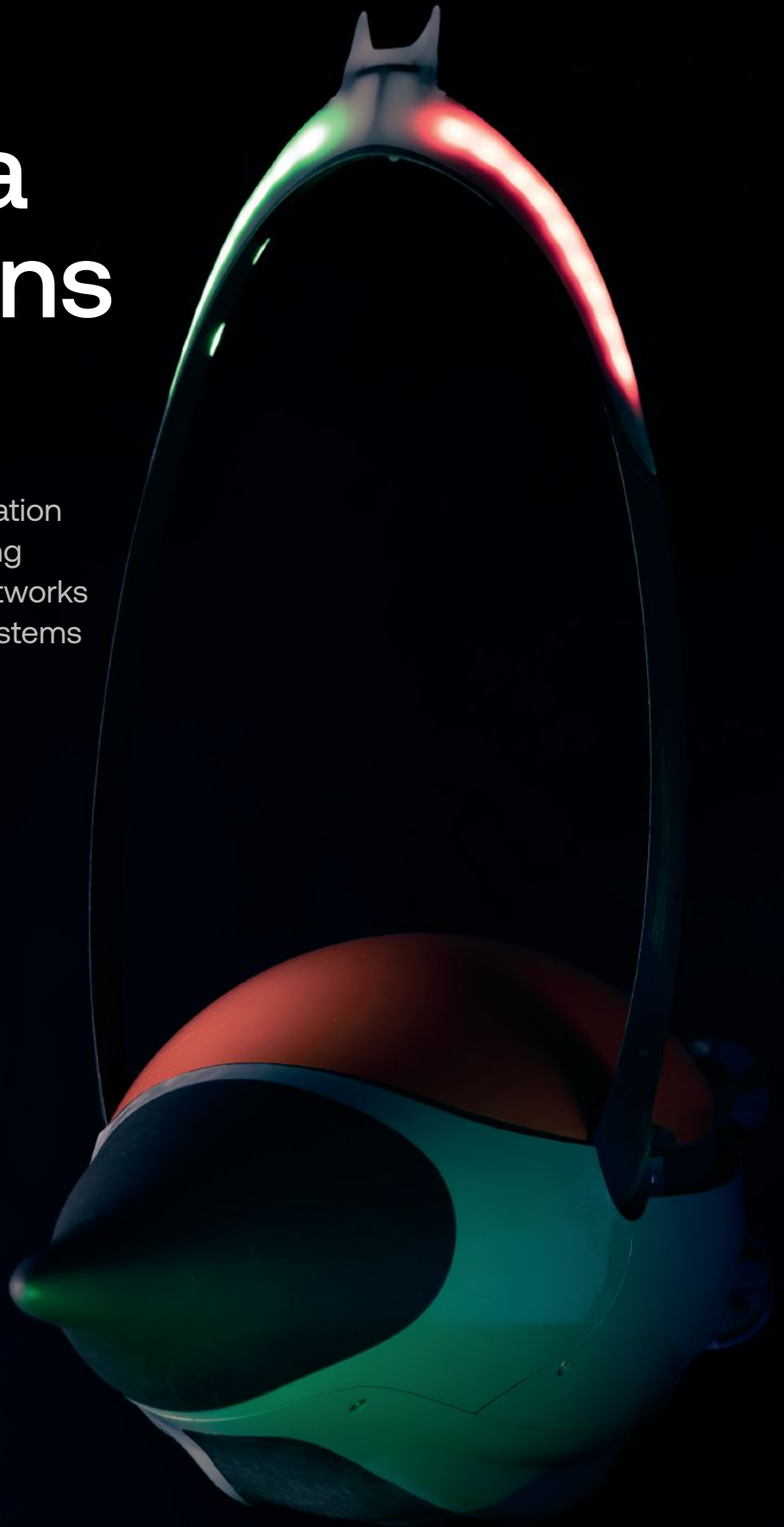


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COVER IMAGE

Preparing a Nortek VM Coastal system with Signature 500 ADCP for vessel-mounted current measurement training in Lima's port of Callao, Peru. Local marine consultancy Canopus Marine Group relies on the Nortek system to understand hydrodynamic conditions in ports. (Credit: Nortek)

NEXT MONTH

Electric power for USV surveys ... Modular solar power system on vessels ... Battery systems for underwater applications ... Subsea telecom project for Isle Au Haut ... Electric propulsion solutions.

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)) Winners of Safety in Seas Awards. The National Ocean Industries Association (NOIA) has announced SEACOR Marine and Proceanic as the winners of the 2025 NOIA Safety in Seas (SIS) Award Competition. SEACOR Marine is the Culture of Safety winner, and Proceanic has won the Safety Practice Award. The Culture of Safety Award honors overall organizational immersion in and commitment to safety, which has resulted in remarkable, measurable, and sustained safety performance over a prolonged period of time. The Safety Practice Award recognizes specific technologies, approaches, methods, or projects with direct and demonstrable impacts on improving safety. SEACOR Marine has been honored for its exemplary safety culture, anchored by a robust Safety Management System (SMS) and innovative programs such as PAUSE (Prevent Accidents Use Safety Equipment). With an impeccable audit record, prestigious ISO certifications, and a data-driven approach—logging over 117,000 behavioral safety observations in 2024 alone—SEACOR Marine sets a gold standard for offshore safety. Proceanic’s Underwater Remote (Mini-ROV) Inspection Services program has been honored for improving underwater inspections in the offshore energy sector. By leveraging advanced mini-ROV technology and innovative tooling, Proceanic delivers high inspection quality while drastically reducing risks to personnel, assets, and the environment, compared to traditional diver and work-class ROV methods. With a 12-year, 350+ campaign, incident-free record founded on a robust SMS, the program has prevented catastrophes by identifying critical structural and equipment defects on platforms and floating assets, removing divers from unsafe work locations, and reducing risk and carbon footprint related to dive support vessels and work-class ROV support vessels. NOIA has held the SIS Awards competition since 1978, sponsored by Compass Publications, the publisher of *Sea Technology*.

)) New Global GHG Pricing Mechanism. The move to implement a global greenhouse gas (GHG) pricing mechanism was made at the International Maritime Organization (IMO) Marine Environment Protection Committee’s session earlier this year. The IMO’s approval of the GHG pricing mechanism is a milestone in the shipping industry’s journey toward decarbonization. For the first time, a binding global economic measure will put a price on emissions from international shipping, creating a clear economic incentive to transition toward cleaner fuels and operations. The cost implications will start at \$100/tonne CO₂, rising to \$380 for higher-emission operations. Furthermore, the shipping sector will be brought under the U.K. Emissions Trading Scheme (UK ETS) from next year under new green maritime plans as part of the U.K.’s new goals for shipping operators to reach net zero by 2050. While the regulatory landscape is evolving fast with FuelEU Maritime, the IMO’s global framework and UK ETS, some shipowners have pulled back from the European market, citing complexity and risk. A change of mindset is necessary as avoidance is no longer a viable strategy, according to EmissionLink, part of Columbia Group. Digital compliance platforms such as EmissionLink will enable shipowners to futureproof their business.

)) Progress in Scalable Hydrogen Energy. Wartsilä Gas Solutions and Höegh Evi have successfully completed development of the world’s first floating ammonia-to-hydrogen cracker. This breakthrough technology enables floating import terminals to produce hydrogen at industrial-scale volumes from transported ammonia, marking a major step in the energy transition. The project is part of Norway’s green platform program. The industrial-scale ammonia cracker has a modular design that allows integration into both hybrid floating storage and regasification units and dedicated floating hydrogen terminals. The technology is highly scalable, with a sendout capacity of up to 210,000 tonnes of hydrogen annually. Ammonia storage can range from 10,000 to 120,000 m³. According to the EU’s REPower strategy, Europe plans to import 10 million tonnes of renewable hydrogen per year by 2030. As the development of the hydrogen grid progresses, floating infrastructure with ammonia cracking technology can unlock large-scale imports, supplying hard-to-abate industries with a stable baseload energy source and balance within the energy system. Hydrogen is emerging as a viable sustainable fuel in the move away from fossil fuels, and it can be produced at a relatively low cost in countries where there is ample access to renewable power. However, it is difficult to store and transport hydrogen, due to its low volumetric energy density and with potentially large vaporization losses. Ammonia is significantly better suited than hydrogen for this purpose. It can be stored in liquid form at moderate pressures and temperatures and transported over long distances by ship. When it arrives at the receiving destination, the ammonia cracker will convert the ammonia back to hydrogen for distribution into the core energy grid.

)) Production Greenlight for USCG Vessels. The U.S. Department of Homeland Security has approved full production of the first U.S. Coast Guard (USCG) Polar Security Cutter (PSC). USCG has also received approval for low-rate initial production of the Waterways Commerce Cutter (WCC). The PSC is the first heavy polar icebreaker to be built in the U.S. in nearly five decades. Icebreakers are essential to ensure U.S. access and sovereignty in the polar regions. The production design for the WCC program entails the first eight hulls of the River Buoy Tender (WLR) and Inland Construction Tender (WLIC), which are WCC variants being acquired under a single contract. USCG plans to acquire 16 WLRs and 11 WLICs to recapitalize the service’s aging inland tender fleet, which supports the U.S. marine transportation system. **ST**

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On Becoming A Software Company

John Deere has been producing farming equipment since 1837, with a brand instantly recognizable from its iconic green and yellow tractors and lawn mowers. But John Deere has been under recent transition, and its story is prescient of the transformation about to occur in ocean technology. John Deere is now a software company.

In 2017, John Deere realized the magnitude of the opportunity to bring precision agriculture and AI to farming across a world of climates, weather, and crops. That year, John Deere Labs was opened in San Francisco to take advantage of the expertise in Silicon Valley. In 2022, John Deere employed about as many software engineers as mechanical and electrical engineers combined. Although mechanical equipment remains at the heart of the business, John Deere is one of the world's largest users of cloud computing.

Marine technology, as a market, is beginning to go through a similar transition. This transition is being driven by development in robotic vehicles (particularly USVs); cloud computing; new telemetry technologies with increased bandwidth; and the ability of software vendors to automate previously tedious, laborious, and error prone data processing steps. The hardware, sensors, mechanical systems and vessels that have been the mainstay of marine technology are poised to begin a step-jump in evolution.

While underwater vehicles have long been navigating without connection to operators, the environment underwater is benign compared to conditions at the surface. For USVs operating on the brutal boundary between air and water, safe navigation, survivability and sensing is much more challenging. Thus, mechanical robustness, controls, self-monitoring and data processing must be increasingly sophisticated. This requires many sensors and a small supercomputer to make sense of the data. To reach these goals, the drive to build USVs will push a sea-change in sensor development that is focused on software.

Navigating a USV safely, while challenging, is rarely ever the sole goal of an endeavor. Other payload sensors are often the real focus, and successful operations require on-the-fly processing of the most mission-critical data. Unfortunately, to keep things inexpensive, vehicles have often been designed as though simply carrying the sensor were enough. A lack of software integration then leaves the vehicle with no ability to semantically understand the data that was the goal of the operation. In addition, when telemetry to the vehicle is easy, the tendency has been to leave monitoring and control to an operator rather than develop machine interfaces to sensors and algorithms that can act on them. Until sensors are tightly integrated, the promise of robotic vessels for force multiplication will be limited.

So, how can companies pivot like John Deere and continue to provide state-of-the-art hardware with state-of-the-art software interfaces too? The Robot Operating System (ROS) might provide a mechanism to do so. ROS is an open-source, message-passing middleware for robotics co-developed by academic and commercial labs worldwide and used in many marine robotic systems. ROS provides standard message types for robot states and multitudes of sensor data, control algorithms, tools to translate between reference frames, and data visualization. By providing ROS message definitions and drivers for their systems, companies can dramatically accelerate sensor integration.

In the coming years, the need for increased autonomy in robotic vessels will drive sensor development. Middleware such as ROS can play a big role. And like John Deere, many traditional hardware companies must adapt. They will need to become software companies. **ST**

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FEBRUARY

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***Undersea Defense Technology (UDT), March 25-27, Oslo, Norway*

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Electronic Charting/Vessel Management/
Ports & Harbors/Dredging/Homeland Security

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APRIL

Offshore Technology/Alternative Energy & Ocean Engineering

MAY

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***OCEANS 2025 Brest, June 16-19, Brest, France*

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Seafloor Mapping/Sonar Systems/Vessels

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AUGUST

Ocean Resources Development & Coastal Zone Management

****MAST AUKUS 2025**, September 3-4, Glasgow, Scotland, U.K.

****OCEANS 2025 Great Lakes**, September 29-October 2,
Navy Pier, Chicago, Illinois

SEPTEMBER

Geophysical Exploration/Seafloor Engineering

OCTOBER

Environmental Monitoring, Remote Sensing & Pollution Control

****CLEAN GULF**, November 18-20, New Orleans, Louisiana

****Offshore Energy**, November 25-26, Amsterdam, The Netherlands

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Florida Seafloor Mapping Initiative

Providing High-Resolution Bathymetry for the State's Coastal Needs

By Richard Goosen • Dr. Cheryl Hapke

Florida's extensive coastline, where the Gulf of Mexico meets the Atlantic, is a major economic driver. It contributes billions of dollars in revenue to the state each year through tourism, fishing, and maritime transportation. It also sustains three-quarters of the state's population. This critical economic and population center faces increasing risks from intensifying storms and accelerated coastal erosion. Recognizing the profound impact of these changes to both lives and livelihoods, the state has implemented the Florida Seafloor Mapping Initiative (FSMI), a comprehensive program designed to enhance understanding of this complex coastal system.

Meeting Multiple User Needs

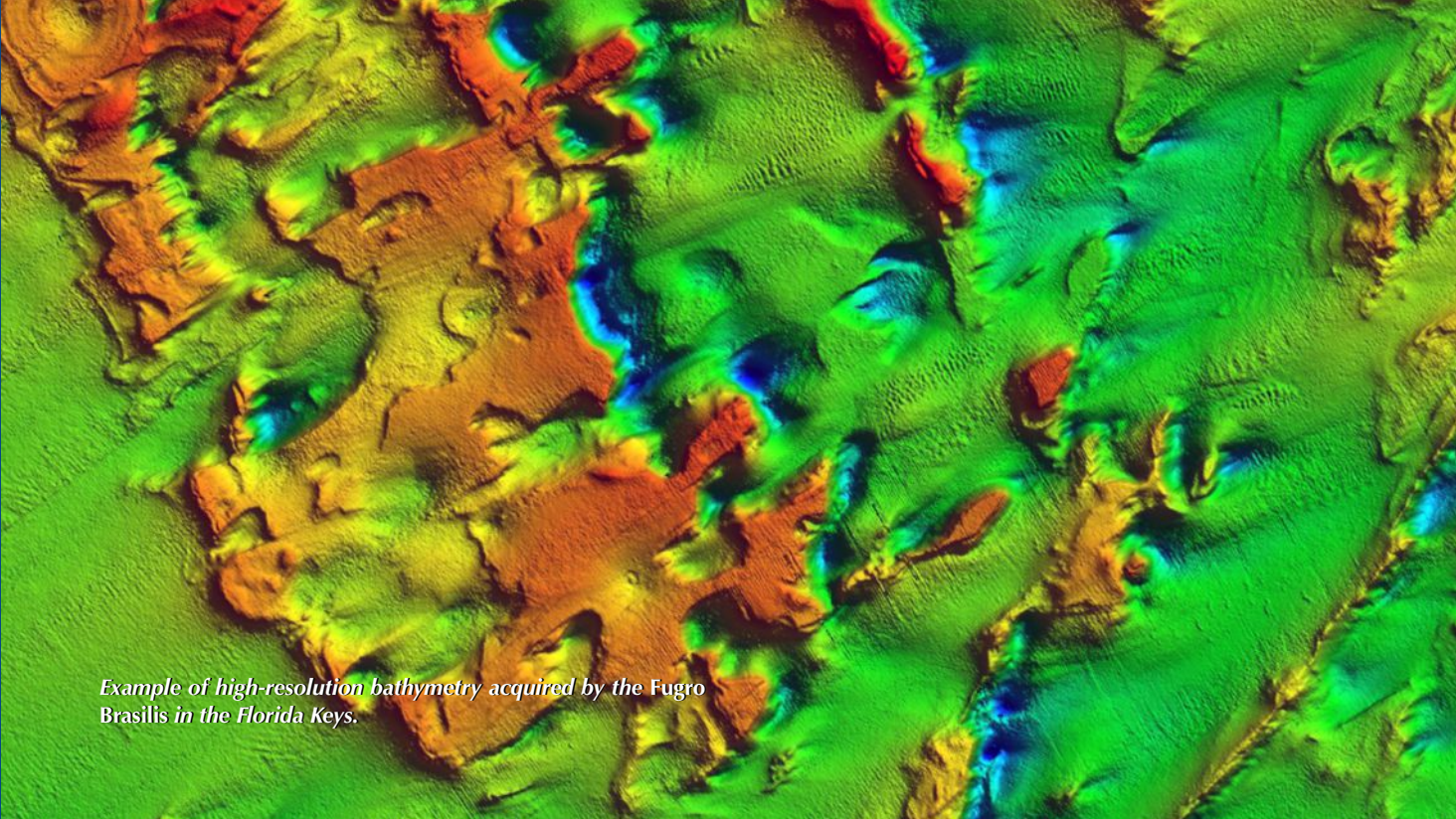
Administered by the Florida Department of Environmental Protection (DEP), the FSMI is a \$100 million in-

vestment dedicated to providing high-resolution bathymetry data for Florida's state coastal waters. It's a project that directly supports a wide range of critical coastal adaptation and mitigation activities.

