and sub-bottom profilers.



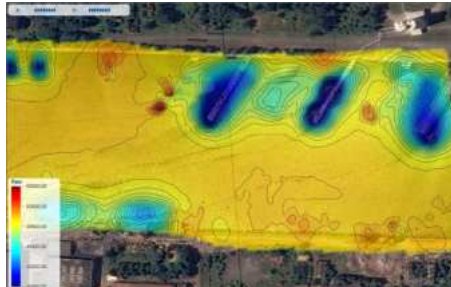
Delph RoadMap

Delph RoadMap is featured with all Delph software and provides advanced real-time and offline data display in a powerful 2D/3D cartographic environment. Delph Roadmap imports any geographical and geophysical data, provides easy access to Delph Interpretation tools and displays all cartographic results.



Delph Mag

Delph Mag locator is a unique operational solution for the mapping of buried objects; in a few steps, it filters and maps magnetic anomalies. Although requiring no prior expertise in magnetic science, it provides an accurate magnetic anomaly map helping locate magnetic sources.



SURFACE INERTIAL NAVIGATION

Surface Attitude and Heading Reference Systems (AHRS) & Inertial Navigation Systems (INS)

Exail offers a complete range of Fiber-Optic Gyroscope (FOG)-based Attitude and Heading Reference Systems (AHRS) and Inertial Navigation Systems (INS) dedicated to maritime surface applications. Highly reliable and performant, Exail systems provide extremely robust navigation information in environments experiencing long-term GNSS outages. For many years now, they've been the preferred surface navigation systems for major operations in the challenging offshore and hydrographic industries.

- Unmatched performance for challenging long-term GNSS denied environments
- Scalable performance thanks to FOG technology
- Unmatched reliability (500,000 hours MTBF)
- Easy to integrate and use
- ITAR-free



Quadrans



Octans



Hydrins



Phins

	Quadrans	Octans	Hydrins	Phins
Heading accuracy (RMS) with GNSS	0.15° deg secant latitude	0.05 deg secant latitude	0.01 deg secant latitude	0.01 deg secant latitude
Roll & pitch (RMS) no GNSS	0.23 deg	0.1 deg	0.05 deg	0.05 deg
Heave	10% RMS / 10 cm	5% RMS / 5 cm	5% RMS / 5 cm	5% RMS / 5 cm
Smart heave	5% RMS / 5 cm	2% RMS / 2 cm	2% RMS / 2 cm	2% RMS / 2 cm
Pure inertial drift				0.6 nm/h
Drift without aiding for 1, 2, 5 min			0.8 m / 3.2 m / 20 m (CEP 50)	0.8 m / 3.2 m / 20 m (CEP 50)
IMO/IMO HSC	•	•	•	•
External sensors	1 GNSS, 1 EM log	1 GNSS, 1 EM log 1 backup GNSS, EM log	2 GNSS	2 GNSS, EM log, DVL

our global footprint



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