For storm preparedness, high-resolution bathymetry enhances the ability to predict floodwater heights and aids in identifying erosion-prone areas. In terms of infrastructure planning, these data help identify stable locations for new development while ensuring the avoidance of sensitive habitats. The mapping also bolsters environmental stewardship by pinpointing critical habitats for conservation, including coral reefs, oyster beds, seagrass meadows, and mangroves, while also informing fisheries management for healthy marine ecosystems. For coastal tourism, the detailed bathymetry data allow for the identification of optimal recreational and navigation

The Fugro Brasilis, a purpose-built survey vessel collecting high-resolution bathymetry in deepwater areas, primarily south of the Keys and off the southeastern coast for the FSMI.





Example of high-resolution bathymetry acquired by the Fugro Brasilis in the Florida Keys.

sites, ensuring these locations are both accessible and environmentally sustainable, thus safeguarding delicate coastal ecosystems. Furthermore, seafloor mapping data are essential to locating and assessing offshore sand resources for beach nourishment and the prediction of sediment transport.

Early Coordination Efforts

Serving multiple stakeholders and applications, the FSMI was informed by the efforts of the Florida Coastal Mapping Program (FCMaP), a coordinating body of federal and state agencies that are working to coordinate and facilitate the mapping of Florida's coastal waters. Prior to

FCMaP's formation in 2017, seafloor mapping in Florida was conducted on an ad-hoc basis, primarily to support specific projects rather than broader, multi-stakeholder uses. To address this limitation, FCMaP advocated for a more comprehensive mapping approach, recommending seafloor mapping from the shoreline to the 200-m isobath, near the continental shelf break. To achieve this, they also recommended data collection standards: 1- to 3-m bathymetric models in shallow water (0 to 20 m) and a 10-m resolution in waters from 20- to 200-m water depth.

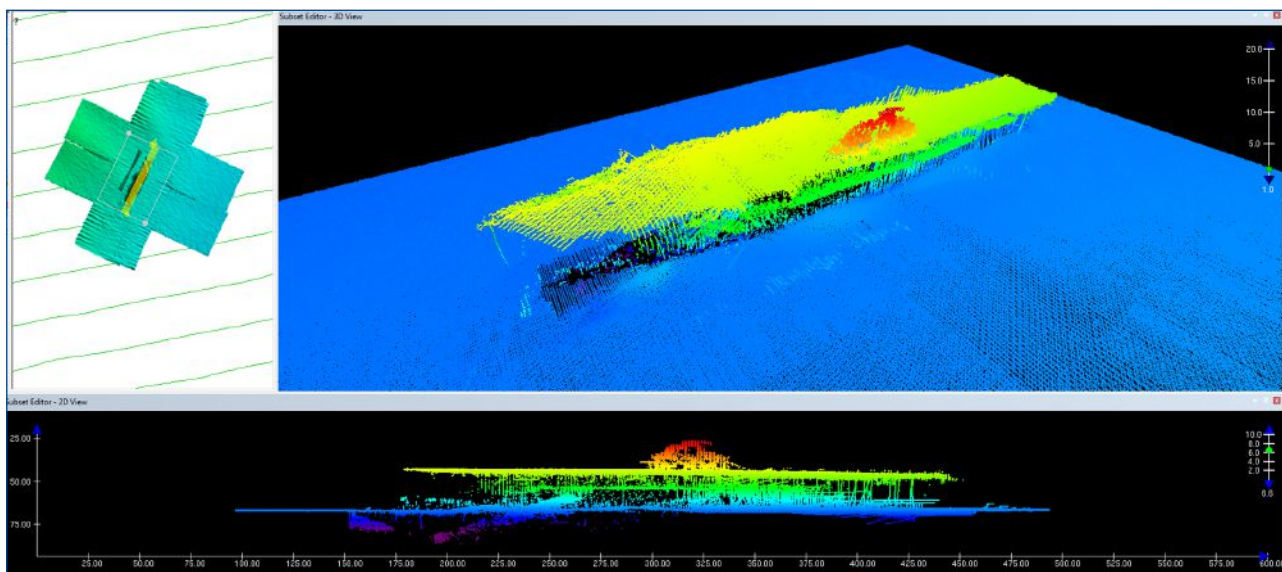
In 2019, FCMaP developed priorities through rigorous stakeholder engagement and an online digital interface where stakeholders allocated virtual currency to indicate their highest-priority mapping areas. (These priorities were further refined through formal consultation with federal, state, and academic agencies with a vested interest in coastal resilience and the marine economy for their highest mapping priorities.) Survey areas were generated from a heat map of these priorities minus any existing high-resolution data.

The FSMI Takes Shape

The FSMI encompasses a strategic, comprehensive "map once, use many times" approach. This ensures statewide data consistency and maximizes the value of collected information. The integrated survey design and standardized data acquisition protocols deliver a seamless, high-fidelity bathymetric data set that can be used at the local, regional, or statewide level for consistency in analysis and resource management. FDEP prioritized data collection using the foundation laid by FCMaP, augmented with further prioritization efforts statewide.

With funding secured for the program in 2022, DEP went about identifying available technologies and con-





Multibeam data over the USS Oriskany. Intentionally sunk in 2006 off Pensacola, Florida, this “Great Carrier Reef” is the world’s largest artificial reef, attracting marine life and divers.

tractors capable of performing the work. To maximize efficiency and to address stakeholder priorities, the program was separated into two phases: an airborne lidar bathymetry (ALB) phase starting in 2023 to collect as much data as possible from the coastline to the 20-m (66-ft.) contour; and vessel-based sonar phase starting in 2024 to collect the remaining priority data, including areas where lidar proved ineffective due to turbidity, from 5 m (16 ft.) to the edge of the continental shelf at 200 m (660 ft.). Data collection will continue through 2025, with final mapping data scheduled for 2026. Working in concert with Florida’s Geographic Information Office, data will be made available to the public through a web portal, with data sharing to federal users, including the U.S. Geological Survey and NOAA.

Fugro’s Role

Fugro has participated in both project phases and is contracted to perform 65 percent of the state’s required vessel-based surveying. Stretching approximately 1,350 mi., the coastal regions of Florida pose multiple mapping challenges. For instance, to map the continental shelf around the state from the coastline to a depth of 200 m (660 ft.) is a huge undertaking, especially on the west Florida shelf, considering the distances involved and the complexity of the environment. Here, the area of interest stretches from close inshore to over 100 nautical mi. offshore, all the way from the southern Gulf Coast down to the Florida Keys. On the East Coast, the shelf break can be as close as 3 nautical mi. from shore, but this proximity often means surveying directly into a 3- to 4-kt. current in the Gulf Stream. This can slow the vessel to a crawl when transiting to the Keys from the Cape Canaveral area, not to mention the many reefs and heavy recreational vessel traffic posing navigational hazards to survey vessels.

Fugro’s award of more than 40,000 sq. km of acoustic collection spans both coasts, requiring tailored mapping

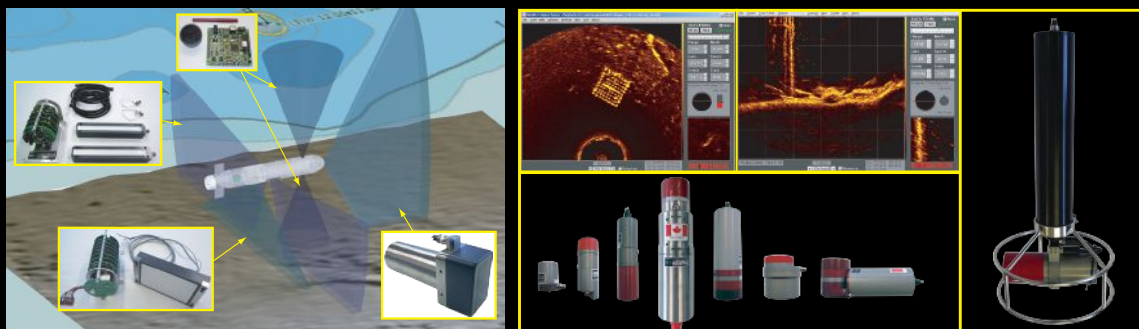
solutions that are efficient in vast shallow-water flats as well as steep continental drop-offs in all seasons. Given the scope of work and the relatively short time to achieve all data collection, upon contract award in 2024, Fugro immediately started sourcing, contracting, and then mobilizing three offshore vessels, capable of getting to and from the survey area at relatively high speed.

While normally used to resupply offshore installations and to perform crew transfers, the vessels were provided with research status by the U.S. Coast Guard following application for and proof that the vessels would be used exclusively for survey purposes for the duration of the project. All three of these craft were fitted with a proprietary, hydrodynamic gondola mounted to a recoverable survey pole over the side of the vessel. Inside the gondola is a dual-head multibeam echosounder. Essentially two sonars fitted at an angle to each other to increase possible coverage, the dual-head technology allows for wide swath coverage in one pass. The vessels were calibrated over the same site to ensure that collected data would conform and meet project specifications.

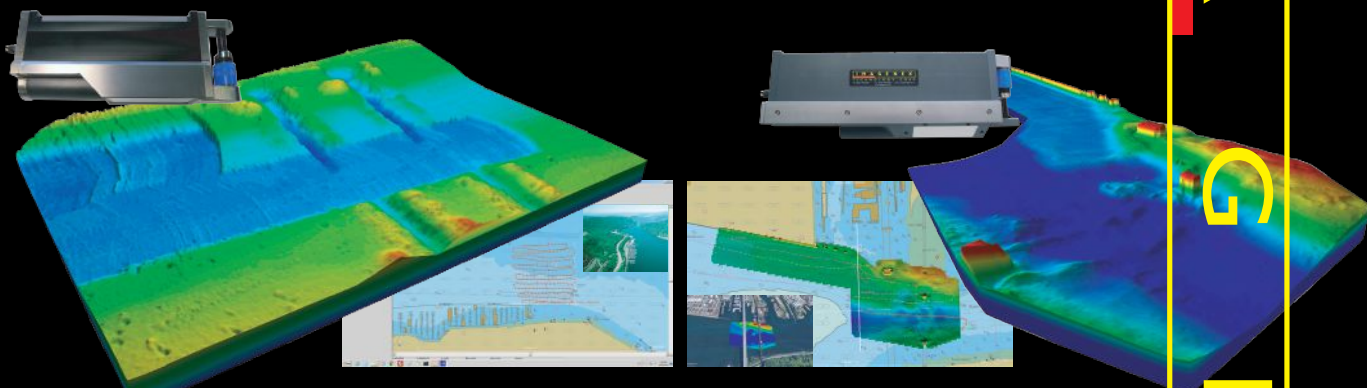
To enhance efficiency in deepwater, Fugro also tasked one of its owned vessels to collect high-resolution data in deeper water, primarily south of the Keys and off the southeast coast of Florida. This hugely capable vessel, the *Fugro Brasilis* can accurately map the seabed from a minimum of 10 m (33 ft.) to a maximum of 7,000 m (23,000 ft.) using a hull-mounted multibeam echosounder system. Fugro also tasked one of its smaller boats, the 32-ft. catamaran *Pelagos*, to collect data in depths less than 10 m (33 ft.). This vessel was also equipped with a dual-head multibeam echosounder to map the shallow-water region and reefs close to the operating areas of the bigger vessels.

Data from all program support vessels are transmitted via satellite to the cloud. There, a combination of automated processes and a dedicated team of data processing specialists compiles and analyzes it for coverage, quality,

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“The FSMI encompasses a strategic, comprehensive ‘map once, use many times’ approach.”

and completeness. This allows the team to provide near-real-time feedback to the vessels, shifting the traditional onboard processing role to shore-based personnel. Furthermore, all onboard systems can be controlled remotely, enabling a lean vessel-based team, enhancing data collection efficiency, and improving the safety profile of Fugro’s fieldwork.

These near-real-time data and coverage results are also uploaded to Fugro’s VirGeo cloud-based geodata engagement and delivery platform. Beyond internal project awareness and progress monitoring, VirGeo enables DEP to track the project using the same high-resolution portal. Notably, VirGeo was also successfully employed during the ALB phase, providing DEP with up-to-date information throughout the lidar data collection portion of the program.

Overcoming Mapping Challenges

The planned acoustic acquisition period, extending beyond a year, requires comprehensive preparation for the diverse weather conditions that Florida’s marine environment can present. The project’s commencement in the lead-up to winter was met with frequent frontal systems traversing the area, resulting in considerable weather-related operational delays. While the associated winds posed challenges for personnel, the quality of the collected data has consistently been high.

A key reason in the selection of the vessels was their ability to quickly relocate in response to developing weather systems. This capability is vital for ensuring the safety of personnel, assets and equipment while allowing operations to continue as effectively as possible. The vessels utilize a wide range of weather information sources, including the expertise of Fugro’s own meteorological forecasters, to make well-informed decisions, particularly in preparation for hurricane season.

Maintaining up-to-date knowledge of weather trends and forecasts is crucial for maximizing opportunities to acquire high-quality data. The three primary vessels are equipped with advanced wide-swath sonar systems, enabling them to gather 3D data from an area up to six times the depth of the water below the sonar.

Continuous progress is further supported by a Fugro-designed moving vessel profiling system. This innovative system allows for the collection of sound velocity profiles of the water column while the vessels continue to acquire multibeam data, eliminating the need to slow down or stop. This information about water characteristics is essential for accurately predicting how sound travels through the water, thereby ensuring the seabed depth

and position data obtained by the sonar system are as precise as possible.

By early April 2025, despite the significant impact of winter weather, more than 40 percent of the planned data collection has been completed, and the rate of acquisition is increasing with the arrival of more favorable weather. Progress is being carefully tracked to ensure that all data can be delivered and accepted by early 2026. Additionally, the possibility of deploying further assets remains an option to assist DEP in ensuring a successful program that achieves all its goals for coverage, accuracy and timely completion.

A Blueprint for Coastal Resilience

The FSMI represents a strategic investment in the state’s future. By adopting a comprehensive and coordinated approach to large-scale baseline mapping of its coastal waters, government and industry stakeholders will have access to the information needed to enable effective storm preparedness, responsible infrastructure planning, robust environmental stewardship, sustainable coastal tourism, and informed sand resource management.

Fugro is proud to have a significant role in this initiative, bringing cutting-edge technology and extensive expertise to the FSMI. By working closely with the DEP and leveraging advanced survey vessels and innovative data processing techniques, the company is contributing valuable data toward a future where Florida’s coastal resources are healthy and abundant.

As final mapping data are published in 2027, Florida will possess an invaluable asset to guide its coastal management decisions for decades to come, ensuring the resilience and sustainability of its economically and ecologically significant shoreline.

References

For a full list of references, contact Cheryl Hapke at: c.hapke@fugro.com. **ST**

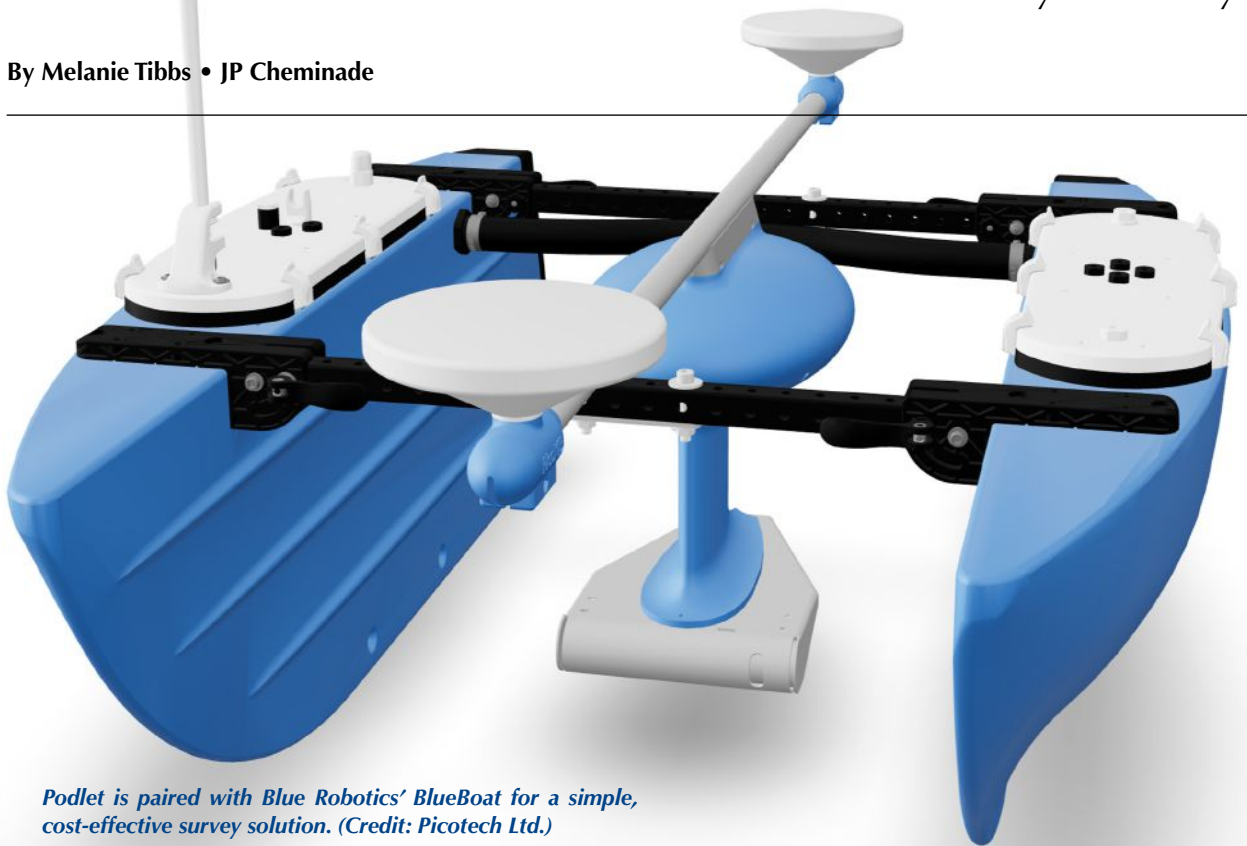
Richard Goosen completed 17 years in the Royal Navy before joining the private sector in 2018. He started with Fugro as a senior hydrographer and is now the operations manager for Fugro’s marine hydrography operations in the Americas, overseeing airborne lidar bathymetry and vessel-based multibeam projects.

Dr. Cheryl Hapke has a Ph.D. in coastal geology and spent 22 years with the U.S. Geological Survey researching coastal change from storms and sea level rise. Since 2019, she has applied that knowledge in the private sector and currently serves as Fugro’s technical leader for coastal resilience in the Americas.

MBES-USV Combo

Multibeam Echosounder and Surface Drones Offer Survey Versatility

By Melanie Tibbs • JP Cheminade



Podlet is paired with Blue Robotics' BlueBoat for a simple, cost-effective survey solution. (Credit: Picotech Ltd.)

Rapid developments in technology, including portability, have created opportunities for new approaches to shallow-water hydrographic and bathymetric surveying in recent years. The holy grail is high-resolution imaging and accurate mapping using light, robust, agile, low-power and low-cost solutions.

New to the market for 2025 is Picotech Ltd.'s innovative Podlet multibeam sonar package in combination with Blue Robotics' BlueBoat USV. Together they form the ultimate one-person-portable survey solution.

A leading innovator for more than a decade, Picotech Ltd. has long been a specialist in the design and manufacture of miniature multibeam. Its products' small size, low weight, and class-leading power consumption

enable rapid mobilization, simple launch and recovery, and long endurance. In 2016, Picotech Ltd. ventured into a new market with the PicoMB-120, which enabled one-person-portable, high-resolution USV multibeam echosounder (MBES) surveys at faster rates in confined spaces. In 2020, Picotech Ltd. released PicoPOD-130, the precursor to Podlet, with a new MBES, which now has a network of global users.

Podlet is a lightweight multibeam package that provides a turnkey solution for International Hydrographic Organization (IHO) Special Order surveys. With low power consumption, it delivers long endurance for seamless, high-precision hydrographic data collection—all in a portable package with a combined mass of just 21 kg.



A construction studies class from St. Colman's College, Midleton, County Cork, Ireland, visited the Celtic Interconnector Project in east Cork recently. The project is being developed by EirGrid and RTE (Réseau de Transport d'Électricité). The students visited the landfall at Claycastle Beach in Youghal where the submarine circuit will come ashore. (Credit: GreenC Marine)



BlueBoat+Podlet fits fully rigged in the trunk of a small hatchback and can be hand-launched and recovered at the point of survey.

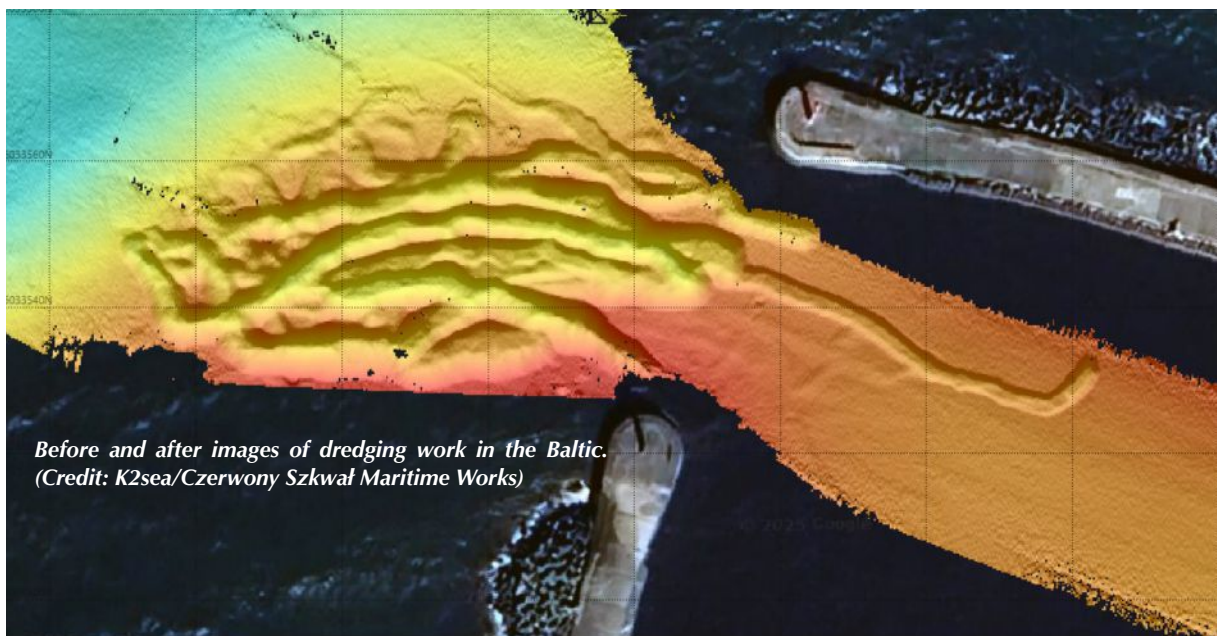
Podlet is supported by industry-standard acquisition and processing software: BeamworX, EIVA NaviSuite, Xylem HYPACK, Teledyne PDS, and QPS QINSy. It also offers bathymetry and backscatter (snippets) as standard. Compatible with low-cost RTK base stations such as the Reach RS2 and built to include an SBG Ekinox Micro INS, Podlet is highly competitive at its price point. The system also opens up the world of hydrography to many traditionally land-based geomatics companies.

Multibeam Sonar Applications

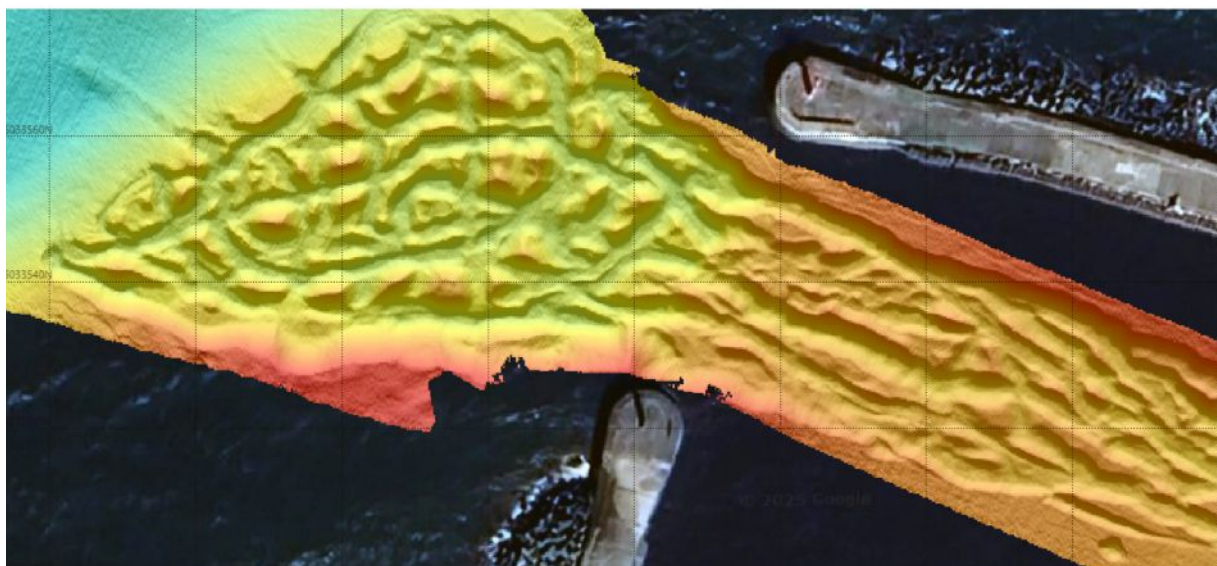
Picotech Ltd.'s multibeam sonars offer unparalleled capabilities in underwater surveying, imaging and mapping. Multibeam revolutionize underwater imaging by focusing and processing multiple beams of sound waves simultaneously. By covering a wider area and capturing more data points than single-beams, multibeam sonars produce highly detailed three-dimensional maps of the seafloor with much greater accuracy. This capability makes them indispensable in various fields, including marine research, underwater archaeology, offshore exploration and hydrographic surveying.



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*Before and after images of dredging work in the Baltic.
(Credit: K2sea/Czerwony Szkwł Maritime Works)*



The bathymetry and snippets/backscatter outputs of Picotech multibeam sonars make them vital tools across a wide range of industries and applications. Snippets (backscatter) data outputs come as standard and provide invaluable additional information on bottom type (hardness). This combination means images show the same geographical extents, with each providing a different insight into the same environment.

In the hydrographic sector, Podlet allows for accurate mapping of navigable waterways, harbors and coastal areas. Detailed bathymetric data provide information for safe and efficient maritime navigation, as well as aiding the planning and construction of marine infrastructure projects. IHO Special Order surveys are achievable and routinely carried out all over the globe with PicoMB and Podlet.

Similarly, in the ports, harbors and marinas sector, PicoMB multibeamers play a vital role in bathymetric surveying for both hydrography and dredge support. Podlet with

BlueBoat can access areas that larger vessels cannot, causing far less disruption to ongoing port/marina operations and enabling complete surveys to be carried out.

The agility of the system also lends itself to scour and accretion monitoring surveys, which look at spatial and temporal changes in bathymetry following the installation or removal of civil engineering works, such as dams, quay walls, flood defenses, tunnels, and bridges, as well as utilities surveying in aquatic areas, especially where depth, access, or flow rates limit the options for larger sonar systems and/or traditional crewed survey craft.

In the field of marine research, Picotech sonars play a crucial role in studying underwater ecosystems and mapping underwater topography and ecology. They have been used by the University of Southampton for the study of seagrass distribution and Newcastle University for the study of geomorphology in the Mekong Delta, to name just two examples.

In the skilled hands of surveyors, researchers, engi-



Baltic dredger with drone alongside, carrying PicoMB131. (Credit: K2sea/Czerwony Szkwiał Maritime Works) (Below) Groupe E's marine drone carrying PicoMB131 is deployed to map the bottom of the body of water located upstream of a hydroelectric dam in Switzerland. (Credit: Maritech France and EscaDrone)



neers, and explorers, Podlet unlocks the secrets of the underwater world in areas never before accessible, with unprecedented clarity and precision.

The Celtic Interconnector

A survey system comprising an MBES on a USV was deployed in April 2025 for the Celtic Interconnector cable, which will facilitate the transfer of 700 MW of electricity between Ireland and France, spanning a total distance of 575 km, with 500 km of the cable submerged underwater.

GreenC Marine was hired to handle the construction required to bring the cable ashore. The project involved creating a 95-m cofferdam, within which 4 m of material would be excavated. To ensure accurate dredging levels and maintain the required depths, Tower Software was brought on board to supply GreenC Marine with a survey system.

Tower Software selected Picotech's Podlet, which integrates the PicoMB13P multibeam echosounder and a high-precision motion reference unit. This system was paired with the Blue Robotics BlueBoat, a compact, one-person-portable USV capable of operating autonomously for up to 6 hr. The Podlet proved ideal for the

landfall site, where shallow waters and spatial constraints demanded a small yet powerful solution with sufficient range to meet the project's unique needs.

The USV performed several key tasks, including confirming the cofferdam's location, monitoring the dredge depths, and verifying the placement of concrete girders used to secure the pipes in place.

Dredging in the Baltic

The PicoMB can be a powerful tool in the dredging industry when properly integrated with a reliable USV. In this example, the USV mKurs 2.0 by K2sea in Poland was used for a dredging control survey in February 2025 to provide the dredger crew with information on the progress of the dredging process. The demanding task was performed at the entrance to a South Baltic harbor under significant time pressure.

The Polish dredging company Czerwony Szkwiał Maritime Works tested the option of acquiring mid-dredge bathymetric data using the rapidly deployed USV. K2sea was able to provide an affordable solution by integrating the mKurs with the PicoMB131, positioned using SBG Ekinix Micro, along with water column parameters measured by AML Oceanographic sensors.

“Podlet is a lightweight multibeam package that provides a turnkey solution for International Hydrographic Organization (IHO) Special Order surveys.”

Managing Hydroelectric Infrastructure

Swiss company Groupe E is a utility active in the production, distribution, sales and trading of electricity, as well as energy-related services (telecommunications, district heating, public lighting), and it has acquired a French-made Bathydrone USV carrying a PicoMB130. The company uses the Picotech multibeam to measure the siltation level of some of Groupe E's artificial lakes upstream of hydroelectric dams.

The stakes are high: Sediment deposited at the bottom of bodies of water reduces the volume of water available for electricity production and can compromise the safety of the structures. Previously, Groupe E carried out bathymetry operations using a motorboat.

“This new tool allows us to better document the state of our lakes and be more responsive,” said Project Manager Stéphane Dupont. “It can be deployed quickly, for example, to observe the consequences of a flood. We can also verify certain hypotheses.”

Sediment deposits risk causing dams worldwide to

lose nearly a quarter of their storage capacity by 2050, according to a UN study published earlier this year. In Switzerland, dams have already lost approximately 23 percent of their initial capacity. By 2050, this loss could reach nearly 33 percent, according to the study, published in the journal Sustainability. Surveys carried out using PicoMB aboard Bathydrone enable successful dredging projects that lower sediment deposit risk.

Conclusion

The technologies developed by Picotech continue to drive new discoveries and insights in subsurface survey and inspection.

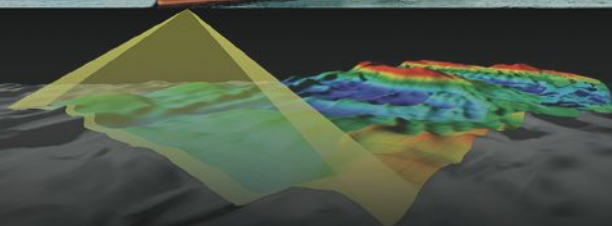
For more information about Picotech's solutions, visit www.picotech-ltd.com or contact: sales@picotech-ltd.com. **ST**

Melanie Tibbs is a director of Picotech Ltd.

JP Cheminade is a director and hydrographic surveyor at Geodesea Ltd.

SVPs and CTDs on time, or we compensate

Contact sales@amloceanographic.com for
more information



Whale Ship Strike Reduction

Technology and Citizen Science Efforts Can Prevent Collisions

By Matthew Zimmerman

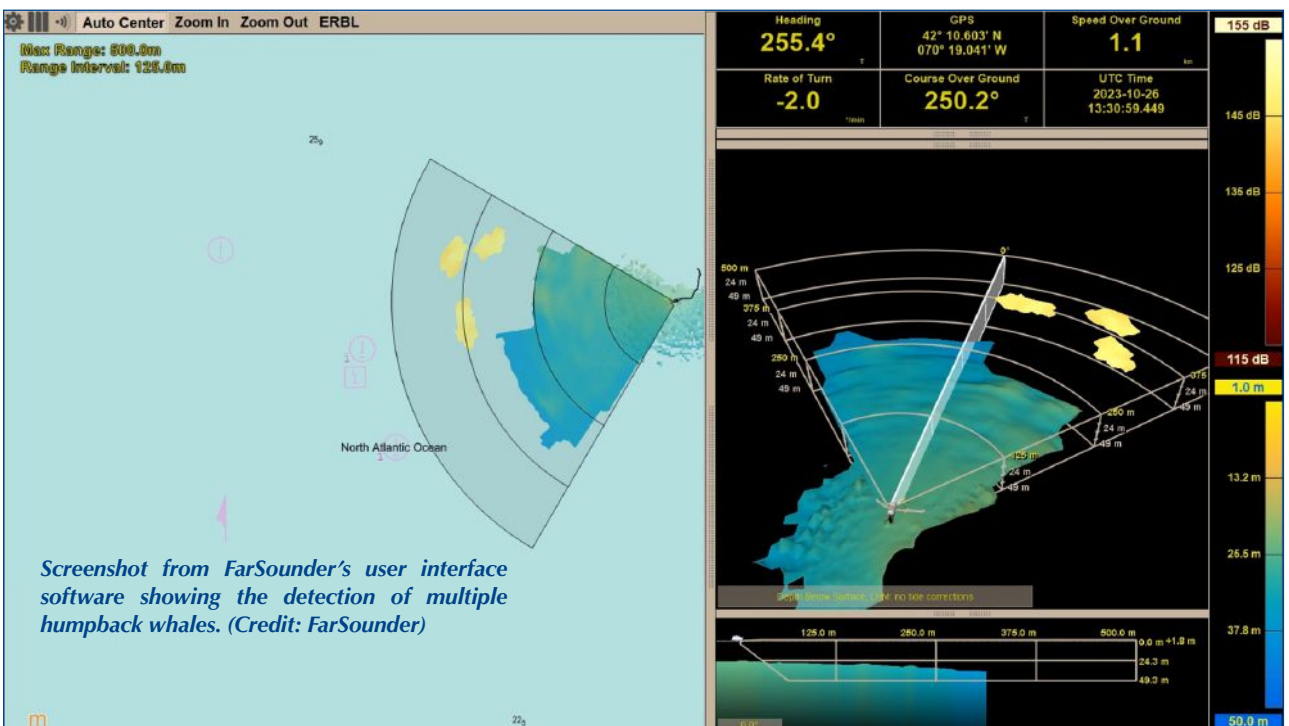
Whales have fascinated humanity for millennia, inspiring myths, music and maritime culture. Anyone who has had the rare opportunity to witness these majestic creatures up close knows that it's an awe-inspiring and deeply emotional experience. However, a number of whale species are shockingly close to the brink of extinction, and ship strikes are a leading cause.

Ship strikes—when vessels collide with whales—pose a significant threat to these animals and are one of the two leading causes of death for great whales. These incidents can be fatal, especially when large commercial vessels or yachts collide with whales resting or surfacing for air.

Even non-lethal encounters often result in injuries that compromise the whales' ability to feed, migrate or reproduce—factors that can still lead to death indirectly.

With only about 370 animals remaining and fewer than 70 breeding females, the North Atlantic right whales capture a lot of the public's attention in the U.S. when it comes to species at risk of extinction. For these whales, ship strikes account for the plurality of their deaths over the last seven years.

However, this issue is not limited to that species. We've already hunted the Atlantic gray whale to extinction, and only about 300 Western gray whales remain. Furthermore, in the Eastern Mediterranean, sperm





Humpback whale suffering ship strike wounds in Hawaii. (Credit: NOAA, taken under NOAA HI-HWNMS, MMHSRP Permit #932-1489)

whales number between 200 and 250, with ship strikes also their leading cause of death.

Beyond the emotional and ethical implications, the ecological impact of losing whales is profound. Whales play an integral role in maintaining healthy global ecosystems and helping to regulate climate systems.

The Role of Whales in Ecological Processes

Phytoplankton are microscopic marine algae that serve as the foundation of the marine food web. They are responsible for producing about 50 percent of the Earth's oxygen, and they absorb an estimated third of human-generated carbon dioxide. "Whale pump" is the name of the process that describes how whales feed at depth and defecate near the surface, releasing nutrients vital for phytoplankton growth. Much of the public isn't aware of how critical phytoplankton are to all life on Earth and how essential whales are in supporting phytoplankton.

Another ecological process coupled to whales is the "whale conveyor belt," which refers to the horizontal transfer of nutrients across vast distances as whales migrate between feeding and breeding grounds. This redistribution fertilizes nutrient-poor waters, boosting productivity across diverse marine ecosystems and helping sustain commercially valuable fish species.

Even after death, whales contribute to the marine environment through "whale fall" events. When a whale dies and its carcass sinks to the ocean floor, it delivers an enormous amount of organic material to deep-sea ecosystems. This serves as a long-term food source for a wide range of marine life and facilitates carbon sequestration, as the carbon locked within the whale's biomass

is deposited into ocean sediments for hundreds or even thousands of years.

If global whale populations were restored to pre-industrial levels, the benefits would be immense. Increased whale populations would amplify the whale pump and conveyor belt effects, promoting more phytoplankton growth and enhancing oxygen production and carbon capture. A thriving whale population would improve biodiversity, bolster fisheries, stabilize ocean ecosystems, and strengthen our planet's resilience to climate change.

Vessel Strike Mitigation

The maritime community is not blind to this crisis. Existing mitigation strategies primarily rely on vessel routing changes and speed reductions. For instance, shifting shipping lanes away from high-risk zones—such as the Eastern Mediterranean, where the MSC Group rerouted to protect sperm whales—has proven effective.

Speed reduction is another widely promoted tactic. Slower-moving ships reduce the probability and severity of collisions, giving whales and crew more time to react.

Yet, these methods have limits: Not all waters are monitored, and not all vessels comply with routing advisories or voluntary speed limits.

Over the past few years, above-water camera systems have grown in popularity, and when coupled with AI-driven image processing, they can provide automated detection of whale spouts and breaches in suitable conditions. However, whales spend the majority of their time below the water. So, above-water camera systems can only catch a glimpse during the brief periods that whales break the surface. This is where underwater technology becomes crucial.



Temporary pole mount deployment of Argos 1000 sonar installed aboard the MV Encourager during a whale research project. (Credit: FarSounder)

Underwater sensors such as 3D forward-looking sonars (3D-FLS) are a clear complement to above-water sensors. When coupled with camera systems, they provide vessels with an even more robust risk reduction system.

FarSounder's Argos 3D-FLS technology bridges this critical detection gap. Unlike above-water systems, Argos sonars continually scan the water column ahead of the vessel, offering dynamic real-time images of objects up to 1,000 m away (more than half a nautical mile).

FarSounder's range of 3D-FLS products have been installed on a variety of vessel types, including USVs, naval and coast guard vessels, icebreakers, research vessels, yachts, and cruise ships. These systems can detect obstacles not visible at the surface, such as whales, rocks, corals, ice and containers at navigationally significant ranges.

The original motivations of FarSounder's founding team over 24 years ago were environmental: How can we help vessels to avoid hitting rocks, thus preventing oil spills, and how can we help vessels not to hit whales?

Therefore, it is important that FarSounder's systems are designed not only with the safety of the vessel in mind but also the safety of the marine environment. All sonar signals are not the same, and those transmitted by FarSounder sonars are safe for the whales and the environment. The FarSounder engineering team has followed the strict guidelines established by the U.S. National Marine Fisheries Service (NMFS) to prevent acoustic harassment of marine mammals. Regular internal reviews are conducted, and participation in industry-wide discussions takes place to ensure products align with best practices for marine environmental stewardship. This commitment reflects our guiding principle that protecting marine life must be a foundational element of maritime innovation.

When paired with above-water systems and included in a vessel's voyage planning, the sonar becomes a key layer in a multifaceted whale protection strategy. It's a

tool not only for collision avoidance but for more responsible and informed vessel operations around the world.

Citizen Science

Mitigating whale strikes isn't just the responsibility of governments and conservation agencies. Everyone in the maritime community can play an important role by participating in citizen science initiatives to expand our collective knowledge and response capabilities because, without widespread data, we can't focus conservation efforts.

One simple way to participate in citizen science is by contributing crowdsourced observations to organizations such as Ocean Wise and Whale Alert. Understanding the value of such widespread observations, FarSounder is committed to contributing to this movement, and the company's entrée into facilitating crowdsourced data collection began over six years ago by enabling its customers to collect and anonymously share bathymetry (*Sea Technology*, January 2024). The bathymetry data are passed on to the International Hydrographic Organization's (IHO) Data Centre for Digital Bathymetry and integrated into Seabed 2030's efforts to map the entire seafloor of the global ocean.

Last year, FarSounder upgraded its data sharing capabilities with an optional cloud service that is provided at no charge to its customers. This cloud service allows users to anonymously share their collected bathymetry map across the FarSounder fleet and with Seabed 2030. In return, they receive the aggregate map created from all of the FarSounder user contributions.

This year, new citizen science capabilities were added to the FarSounder system. A recent software update added a simple interface for logging both whale sightings and floating trash. If users opt-in, these logs are automatically uploaded to FarSounder's cloud service and will be anonymously passed on to a variety of conservation organizations, including Ocean Wise, Whale Alert, and

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Adult right whale with calf. (Credit: NMFS, NOAA)

Eyesea. These systems consolidate public reports with verified sightings from research institutions, expanding the available data used for marine mammal protection.

FarSounder's crowdsourced bathymetry and observation logging capabilities enable its customers to easily make meaningful contributions without impacting the vessel's normal operations. Citizen science can turn every ship into a potential research vessel, creating a distributed network of environmental stewards.

Clearly, the installation of below-water sensors such as 3D-FLS and above-water sensors such as cameras with automatic recognition software provide a great benefit to the vessel on which they are installed. However, when it comes to reducing the risk of whale ship strikes, not every vessel can justify installing such systems. That's why FarSounder is proud to support the Whale and Ves-

sel Safety Taskforce (WAVS), which is working on a holistic, industry-wide risk reduction strategy.

The WAVS initiative is building an aggregated whale activity database by fusing data from satellite imagery, aerial surveys, citizen science observations, shipboard sensors and government research programs. The data will then be analyzed to find areas of high whale density. The ultimate goal is to feed this intelligence into navigational tools, such as multifunction and ECDIS displays aboard any vessel.

By identifying and broadcasting zones of high whale density, WAVS empowers mariners to make safer routing decisions, even without specialized hardware on board. The initiative also promotes the integration of whale risk information into standard marine navigation interfaces to improve industry-wide adoption.

FarSounder's contributions to the taskforce includes helping to develop the technical roadmap, including on-ship sensors such as its own 3D-FLS, as well as other sources of whale sightings and outreach for this important initiative.

Through the development process of its products over the past few decades, the FarSounder team has learned a lot about whales and how to operate safely around them. In the overall task of protecting whales, FarSounder understands that not only are technology and data vital, but so is human knowledge. That's why FarSounder is launching a Whale Spotting and Safe Vessel Operations training course based on everything the team has learned over the years. This class is not a FarSounder product class. Rather, it is an industry topic class, designed for captains, bridge officers and crew. Class topics include: how to spot and identify whales and how to operate vessels safely in areas with whales. The class also covers the basics of whale biology, discusses the threats they face, and how individuals can get involved with various citizen science initiatives.

This course was developed in collaboration with Amy Whitt from Azura, an environmental services company that provides protected species observers for government and commercial projects. Guest lecturers from leading marine science and conservation organizations have also been recruited to help present the materials. Details about the class can be found at: www.farsounder.com/whales.

Conclusion

Whale ship strikes are a preventable tragedy. With advances in sonar, integration with camera systems and powerful citizen science tools, we now have the ability to reduce this risk vastly. FarSounder is committed to being part of the solution through its technology products and by contributing to global efforts via training and industry collaboration.

The maritime sectors have both a responsibility and an opportunity to lead. By adopting tools such as 3D-FLS, contributing to WAVS, participating in training programs, and logging sightings, every vessel can become a protector of marine life.

Because saving whales isn't just good for the ocean—it's good for the planet and all mariners. **ST**

Matthew Zimmerman is the CEO of FarSounder. He founded the company more than 24 years ago and has driven the company's vision and technical development. His focus is on growing the company's reach and developing an expert design and implementation team capable of translating customer needs into best-in-class commercial products. Zimmerman's passion for marine safety and ocean sustainability motivate FarSounder's contributions to citizen science initiatives, including whale conservation, ocean trash mapping, and crowdsourced bathymetry, as well as the Whale and Vessel Safety Taskforce and IHO's Crowdsourced Bathymetry Working Group.





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Find out more

Reviving the MIRs

Russia's Famed Deep Manned Submersibles

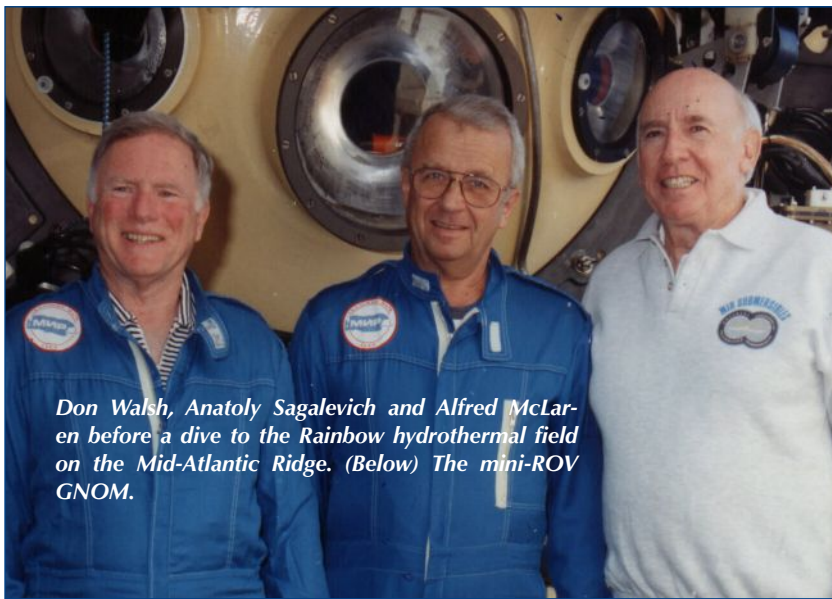
By Dr. Anatoly M. Sagalevich

The deep manned submersibles MIR-1 and MIR-2 were created by the Finnish company Rauma-Repola by the engineering group headed by myself and the Russian scientist Dr. Igor Mikhaltsev. The head of the Finnish group Sauli Ruuhonen also made a great personal contribution to the construction of the MIRs.

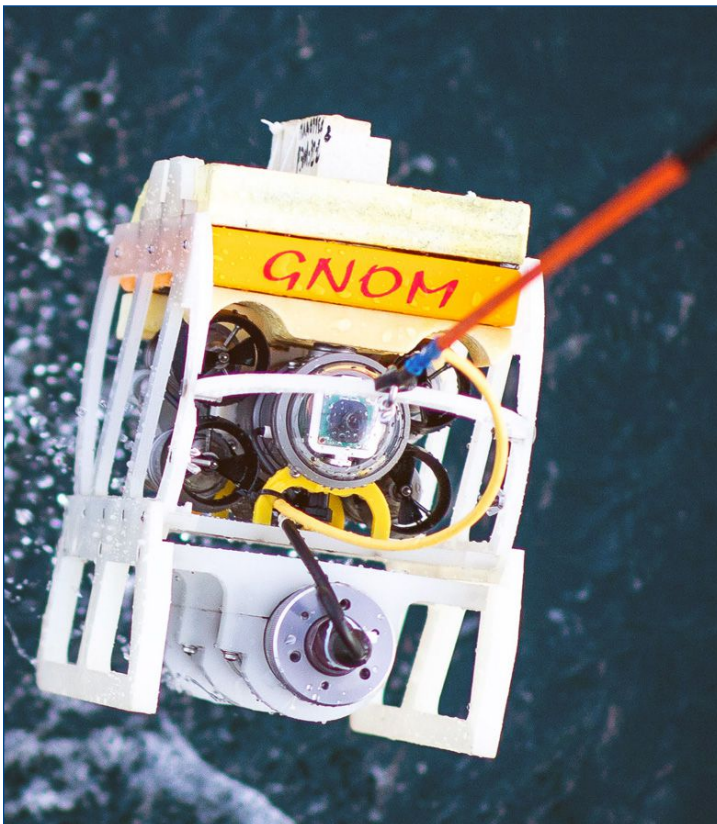
The vehicles' high technical and scientific level was confirmed by 24 years of intensive use. Despite major changes in the state structure of Russia, the MIRs were operated practically without any breaks, thanks to international partnerships. For example, joint expeditions on the RV *Akademik Mstislav Keldysh* with the MIRs on



MIR-1 and MIR-2 were transported aboard the RV Akademik Mstislav Keldysh for various dives around the world over 24 years.



Don Walsh, Anatoly Sagalevich and Alfred McLaren before a dive to the Rainbow hydrothermal field on the Mid-Atlantic Ridge. (Below) The mini-ROV GNOM.



in the MIRs to various sites throughout the ocean.

Hydrothermal Discoveries

The MIRs have been instrumental in several discoveries. Scientific dives on the vehicles resulted in the discovery of 23 hydrothermal fields in the global ocean, including the underwater volcano Piipa in the Bering Sea and the methane-rich Haakon Mosby mud volcano in Arctic deepwater. Deep hydrothermal circulation in the ocean crust was discovered in the Logatchev field at 14°45' N on the Mid-Atlantic Ridge via MIR-1 with the crew of geologist Dr. Yury Bogdanov and myself. This circulation comprises high-temperature fluid that is formed in the deep layers of ocean crust, practically on the border with the

mantle. Serpentine rocks were found near black smokers on the seafloor at 3,100-m depth.

Russian scientists discovered tens of new species of animals in hydrothermal fields found by the MIRs, types of life that are based on chemosynthesis. Big deposits of sulfide ores in the Atlantic and Pacific were investigated. The approximate volume of the deposits was measured, and chemical analyses were conducted of samples that were lifted by the MIRs from the bottom of the sea. Along the Trans-Atlantic Geotraverse, the largest hydrothermal body on the ocean bed was discovered: the MIR zone, containing millions of tons of sulfide ores. This discovery was achieved together with Peter Rona, who was part of Rutgers University, during a dive in MIR-1.

Pioneering Cinema

The MIRs were integral to the pioneering cinematic work of filming deep-ocean images for the IMAX documentary "Titanica" and the Hollywood picture "Titanic," plus four more films with the director James Cameron.

James Cameron conducted six expeditions with the MIRs: three of the *Titanic*, one of the *Bismarck*, and two of hydrothermal fields the Atlantic and Pacific Oceans. In each expedition, technical innovations were implemented, such as detailed observation

of the *Titanic's* interior using mini-ROVs that were controlled from pilot cabins in the MIRs via fiber-optic cable. A live TV broadcast from the *Titanic* was conducted with Cameron using the MIR submersibles, with the world watching the show on the Discovery Channel.

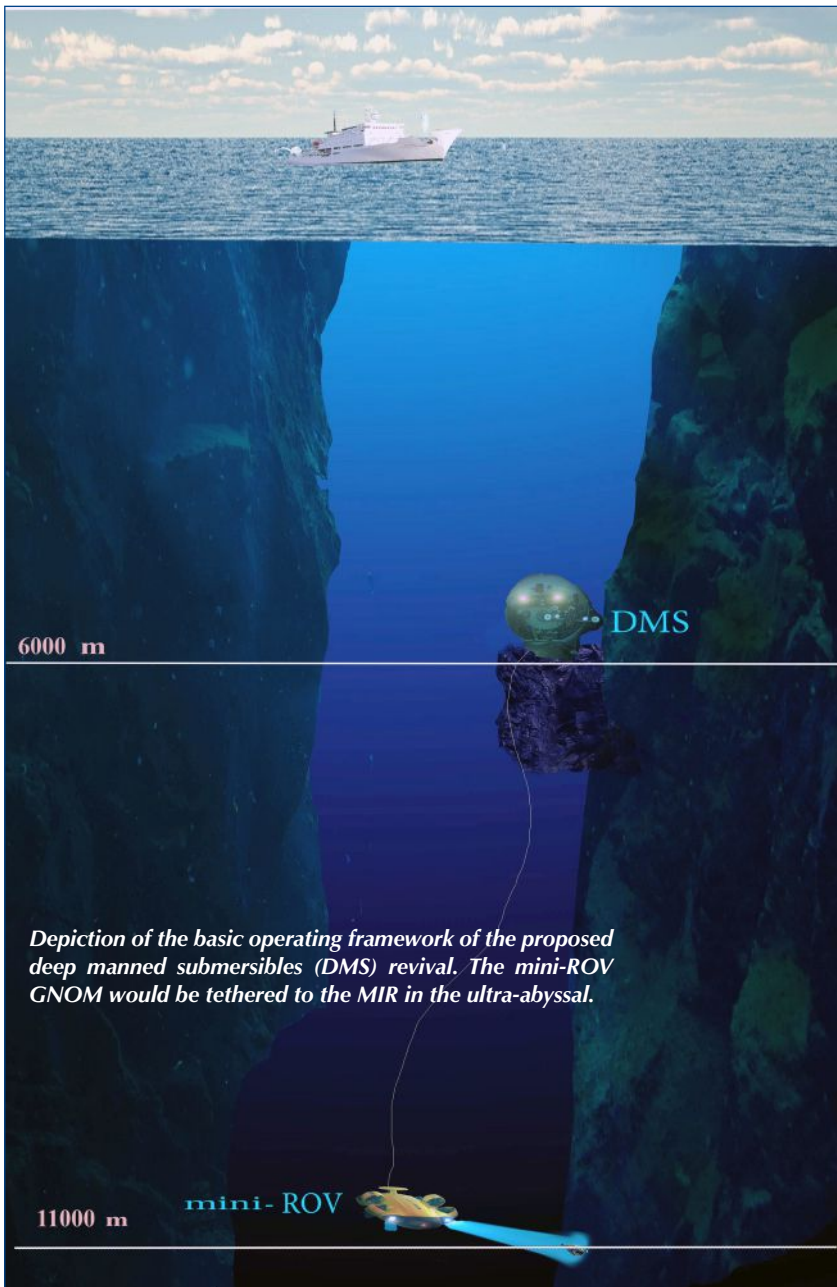
Historic Work

The MIRs operated on missions to the sunken nuclear submarines *Komsomolets* and *Kursk* that enabled decision making for the conservation of the *Komsomolets* and for the lifting of *Kursk* from the bottom of the ocean.

The MIRs provided vehicles for operations on the

board were organized together with the National Geographic Society, NOAA, and universities from the U.S., England, Germany, and other countries.

Prominent figures of the international underwater community participated in MIR dives to the *Titanic*, the German warship *Bismarck*, and hydrothermal fields in the Atlantic and Pacific Oceans. Don Walsh, an oceanographer who was the first to reach the deepest part of the ocean (with Jacques Piccard); oceanographer and explorer Sylvia Earle; oceanographer Peter Rona; biologist Shirley Pomponi; photographer Emory Kristof (who was on the expedition that discovered the *Titanic*); and other luminaries in ocean research and exploration made dives



despite the fact that they were in good shape and could have continued to dive for tens of years.

There is a push to rehabilitate the MIR submersibles for scientific research and technical operations, particularly at ocean rift zones and hydrothermal vents on the seafloor, which are the most active and interesting sites for science.

Several steps are required to restore the MIRs to working condition. First, the power block of the submersibles must be changed. Originally, nickel-cadmium batteries with a total power of 100 kWh were used. They were big and heavy but reliable, providing underwater power up to 24 hr., including for scientific and navigational equipment. The redesign would use lithium-ion batteries with the same power level. This would reduce the weight of the vehicles and allow for an increase in payload.

The next step would be full disassembly of the MIRs: updating the systems and testing the main and ballast spheres in high-pressure chambers. Following this would be reassembly and testing of the vehicles in the lab. Finally, sea trials in shallow water and then at depth will be conducted.

Anticipated total time for rehabilitating the MIRs would be two to three years. The mini-ROV GNOM, which was developed at Russia's Shirshov Institute of Oceanology, will be tailored to operate at maximum ocean depth (11,000 m).

We have applied for financing of this project, with the hope that we will be able to begin technical work in the second half of this year. The real adventure

would then begin in 2027/2028.

We seek support from the international underwater community. If you are interested in being a part of this project, please reach out to: sagalev38@gmail.com.

Acknowledgments

This work was completed on state assignment No. FMWE-2024-0026. **ST**

One of principal designers of the MIR submersibles, Dr. Anatoly M. Sagalevich is the head of the Deep Manned Submersibles Laboratory of the Shirshov Institute of Oceanology of the Russian Academy of Sciences. He directs the deep-dive submersibles program and has led more than 30 worldwide expeditions, logging more than 4,000 hr. as a submersible pilot. He is a hero of the Russian Federation and a member of the U.S.-based Academy of Underwater Arts and Sciences.

deepest military submarine wreck, the Japanese I-52, which sunk in the Atlantic at 5,430-m depth in 1944, as well as on a deep wooden wreck near The Bahamas at 4,700 m. (Both expeditions were done with private American companies.)

Historic work was done using the MIRs at the geographical North Pole under the ice at a depth of 4,300 m. This was considered the discovery of "the real North Pole," with the installation of Russia's flag on the seafloor to commemorate the find.

How to Revive the MIRs

The RV *Akademik Mstislav Keldysh* with the two MIRs on board enabled a truly international deep-ocean research complex and provided a wide spectrum of work at great depths.

Unfortunately, in 2011, the MIRs stopped operations,

Climate Change and Cables

Environmental Trends in the Subsea Cable Industry

By Rebecca Firth

Telecommunication and electrical service providers use subsea telecommunication cables to transmit data and power between landmasses separated by bodies of water. The entirety of a submarine telecommunication or power cable system is exposed to the potential hazards associated with climate change.

A subsea telecommunication cable system comprises two or more cable landing stations connected by a fiber-optic cable. The cable landing stations house equipment such as routers, switches and power feed. The fiber-optic cable may incorporate branching units that allow a cable to serve multiple landing points and repeaters that boost transmitted signals.

Subsea power cables commonly carry high-voltage direct current for long-distance transmission. Cable landing stations are located close to existing electrical substations or grid connection points to integrate power from the subsea cable efficiently into the regional or national electrical grid.

Impacts of Sea Level Rise and Storms

Sea level rise is a significant consequence of climate change, primarily driven by two factors: thermal expansion of seawater and the melting of ice sheets and glaciers. Between 2006 and 2015, the rate of global mean sea level rise was 8 mm per year, which is 2.5 times the rate for the period between 1901 and 1990 (1.4 mm per year).

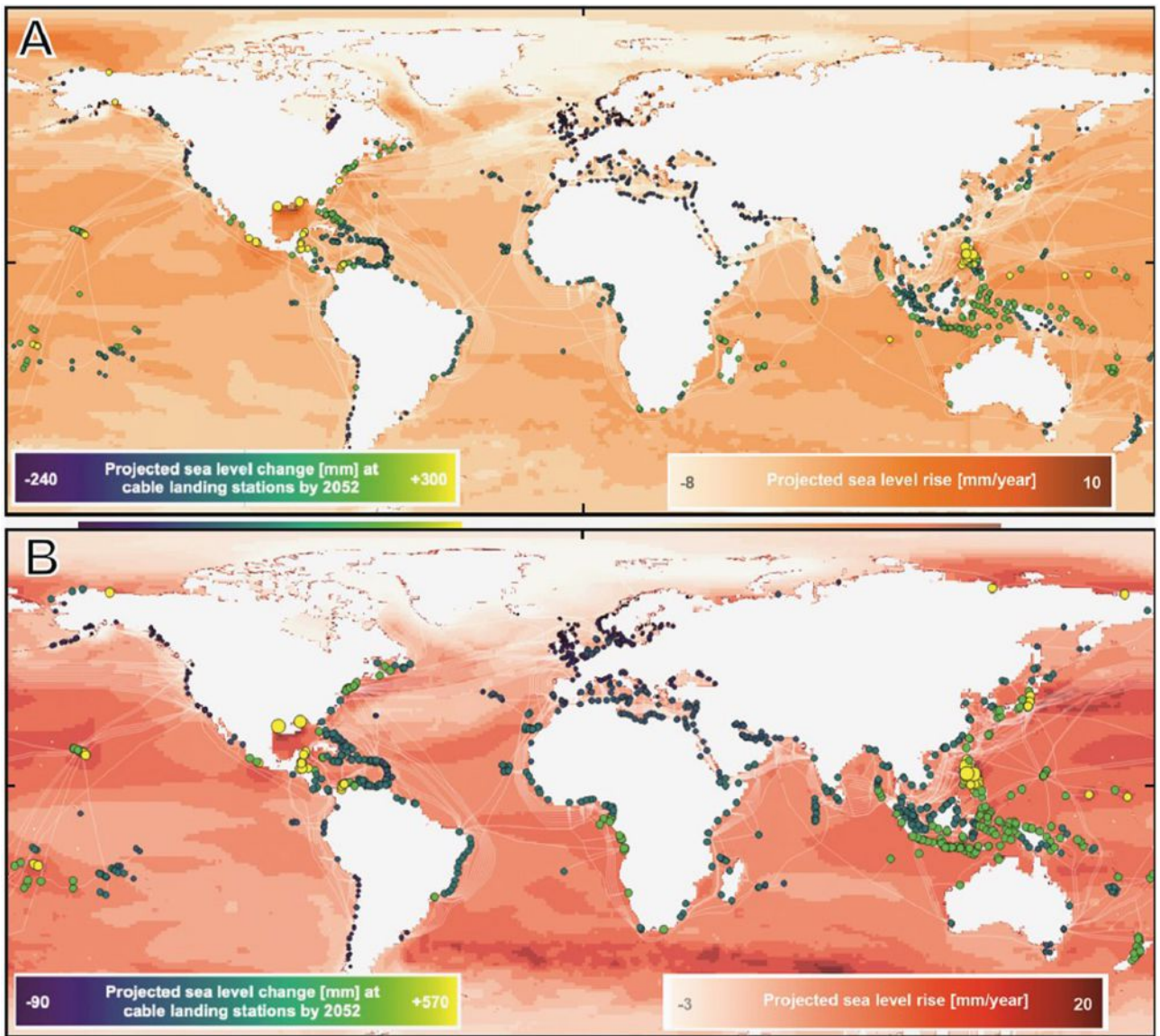
Clare et al (2023) assessed the projected sea level by 2052 (over a 30-year operational life of a cable system) at cable landing stations, estimating that the rate of sea level rise is not geographically uniform. Moreover, within 100 years under the SSP1–2.6 scenario (warming to 1.5 to 2° C above pre-industrial levels), more than 50 percent of cable landfall locations are projected to experience more than 500 mm of sea level rise compared to 97 percent under the SSP5–8.5 scenario (warming exceeding 4° C above pre-industrial levels).

The majority of cable landing stations are located near tidally active regions and terminate at colocation facilities and points of presence that are designed to be weather and water resistant. However, they are not designed to be surrounded by or submerged in water. Durairajan et al (2018) investigated the impacts of sea level rise on terrestrial network infrastructure in the U.S., concluding that projected sea level rise by 2030 may immerse thousands of kilometers of terrestrial cable not designed to be submerged in water. The potential effects of tidal inundation include physical damage and corrosion, leading to signal loss. In addition, buried cables will be exposed continuously to these threats, and cables deployed over the past 20 years will be particularly vulnerable to damage due to the age of seals and cladding.

The risk of inundation increases in areas where there is a higher likelihood of storm surges. For example, in the Gulf of Mexico, it is anticipated that a 1-in-100-year storm surge may become a 1-in-30-year event by the end of the 21st century. At present, 4.1 percent of cable landing stations could be inundated by 1-in-100-year events, which increases to 7 percent by 2122 in the SSP5–8.5 scenario (Clare et al, 2023).

Hurricanes/typhoons/cyclones are also intensifying due to warmer oceans and shifting atmospheric conditions that promote wetter and more destructive storms. In September 2017, Hurricane Irma caused widespread disruption to telecommunications services across the Caribbean and the U.S. East Coast, leaving millions cut off by inundated terrestrial cables. Subsea cables connecting Florida to the Caribbean islands were damaged, disrupting connectivity to the British Virgin Islands, the U.S. Virgin Islands and Puerto Rico.

Typhoon Morakot, which struck in August 2009, caused extreme river discharge that led to significant damage to subsea cables connecting Taiwan to Guam and other parts of Asia. Subsea cables were damaged when debris-charged river waters plummeted to the sea-



Projected rates of sea level rise and elevation change at cable landing stations by 2052. A: Sea level rise under SSP1–2.6 scenario. B: Sea level rise under SSP5–8.5 scenario (Clare et al, 2023)

bed and down Gaoping Canyon. A second, more damaging sediment density flow arose three days later when river levels were near normal, damaging cables down to water depths beyond 4,000 m.

Erosion

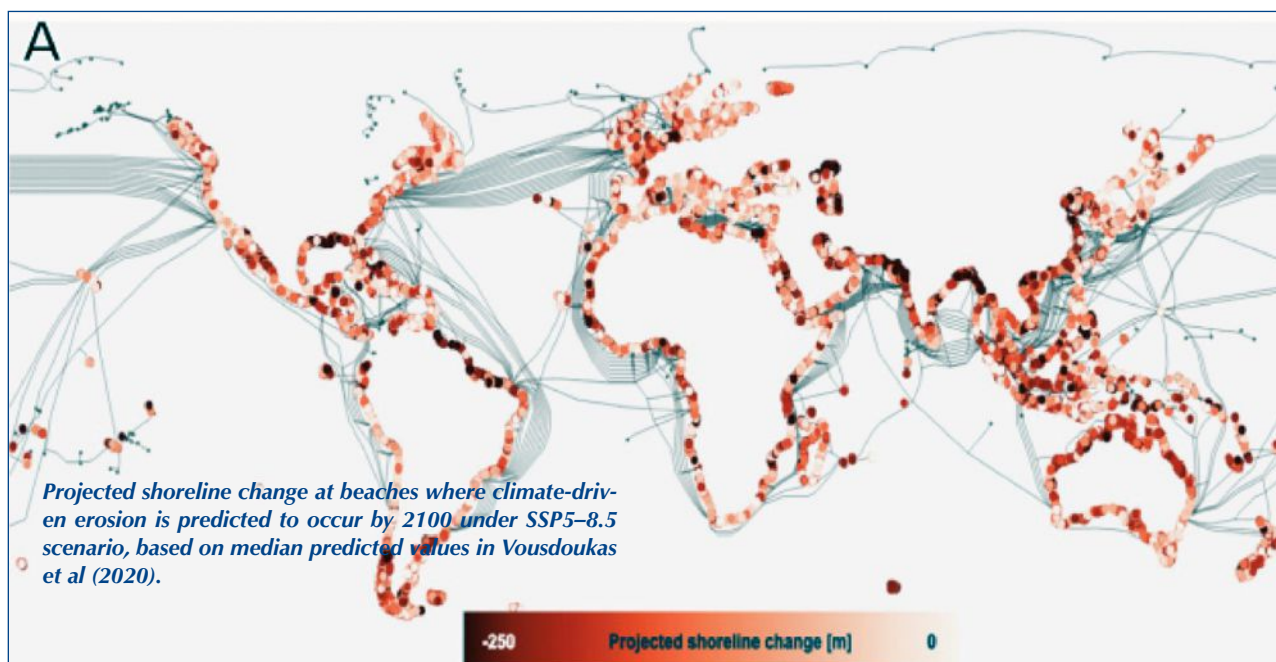
Erosion is another climate factor that puts subsea cables at risk. The severity depends upon the weather, wave climate, nearshore bathymetry, coastal topography, sediment supply, sea level rise and the presence of coastal ice.

Under the SSP5–8.5 scenario, the global median of predicted shoreline retreat is 128 m by 2100. Approximately 15 percent of the world's sandy coastlines could experience severe (>100 m) erosion by 2050, escalating to 35 to 50 percent by 2100. Subsea cables on the continental shelf traveling to shore can be at risk where erosion exposes them to currents and waves.

For example, in 2012, Hurricane Sandy triggered con-

siderable erosion, with numerous beaches and dunes losing up to 6 m vertical height, which permitted waves to travel further inland. Global Marine Systems conducted a site visit to Long Island, New York, one week following Hurricane Sandy making landfall. Hurricane Sandy caused severe erosion of beach sand and significantly changed the local beach profile. The lower shore dropped. At the top of the beach, near the boardwalk, the beach level was higher than normal, where sand had been driven up the beach by the large storm surge. Two open plots of land were designated to store the sand washed inland during the hurricane, called "Mount Sandy" by the locals. The aftermath of this massive sand displacement reduced the sediment cover over subsea cables and pipes buried on the beach. Extensive beach nourishment was required, which involved the U.S. Army Corps of Engineers pumping millions of cubic yards of sand to restore the beach.

Coastal permafrost erosion is another risk, affecting



more than 30 percent of Earth's coastlines situated in Arctic regions. Over the period of 1950 to 2000, the mean coastal permafrost change rate was -0.5 m a year across the Arctic. As permafrost thaws, the shoreline weakens and becomes less stable, leading to loss of coastline. Sea ice acts as a protective barrier, reducing the impacts of waves and storms, but as Arctic sea ice cover declines, coastal retreat is amplified. Consequently, permafrost thaw and coastal erosion may compromise the stability of subsea cables coming to land on Arctic coasts.

A Shifting Fishing Industry

In Europe, as sea temperatures rise, many fish species that prefer warmer waters are migrating up to the North Sea, a trend called "tropicalization." Species such as sea bass, red mullet and John Dory, which were once more common in southern European waters, are increasingly being found in the North Sea. These species are thriving in the warmer conditions, leading to shifts in the ecosystem and causing fishing fleets to follow.

This trend is expected worldwide and can bring fishing activities closer to where submarine cables are laid. Increased fishing in new regions can result in heightened risks of cable damage from trawling, especially in areas where deep-sea trawling or other high-risk fishing methods may not have been prevalent before. Cables in these areas become vulnerable to anchor drags, net entanglements and other gear impacts, which can sever or displace cables.

Coldwater species such as cod, haddock and plaice are struggling with rising temperatures. For example, the North Sea is warming faster than many other marine regions, and this is driving some coldwater species to deeper, cooler waters or further north toward the Arctic Circle. Cod populations, which have been central to North Sea fisheries, are moving to cooler regions, and this shift affects their abundance and reproduction rates, making it harder for fisheries to maintain sustainable catches.

Furthermore, submarine cables in deeper waters may become more exposed to new fishing pressures, particularly from larger vessels and more intensive fishing operations, resulting in a higher likelihood of cable strikes.

New Shipping Routes

Climate change is opening up new shipping routes in the Arctic as ice melts, which has significant implications for submarine cables and global data infrastructure.

The Northern Sea Route that runs along the Russian Arctic coast is becoming more navigable as ice melts earlier and forms later in the year, providing a shorter path between Europe and Asia. The Northwest Passage traversing the Canadian Arctic archipelago is also becoming more accessible, offering another potential path between the Atlantic and Pacific Ocean. As more vessels travel through Arctic waters, there is a higher risk of cables being damaged by ship anchors or fishing activities in high latitudes. As traffic increases, the potential for accidents rises.

Monitoring the life cycle and extent of the sea ice will be necessary throughout the life of a cable system. If the present trends of decreasing sea ice persist, cables in shallow water will be increasingly prone to abrasion. Additionally, ice scouring caused by the keels on multiyear ice is a commonly cited risk to cables. Ice scour from icebergs or multiyear sea ice occurs when they ground on the seabed and gouge out the sediments. Ice gouges have been found to occur in water depths up to 70 m and can range in incision depth up to 5.5 m.

Mitigation and Adaptation

The International Cable Protection Committee (ICPC) published a recent paper on climate change stating that "the global climate has been and will likely continue warming at an unprecedented rate as a result of human-induced greenhouse gas emissions."

The ICPC commented further at a consultative meeting



“Mount Sandy,” the pile of sand washed inland by the hurricane on Long Island in 2012. (Credit: Global Marine Systems) (Below) Pipe exposed due to massive sand displacement on Long Island Beach during Hurricane Sandy. (Credit: Global Marine Systems)



of the United Nations on sea level rise and its impacts: “It is critical that sea level rise and climate change be considered in future route and landing station planning, as well as assessing the risk posed to existing systems.”

Current mitigation and adaption strategies to protect against the impacts of climate change include: increased armoring and/or cable burial protection at shore-ends where erosion is increasing; liaising with fishermen, route clearance of discarded fishing gear, and use of more resistant cable; avoiding low-lying areas for beach manholes and cable landing stations; learning local environmental conditions and historic events; and geographical information system (GIS) analysis using various geospatial data sets incorporated into desktop studies to identify optimal routes and landing points.

Projections of climate drivers known to damage cables as discussed in the ICPC paper are on the rise, implying that cables will likely be exposed to more hazardous conditions. Where achievable, resilient cable routing should avoid submarine canyons and channels subject to turbidity currents and other sediment flows. This particularly applies in regions exposed to cyclones. Additionally, establishing redundant paths in the design of routes to allow for alternative channels if a primary

cable is damaged would help to maintain connectivity and reduce potential service disruptions.

To appropriately evaluate the impact of climate-driven changes, it is critical to verify site-specific environmental conditions. In particular, coastal erosion is determined not solely by ocean and atmospheric conditions but also by local morphology, substrate, and human-built coastal structures. The rates at which erosion may occur at cable landing stations (and along their shore approaches) should be calculated to inform how erosion may change over the design life of a cable system.

Cable technology advances may be required to address Arctic-specific challenges, such as more durable, ice-resistant materials and smart cable systems that can monitor conditions and automatically report damage or interruptions.

Given shifting fishing patterns, submarine cable operators may need to adapt their protection measures. These could include increasing the burial depth of cables in regions now more exposed to fishing activity, reinforcing them with armoring in higher-risk areas, and utilizing deep water areas with less fishing activity. As fish populations migrate, tensions could increase between the fishing industry and cable operators. Collaborative management strategies could mitigate risks, such as information sharing on cable locations and fishing routes and creating policies that balance the interests of both sectors.

Conclusion

The impacts of climate change will be diverse worldwide, and these changes are already being felt. The sub-sea cable industry is embracing numerous mitigation and adaptation strategies. Cable routes should be developed based on the analysis of local conditions, and both short-term events and long-term impacts should be considered.

As cable routes traverse higher latitudes, there is a risk of new hazards. Multiple geospatial data sets should be integrated, and future routing should consider oceanographic, atmospheric, and geological components on a case-by-case basis. Being mindful of the current and anticipated challenges is key for building resilient global communications and power networks. **ST**

Rebecca Firth is a route engineer and project assistant at OceanIQ.

international

ENC Distribution Partnership

C-MAP, specializing in digital marine cartography and cloud-based mapping, has become a distribution partner for the International Centre for Electronic Navigational Charts (IC-ENC). C-MAP has been appointed by the IC-ENC to deliver comprehensive end-user services. This includes processing of ENC data for inclusion into C-MAP's proprietary data format to support safe navigation using systems other than ECDIS. C-MAP will now have access to hydrographic data from several more countries, to be integrated into C-MAP's charting products.

IC-ENC is the largest regional ENC coordinating center, representing more than half of the world's hydrographic offices. IC-ENC provides cost-effective services to ensure maritime data products comply with international standards and uphold the International Convention for the Safety of Life at Sea (SOLAS).

Corvus Expands in China

Corvus Energy has opened a new office in Shanghai, China to support the Chinese shipbuilding industry.

Ren Li has been appointed as the country manager for Corvus Energy in China. Li has extensive experience from working at Rolls Royce, Wärtsilä and Bergen Engines, as well as Corvus Energy in Norway. He has relocated to Shanghai.

Sealite Office in Estonia

Sealite has opened a new marine-aids-to-navigation facility in Tallinn, Estonia, to provide faster, more reliable service to customers. This expands SPX aids-to-navigation buoy manufacturing to Europe, strengthening Sealite's global manufacturing footprint alongside facilities in the U.S., Australia and Finland.

Automated Vessel Management Collaboration

Rolls-Royce and the Singapore Institute of Technology will collaborate to develop innovative technologies to enhance equipment health management and fleet management for harbor crafts, autonomous ships, and ships with hybrid propulsion systems. The aim is to improve ships with hybrid and electric propulsion systems and entire fleets in terms of availability, fuel consumption, and emissions by further developing an automation solution.

The multipurpose patrol craft *MPA Guardian* of the Maritime and Port Authority of Singapore will be the pilot vessel. The hybrid vessel, which is equipped with two mtu 16V2000 engines, will be fitted with the equipment health management system mtu NautIQ Foresight to collect data and optimize operations, showcasing how the technology can be applied to other ships.

Best Management Practices for Maritime Security

A group of industry associations have released Best Management Practices (BMP) for Maritime Security (MS): www.maritimeglobalsecurity.org. As an interactive online publication, BMP Maritime Security consolidates



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previously published regional publications into a single, comprehensive publication with actionable insights and advice. It focuses on providing a threat and risk management process and, recognizing the dynamic nature of regional security situations, provides guidance to direct users to the most up-to-date security intelligence and risk assessment information.

Seafarers operating ships around the world encounter a range of maritime security threats, which often involve aggressive state and non-state actors. Although these threats vary across regions and in their severity, they can have a traumatic effect on seafarers who face unwarranted physical and mental harm; in some cases, being held as hostages.

Education, Training Collaboration to Support Japan's Maritime Future

The University of Osaka, in collaboration with Imabari Shipbuilding Co. Ltd., Japan Marine United Corp. (JMU), Nippon Kaiji Kyokai, ClassNK and MTI Co. Ltd., has established the Open Collaboration Laboratory for Enabling Advanced Marine Systems (OCEANS) at the Techno Alliance Building within the university's Graduate School of Engineering. This initiative aims to promote the global competitiveness of Japan's maritime industry.

Nihon Shipyard Co. Ltd., a sales and design company owned by Imabari Shipbuilding and JMU, will also cooperate with this program.

The collaboration will integrate diverse engineering fields, such as ship hydro and structural dynamics, propulsion, electrical systems, and control systems. Leveraging advanced systems engineering and cutting-edge AI technologies, this initiative will feature education and training for the next generation of maritime talent.

US, South Korea Shipbuilding Support

HII and HD Hyundai Heavy Industries (HHI) have signed a memorandum of understanding to explore opportunities to collaborate on accelerating ship production in support of defense and commercial shipbuilding projects. These efforts will increase the collective maritime industrial base strength of both the U.S. and South Korea.

Sustainable Technology Hub Expansion

Wärtsilä is set to expand its state-of-the-art Sustainable Technology Hub in Vaasa, Finland, with a €50 million total investment.

Expanding the R&D testing capabilities and facilities will enhance Wärtsilä's ability to meet the growing demand for developing and delivering sustainable technologies in marine and energy sectors and to support fuel applications needed in the future.

Wärtsilä anticipates this investment to accelerate product development and time to market, reduce testing time and costs, cut test-related emissions, and create potential for future growth of manufacturing capacity and volumes at the hub.

The extended space is expected to be commissioned in 2028.

UK NOC Innovation Hub

The U.K.'s National Oceanography Centre (NOC) has unveiled an ambitious new Innovation Hub in Southampton, designed to accelerate advances in ocean technology and support sustainable growth across the blue economy.

Backed by a £200,000 investment, the facility will serve as a catalyst for innovation in marine autonomous systems, the blue economy, and beyond—bringing together researchers, businesses, and entrepreneurs to drive progress across the ocean and maritime sectors.

The Innovation Hub has tiered memberships to suit all organizations, from startups to multinationals, on site or remote.

Saildrone to Set Up in Denmark

Saildrone will establish its first European subsidiary, based in Denmark, to address the urgent need for maritime domain awareness in European waters.

"Given the recent sabotage of critical undersea infrastructure in the Baltic Sea, the need for permanent maritime domain awareness has never been greater," said Richard Jenkins, Saildrone founder and CEO.

Denmark is uniquely situated in the center of the European maritime environment, with coastlines on both the Baltic and North Seas. Saildrone Denmark will be the hub for all the company's European operations, employing local staff.

Heavy-Lift Vessel for Xenos

Xenos Marine has christened its newly acquired TX-10,000, a heavy-lift engineering marvel, after a mandatory five-year drydock maintenance at Gulf Copper Shipyard.

The vessel, originally built by Versabar and later sold to TCM, a Teichman Group affiliate, in 2020, was acquired by Xenos Marine in December 2024. Xenos Marine is a joint venture between Matt Fish and the Teichman family.

The TX-10,000 is the largest heavy-lift vessel ever built in the U.S. It is U.S.-flagged and Jones Act-compliant, enabling unrestricted operations in U.S. waters. Built in 2010, the vessel measures 297 ft. long, 310 ft. wide, and 250 ft. tall. The vessel's gantry system is rated for a 10,000-ton lifting capacity, though offshore operations are limited to 7,500 tons due to pontoon restrictions.

Hull Grooming Tech Certification

Greensea IQ has received Lloyd's Register's approval for its EverClean service as a certified hull grooming provider for vessels coated with GIT Coatings' advanced foul release systems, such as XGIT-FUEL.

Grooming is defined as a proactive measure of periodic removal of microfouling (slime) to prevent the development of macrofouling on ships' hulls.

Klein Sonar for Micro-AUV

RTsys has bought 20 high-resolution, 900-kHz side scan sonar systems from Klein Marine Systems. They will be integrated into RTsys' micro-AUV NemoSens. **ST**

Buoyancy System for Full-Ocean-Depth Submersible

Base Materials will supply its buoyancy solutions to Inkfish, an organization that supports marine research, as part of wider upgrade of the full-ocean-depth submersible, DSV *Bakunawa*.

Formerly DSV *Limiting Factor*, this two-person, 12-tonne vessel was previously used for the Five Deeps Expedition, the first successful manned descent to the deepest point of each of the world's five oceans. The vessel is one of only a handful of manned submersibles capable of reaching the Challenger Deep, the deepest point of the global seabed, approximately 10,925 m (35,843 ft.) below sea level.

The proposed buoyancy system will be manufactured from Base Material's DNV type-approved Subtec 11500, a low-density, high-performance syntactic foam buoyancy material qualified for use in seawater down to 11,500-m depth.

DriX USV for Portugal Ocean Observatory

Exail has been awarded a contract by the Oceanic Observatory of Madeira (OOM) to supply a DriX O-16 USV that will enhance OOM's capabilities in conducting comprehensive full-ocean-depth scientific and hydrographic surveys.

The DriX O-16, equipped with a multibeam echosounder, Exail Gaps M7 USBL, a biomass echosounder (Kongsberg EK80), and oceanographic sensors, will support underwater asset tracking and INS navigation updates, and will provide high-resolution seabed mapping and precise environmental monitoring in Madeira's complex archipelagic conditions. The USV will enable advanced multi-robot collaboration missions, allowing coordination between USVs, ROVs and AUVs.

Previously, the institute has integrated Exail's DriX H-8 and the R7 ROV into research initiatives to advance robotic operations in ocean monitoring.

As maritime operations move toward greater autonomy and sustainability, the DriX O-16 supports this evolution by offering an efficient, low-carbon alternative to conventional crewed vessels. Its hybrid propulsion system and optimized design help reduce fuel consumption and operational costs, while its autonomy enables safer and more resource-efficient missions.

Microplastics Found in Arctic Spotted Seals' Diet

Spotted seals in some of the most remote marine areas around Alaska are consuming significant amounts of microplastics in their diets, according to a new University of Alaska Fairbanks-led study.

The paper, published in *Marine Pollution Bulletin*, analyzed the stomach contents of spotted seals harvested by subsistence hunters in the Bering and Chukchi seas. Of the 34 seal stomachs that were examined, only one had contents that were free of microplastics.

The study focused on specimens from 2012 and 2020 that were harvested in the Alaska communities of Gambell and Shishmaref. A total of 190 microplastics were found in the seal stomachs, appearing in quantities that did not vary by age, location or the year they were harvested.

The findings indicate that similar levels of microplastics have been in the seals' diets since at least 2012.

The specific source of microplastics in such remote areas is unknown, but ocean circulation has contributed to their spread throughout the world.

Research has also shown that sea ice is heavily polluted with microplastics, releasing it into the ocean when the sea ice melts.

The highest levels found in the spotted seal stomachs were in prey on the bottom of the seafloor, where microplastics accumulate, and in fish species that are higher on the food web.

The study is the first to analyze stomach contents from marine

mammals in the Bering and Chukchi Seas, but its findings are just the latest in a consistent pattern. Research led by an associate professor of marine biology at University of Alaska Fairbanks has found microplastics in numerous marine mammals in the Arctic and sub-Arctic. The pollutants have also been found in tissues of bowhead whales, bearded seals, beluga whales, northern fur seals, and walruses, including detection in placentas, amniotic fluid, livers, and muscle tissue.

Research support comes from subsistence hunters in the region who donated specimens to the Alaska Department of Fish and Game as part of a long-term biomonitoring project.

RV *Nautilus* Expeditions

In 2025, Ocean Exploration Trust (OET) and its partners will explore deep-sea habitats in the Western Pacific using EV *Nautilus*, its mapping sonars, ROV systems, and other exploration technologies brought aboard from the NOAA Ocean Exploration Cooperative Institute (OECI). The research will characterize deep-sea habitats in the Mariana Islands, the Republic of the Marshall Islands, the Solomon Islands and the Pacific Islands Heritage Marine National Monument.

The 2025 EV *Nautilus* expeditions are primarily sponsored by OECI, with support from the U.S. Bureau of Ocean Energy Management in collaboration with the U.S. Geological Survey.

Expeditions will be streamed live on NautilusLive.org until September 2025. This 24-hr. platform brings ocean exploration directly to viewers on shore. Viewers can engage with the team at sea via telepresence, asking questions and receiving real-time, behind-the-scenes updates on social media. Classrooms worldwide are invited to connect with the research team.

The upcoming expeditions are: Exploring Mud Volcanoes and the Mariana Trench, June 2 to 28; Maritime Archaeology of Guadalcanal: Iron Bottom Sound, July 2 to 23; and Mapping Around Wake Atoll, August 20 to September 11. **ST**

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Diver Tracking System



Designed for the MCM100 multi-role rebreather, this system enhances military diver safety and integrates into the underwater battlespace during training missions. The advanced geolocating system gives surface teams the ability to three-dimensionally track the dive team during training operations and provides live rebreather status information, combined with a diver recall/safety alert managed by the surface support team. All critical information is clearly displayed on a surface PC tablet overlaid with a mapping system. Avon Protection and Blueprint Subsea.

Electrical System Management

ECOPAC optimizes energy efficiency and sustainability of shipboard electrical systems, enhancing vessel performance, saving costs and reducing environmental impact. ECOPAC requires the installation of variable frequency drives (VFD) at equipment level, plus a cable connecting the VFD to the controlling software, which controls the speed of the motor in accordance to the load. ECOPAC can typically deliver energy savings of over 60%. Oceanly S.r.l.

Onboard Waste Management

Dehydro reduces wet waste volume by approximately 80% through its dehydration process, transforming wet waste into a sterile, dry powder. This eliminates the need for additional treatment and simplifies off-loading. The compact design suits vessels producing between 50 and 1,000 kg of wet waste per day, such as small merchant vessels, OSVs,

ferries and passenger vessels, and large yachts. Evac Group.

Hull Cleaning Robot

The EverClean inspection robot is built on the same platform as the EverClean hull cleaning robot. It is a standalone system designed specifically for underwater inspection. The robot has integrated cameras, ultrasonic thickness sensors, and forward-looking sonar to enable comprehensive visual and structural inspection of underwater assets. It's ideal for collecting actionable data to support regulatory compliance, maintenance planning and asset health monitoring. Greensea IQ.

MEMS-Based Gyrocompass IMU



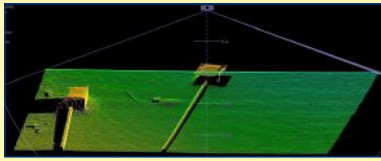
The world's first MEMS-based, North-seeking IMU can operate without GNSS—a breakthrough in MEMS technology. This paves the way for future products, including AHRS and INS solutions, to further expand the possibilities of MEMS-based navigation. This IMU achieves a heading accuracy better than 1° secant latitude without GNSS aiding and an INS heading accuracy better than 0.01° when fused with GNSS using SBG Systems' navigation and orientation algorithms. SBG Systems.

Modem-Logger Combo

Hydromea's LUMA FLEX optical modem has been integrated into RBR's range of standard loggers. This enables the wireless transmission of oceanographic data from subsea environments for environmental monitoring. The integration

empowers users to efficiently collect large volumes of data wirelessly using AUVs and ROVs. RBR and Hydromea.

Multibeam Echosounder



SeaBat T51-S is the latest advancement in the SeaBat T-series. Building on the success of the flagship SeaBat T51-R, the SeaBat T51-S is designed specifically for subsea applications, enabling deployment on ROVs and AUVs for deep-sea exploration and underwater surveys to 6,000-m depth. The 170° swath width at 800-kHz coverage represents a significantly larger area of the seabed in a single pass, increasing efficiency and reducing survey time. Teledyne Marine.

Wind Sensor

SailTimer Ultrasonic provides precise wind angle and wind speed, transmitted on NMEA 0183 wiring. Wind conditions can be shown on a multifunction display and contributed to high-resolution crowdsourced wind maps, similar to Google Maps and Waze. The wind sensor can connect to the SailTimer Air Link, which can send wind data to a chartplotter on NMEA 2000 or 0183. Air Link can also retransmit

the wind data on Wi-Fi for mobile app use. SailTimer Inc.

Nine-Contact Connector

The SubConn Micro Circular series now includes the nine-contact connector, which minimizes signal interference to ensure optimal data integrity, minimal signal loss and high data accuracy. It provides a stable and uninterrupted connection for underwater equipment. MacArtney A/S.

Side Scan Sonar Range

GeoScan comprises two models that offer simultaneous broadband dual-frequency operation and advanced sonar processing features. GeoScan 2361 operates at 300 and 600 KHz, while GeoScan 2491 runs at 400 and 900 KHz to deliver even higher image resolution. Both feature a 60-kHz update rate and depth rating of 300 m. GeoAcoustics Ltd.

CO₂ Sensor + ADCP

Sonardyne has integrated a CONTROS HydroC dissolved CO₂ sensor from -4H-JENA engineering into its Origin 600 ADCP to enable precise, real-time monitoring of dissolved CO₂ levels alongside detailed current profiling. This allows for critical insights into the impacts of rising CO₂ concentrations on marine ecosystems and biodiversity. Sonardyne International Ltd. and -4H-JENA engineering GmbH.

Data Quality Module

Part of the Fleet Insights solution, this new feature ensures that high-frequency data received via Fleet Insights are accurate and actionable. The module transforms raw sensor data into a dependable foundation for emissions reporting, performance optimization and regulatory compliance. Danelec A/S.

SAS for Offshore Energy Market

The synthetic aperture sonar (SAS) service features dedicated KATFISH towed SAS systems available for rent. The system offers real-time 3x3-cm resolution with a range of up to 200 m per side. Applications include pre- and post-offshore construction survey and underwater infrastructure inspection. Kraken Robotics.

Hovering AUV

The Boxfish AUV, rated to 600 m, enables users to monitor mission progress and intervene if required. It supports benthic photogrammetry, seabed mapping, coral reef monitoring, coral bleaching studies, fish studies and invasive species studies. Boxfish Robotics.

Sealing for Wind Foundations

IRIS for airtight platforms eliminates the need for welded steel landing rings traditionally used in monopiles and transition pieces for offshore wind projects. Trelleborg Marine and Infrastructure. **ST**



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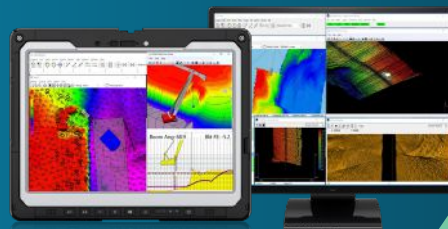
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Marlink Cyber Launches

Marlink, a specialist in managed services for business-critical IT solutions, has created Marlink Cyber, a dedicated cybersecurity company to address the growth of cyber threats and the increasing need for compliance.

Marlink Cyber combines legacy expertise with the skills, resources, and geographic presence gained from the acquisition of Diverto and Port-IT.

Marlink Cyber will deliver services and solutions across three principal areas of operation: Cyber Security Professional Services, Infrastructure and Endpoint Security, and the Cyber Security Defence Centre. The company will provide a complete portfolio of managed cybersecurity solutions, detection and response services, vulnerability assessments, penetration testing, phishing and awareness programs, compliance and gap assessments, and risk management.

Simulations to Stress-Test Autonomous Navigation

BMT has successfully partnered with ATLAS ELEKTRONIK UK (AEUK) to advance autonomous maritime navigation by utilizing BMT's proprietary Synthetic Environment Assurance Service (SEAS) testbed. This collaboration rigorously assessed AEUK's cutting-edge autonomous navigation system, ARCIMS, delivering critical insights into its decision-making capabilities and compliance with the International Regulations for Preventing Collisions at Sea (COLREGs).

ARCIMS is a maritime platform designed for modularity and adaptability that offers advanced capabilities for autonomous mine warfare and unmanned vessel operations.

Leveraging its proprietary SEAS testbed, BMT evaluated ARCIMS's ability to operate safely and effectively in complex and dynamic maritime environments. BMT's SEAS testbed enabled the testing of AEUK's system in detailed synthetic maritime environments, replicating

complex operational scenarios under controlled, repeatable conditions. By providing robust assurance through this innovative approach, BMT has supported the system's readiness for certification and deployment, advancing the safe integration of autonomous systems in real-world maritime operations.

Using BMT's SEAS platform, AEUK's system was tested in a wide array of high-pressure scenarios designed to stress-test its algorithms and reveal actionable insights for refinement.

By using advanced simulation capabilities, BMT reduced the costs and risks associated with live testing and provided essential evidence for the system's certification. The testing defined safe operational envelopes and identified areas for algorithmic refinement, ensuring confidence in the system's deployment.

Scalable Marine Autonomy Collaboration

Hefring Marine, an Icelandic specialist in intelligent marine technology, and Marine AI, a U.K.-based specialist in autonomous vessel control systems, have created a partnership to enhance autonomous maritime operations by integrating Hefring Marine's Intelligent Marine Assistance System (IMAS) with Marine AI's GuardianAI autonomy suite.

This partnership sets the stage for seamless technological integration, where Hefring Marine's IMAS will complement GuardianAI's existing capabilities by providing real-time insights into sea conditions, optimizing vessel operations, and improving safety. The collaboration will ensure that IMAS is fully compatible with the GuardianAI marine autonomy stack, with future plans to offer IMAS as an OEM-supported module within the GuardianAI suite.

Hefring Marine's IMAS leverages AI technology, sensor data, and edge computing to deliver actionable insights, improving vessel efficiency, reducing fuel consumption,

and enhancing onboard safety. Marine AI's GuardianAI is a modular, state-of-the-art autonomous vessel control system capable of IMO Level 4+ autonomy, enabling high-fidelity situational awareness, tactical path routing, and intelligent vessel control.

This partnership will focus on key maritime sectors, including rescue operations, law enforcement, defense, offshore support, crew transfer and the leisure industry. By integrating IMAS within GuardianAI, the partnership will provide enhanced situational awareness and improved vessel survivability in various sea conditions.

Future plans include ongoing joint product development and system enhancements to expand the capabilities of autonomous vessel operations. The scalable nature of this technology means it can be applied across a broad spectrum of vessel types, from small uncrewed autonomous vessels to large passenger ships.

Increased Service for Stockholm's Hydrofoil Ferry

Region Stockholm has increased the electric hydrofoil ferry *Nova's* service from five days a week to daily operations.

The ferry is a Candela P-12 vessel that combines electric propulsion with hydrofoil technology, allowing it to literally fly above the water surface, with lower energy consumption and higher speeds.

Nova emits 95 percent less CO₂ compared to the conventional diesel-powered vessels that operate the same route, and it uses 84 percent less energy per passenger-kilometer.

Nova is extremely popular; most departures have been fully booked, often with long queues. The popularity stems from reduced travel time compared to car or bus.

The Candela P-12, with a cruising speed of 25 kt., is the fastest electric ship in the world. It is also faster than Stockholm's fastest diesel-powered archipelago ferries.

Thanks to its speed and low wake signature, the hydrofoil vessel is well-suited to both urban areas and sensitive ecosystems. **ST**

eDNA Autosampler Testing

Fugro has successfully tested the DOT-NM Autosampler, a new device developed by Dartmouth Ocean Technologies Inc. (DOT) and NatureMetrics. The trial took place in the marina directly outside of the Fugro office in Portchester, U.K.

This advanced technology rapidly generates biodiversity assessments by collecting environmental DNA (eDNA) samples autonomously, reducing project time and costs.

The compact, programmable, and self-cleaning Autosampler enables in-situ collection and preservation of eDNA samples with no human interaction, enhancing safety and efficiency, especially in remote or hazardous environments.

Continuous collection of biodiversity data supports monitoring over extended periods. This provides a more representative sample for compliance with Biodiversity Marine Net Gain commitments.

Comprehensive monitoring of marine biodiversity is crucial for understanding the impacts of energy infrastructure, such as offshore wind farms, on marine ecosystems.

The device streamlines the process by integrating eDNA collection into routine maintenance, with deployment options available off the back of a vessel, underneath buoys and moorings, or manually in rivers and lakes.

The results show that the Autosampler provides data as reliable as manual methods, supporting long-term environmental monitoring, crucial for sustainable development projects.

Dynamic Positioning Simulator

Kongsberg Maritime has launched its K-Sim Offshore DP3 Anchor Handling Simulator, with an investment of more than £250,000. This innovative training solution is designed to elevate competency standards, enhance operational efficiency and promote sustainability.

Situated at Kongsberg Maritime's Aberdeen office, the simulator has been upgraded in response to the

growing need for skilled dynamic positioning professionals, particularly in offshore oil and gas operations, including drilling, pipe-laying, heavy lift, and emerging floating wind operations. The simulator will provide operators with the essential skills and expertise needed to safely and efficiently support large-scale projects in the North Sea and across Europe.

The simulator provides a highly realistic training environment, enabling course delegates to practice complex operations and emergency preparedness in fully immersive, controlled conditions. It replicates real-world scenarios with advanced physics-based simulations.

Pioneering Demo of Ammonia-Fueled Tugboat

The world's first commercial-use ammonia-fueled vessel, *Sakigake*, has successfully completed a three-month demonstration voyage, during which the vessel engaged in tugboat operations in Tokyo Bay and achieved a greenhouse gas (GHG) emission reduction of up to approximately 95 percent.

The vessel was completed by Nippon Yusen Kabushiki Kaisha (NYK) and IHI Power Systems Co. Ltd. (IPS) in August 2024 in cooperation with Nippon Kaiji Kyokai (ClassNK) as part of a Green Innovation Fund Project under Japan's New Energy and Industrial Technology Development Organization (NEDO).

NEDO will continue to promote research and development of next-generation-fuel vessels, including developing an ammonia-fueled ammonia gas carrier, and to work toward achieving carbon neutrality in the shipping industry.

To achieve net-zero emissions in marine transport, it is essential to switch from existing heavy fuel oil to gas fuels, such as hydrogen, ammonia and carbon-recycling methane. Developing related machinery is also necessary.

The demonstration of tugboat operation confirm that ammonia is

one of the most viable and promising options as a next-generation fuel for vessels.

The vessel will continue to operate in Tokyo Bay to accumulate knowledge related to the development and operation of ammonia-fueled vessels.

In addition, NYK, Japan Engine Corp., IPS and Nippon Shipyard Co. Ltd. are developing an ammonia-fueled ammonia gas carrier, scheduled for delivery November 2026, also as part of NEDO's Green Innovation Fund Project.

Investment to Develop Sustainable Drop-In Fuels

XFuel, a producer of high-grade sustainable drop-in fuels and carbon removal for the transport sector, has secured €7.7 million in blended finance from the European Innovation Council (EIC) to help bring its fuel-from-waste technologies to transport markets.

XFuel has developed proprietary conversion and refining tech to produce sustainable fuels from a variety of scalable waste materials, with a focus on industrial hydrocarbons and biomass residues. Their drop-in nature indicates they meet fossil fuel specifications and performance, making them fully compatible with existing combustion engines and fossil fuel infrastructure and allowing for direct replacement today. These fuels require no capital expenditure, and they significantly reduce operational costs compared to other decarbonization options.

XFuel has developed two novel technologies: chemical liquid refining (CLR), which can refine and crack hydrocarbon liquids and residues into fuels for the marine, road, and aviation sectors, and mechanical carbon conversion (MECC), which co-processes lignocellulosic waste biomass and waste oils to produce low-carbon transport fuels and biochar.

The immediate focus of the EIC funding is on delivering sludge-derived marine gasoil-grade fuel, with anticipated GHG emission savings of up to 85 percent under the EU RED II framework for recycled carbon fuels. **ST**

Eco Wave Power Advances Portugal Project

Eco Wave Power Global AB has begun critical infrastructure enhancements at its pioneering wave energy project in Porto, Portugal, where the company is implementing its first 1-MW project.

The Porto project, Eco Wave Power's first megawatt-scale wave energy venture in Portugal, which is expected to be finalized during 2026, aims to harness ocean wave energy to generate sustainable electricity. Central to this initiative is the transformation of "The Gallery," an existing breakwater tunnel, into a state-of-the-art facility housing the company's innovative wave energy conversion equipment. Upon completion, "The Gallery" will also feature an underwater wave energy museum and education center, offering visitors an immersive experience into the world of renewable energy.

To prepare "The Gallery" for equipment installation and public engagement, Eco Wave Power is undertaking sand and debris removal, structural reinforcements, and waterproofing measures.

Following the completion of the infrastructure enhancements, Eco Wave Power will advance to the next phase of the project, which includes the production and deployment of its proprietary wave energy technology.

The project aims to support Portugal's renewable energy strategy, which targets 85 percent renewable electricity generation by 2030, while serving as a model for global expansion.

Subcontractors Chosen For Hornsea 3 in UK

SeAH Wind has appointed Mammoet, Glacier Energy and Hutchinson Engineering as key subcontractors for the Hornsea 3 offshore wind project. With commercial production set to commence in the coming months, these subcontractors have been selected to support the operational and logistical services with-

in the 120-acre site located on the South Bank of Teesworks, U.K.

SeAH Wind will supply the monopile foundations for Hornsea 3, situated approximately 120 km off the Norfolk Coast in the North Sea. Upon completion, it will become the world's largest offshore wind farm.

Mammoet has been appointed to provide self-propelled modular transporters within the SeAH Wind facility. Its scope includes the transportation of can/cone structures and completed monopiles.

Glacier Energy will conduct non-destructive testing of welds throughout the manufacturing process, ensuring the highest quality standards.

Hutchinson Engineering will supply secondary steel components for the Hornsea 3 project.

Tidal, River Energy Initiative In Northwest Europe

The SHINES project (Showcasing Hydrokinetic energy Innovations for Northwest European Energy Sovereignty) has launched, bringing together 14 partners from France, Ireland, Belgium, the Netherlands, Switzerland and Germany.

Co-financed by Interreg North-West Europe, SHINES is set to unlock the potential of tidal and river energy systems, an opportunity still largely untapped in the region.

With a total budget of €10 million, this ambitious project led by OPEN-C Foundation will run to December 2028.

Northwest Europe (NWE) is a prime location for tidal and river energy development, thanks to its unique natural features: gulfs, straits, islands, inlets and spots along large rivers.

Despite its potential, tidal and river energy in NWE requires further investment to overcome political, economic and regulatory hurdles.

SHINES will address these challenges by replicating and scaling up three innovative solutions: HydroWing, RivGen and TidalKite. This will be done through grid connections and at-sea deployments in

France and the Netherlands. Some of the most promising sites in the region will be developed, engaging 100 organizations in the adoption of tidal and river energy systems.

Inyanga, a partner in the SHINES project, will use its HydroWing technology to design, construct, and install a grid-connected 600-kW tidal energy turbine on the Paimpol-Bréhat test site in France, then operate and monitor the device throughout the test period.

In addition, Inyanga will install and maintain the SeaCurrent Tidal-Kite device at Paimpol-Bréhat, managing all offshore operations.

SHINES is aligned with Europe's Net-Zero Strategy and the Critical Raw Materials Act, contributing to the goals of 1 GW of ocean energy capacity by 2030 and 40 GW by 2050.

Project Notice for Renewable Ammonia Production Plant

Hy2gen Canada Inc., the Canadian subsidiary of global renewable hydrogen producer Hy2gen, has submitted the project notice for the renewable ammonia production plant project COURANT to the Quebec government. This milestone marks the end of the planning stage. In the next step, Quebec's Environment Ministry will define the directive for an impact study that Hy2gen will carry out. The study aims to test the proposed project to ensure safety and minimal environmental impact.

Project COURANT's output of 230,000 tonnes of ammonia per year will be used to decarbonize the local mining industry and help the region around Baie-Comeau, where the plant will be located, achieve its climate goals by reducing CO₂ emissions.

With 300 MW of electrolyzer capacity, Hy2gen's COURANT project will be one of the largest ammonia production plants in North America when it becomes operational in 2030. This will serve as a proof of concept for similar ammonia production plants Hy2gen is developing in the Americas and Nordic countries. **ST**

people

EMEC (European Marine Energy Centre) has revealed its new executive leadership team as the company embarks on its next phase to pioneer a clean energy future: **Matthew Finn**, managing director; **Donna Ritch**, finance director; **Mark Hamilton**, operations and technology director; and **Eileen Linklater**, corporate affairs director. Finn has worked at EMEC for 19 years. He seeks to expand EMEC's test and demonstration sites for wave and tidal energy to accelerate the progression from prototype demonstrations to array deployments, as well as develop infrastructure to support the burgeoning floating wind sector.



Vessev has appointed **Josh Trout** as director of North America. Trout will oversee the production of Vessev craft in the U.S. and the company's business development. With more than two decades of experience in marine technology, his knowledge of the electric and hybrid marine industry, combined with a proven leadership track record, will play a key role in Vessev's expansion from New Zealand to the U.S.



Process Visions has appointed **Michael Downey** as the new Latin America business development and area manager. He is a seasoned chemical engineer with nearly 30 years of experience in analytical instrumentation for gas and liquid applications. He has successfully implemented innovative technologies, such as micro GC, tunable diode laser spectroscopy, UV fluorescence and advanced pH sensors.

Javier Suárez has succeeded **Finn Wollesen Petersen** as Knud E. Hansen's managing director. Suárez has an M.S. in naval architecture and marine engineering and has worked in commercial, technical, and management roles in his career.

Marotta Controls has promoted **Bryan Begane** to vice president of naval systems. Begane succeeds **Marilyn Petite**, who has retired. Begane will leverage Marotta Controls' legacy in marine systems while advancing into industrial applications, and lead the integration of next-generation technologies, including additive manufacturing and advanced actuation systems.

ClassNK has promoted **Hayato Suga** to president and CEO, as well as representative director. **Fumihiko Higashi** has been promoted to executive vice president. ClassNK's leadership aims to develop maritime sustainability.

Crowley has named **Jenny Fuss** as its chief financial officer. She has more than 20 years of experience as an executive for global institutions.

MacArtney Germany has appointed **Alexander Gravert** as sales manager to strengthen regional connectivity ini-

tiatives. He will focus on ocean science, marine and offshore, and naval industries.

Simpson Gumpertz & Heger (SGH) has announced that Senior Principal **William (Bill) Bruin** will serve as the new structural engineering region head, West, overseeing the structural and marine engineering divisions in Oakland, Los Angeles, and Newport Beach, California; Houston, Texas; and Denver, Colorado. He also joins SGH's Executive Committee.

Forcys has promoted **Dan Zatezalo** to vice president. He has served as general manager for North America and head of global sales. He will continue to support the delivery of cutting-edge naval and subsea solutions to the U.S. military and allies. **ST**

Ocean Power & Monitoring
 Transform into the cost-efficient and sustainable future

A detailed advertisement for SubCtech. The background is a blue ocean with a yellow sun. The SubCtech logo is in the top left. Various marine energy and monitoring solutions are illustrated: Wave Energy & Wind Battery Storage, Vehicle Batteries, 1-6 Mwh Energy Storage Systems, Intervention Batteries, AUV / Drone Docking Station, and Subsea UPS & Converter. A QR code is in the bottom left. Certifications for UN 38.3, ISO 9001, and API 17K are shown in the bottom right.

contracts

De Boer Marine, Westwal, Netherlands, a service provider of maritime connectivity solutions, has signed a new multi-year connectivity service agreement to enable ship operators to access high-speed, flexible and seamless global VSAT satellite connectivity, enabling scalable capacity wherever required. **SES**.

Klein Marine Systems, Newburyport, Massachusetts, has selected the Octans Nano OEM attitude and heading reference system as the standard navigation solution for its 5900 side scan sonar. This will enhance the sonar's precision and reliability for high-resolution seabed mapping, supporting a range of defense, security, and commercial applications. **Exail**.

Grafmarine, Altrincham, U.K., has signed a memorandum of understanding for a knowledge partnership that will test AirGo Design's fiber-reinforced thermoplastic composites on Grafmarine's NanoDeck tiles, which capture, store and remotely manage clean energy while vessels are at sea. **AirGo Design**.

Danelec, Farum, Denmark, has reinforced a longstanding partnership by signing a new global agreement covering nine of Aage Hempel's locations worldwide. This extends Danelec's global service capabilities for its voyage data recorders and other digital solutions. **Aage Hempel**.

Ashtead Technology, Aberdeen, U.K., has placed an initial order for the Compact Navigator, a new ultracompact autonomous navigation system for subsea and surface vehicles. **Teledyne Marine**.

Teledyne Marine, Reykjavik, Iceland, has delivered a Gavia AUV to a subsidiary of the Sea Vorian group that is located in Caudan, France. It will be used for geophysical surveys, cable and subsea infrastructure inspection, environmental studies, and other underwater data

collection and analysis applications. **SEA360**.

PowerCell, Gothenburg, Sweden, has its first commercial order for its M2Power 250 system from a European shipyard, including a 2-MW installation of methanol-to-power technology. **Undisclosed**. **ST**

meetings

AUGUST

August 25-28—SEG/AAPG Image, Houston, Texas. www.imageevent.org.

August 26-28—Oceans in Action, Biloxi, Mississippi. www.mtsociety.org/oceans-in-action.

SEPTEMBER

September 10-11—Digitalisation in Shipping: Europe Summit, Rotterdam, Netherlands. www.wplgroup.com/aci/event/digitalisation-in-shipping-europe.

September 10-11—International Antifouling Conference, Gothenburg, Sweden. <https://international-antifouling-conference.confetti.events>.

September 10-12—INMEX SMM India, Mumbai, India. www.inmex-smm-india.com.

September 15-19—London International Shipping Week, London, U.K. www.LISW.com.

September 24-25—European Carbon Dioxide Utilisation Summit, Antwerp, Belgium. www.wplgroup.com/aci/event/co2.

September 26—The Maritime Standard Transportation and Climate Change Conference, Abu Dhabi, United Arab Emirates. <https://tmstaccc.com>.

September 29-October 2—OCEANS 2025 Great Lakes, Chicago, Illinois. <https://greatlakes25>.

oceansconference.org.

OCTOBER

October 6-8—AAPA Annual Convention, Québec City, Canada. <https://aapa.getregistered.net/2025-annual-convention>.

October 7-9—International Boat Builders' Exhibition and Conference, Tampa, Florida. www.ibexshow.com.

October 15-16—Decarbonisation in Shipping: Europe, Hamburg, Germany. www.wplgroup.com/aci/event/decarbonisation-shipping-europe.

October 22-24—WISTA International AGM & Conference, Barcelona, Spain. <https://wistainternational.com>.

NOVEMBER

November 4-6—Deepwater Operations and Topsides, Platforms & Hulls Conference and Exhibition, Galveston, Texas. www.offshore-event.com.

November 4-6—Sustainable Ocean Summit and Global Blue Finance Summit, Barcelona, Spain. www.oceancouncil.org.

November 5-6—European E-Fuels Conference, Hamburg, Germany. www.wplgroup.com/aci/event/european-e-fuels-conference.

November 19-21—Vietnam International Marine & Offshore Expo, Ho Chi Minh, Vietnam. marine-vietnam.com and offshorewindviet.com.

November 25-26—Offshore Energy, Amsterdam, Netherlands. <https://oeec.biz>.

DECEMBER

December 3-5—International WorkBoat Show, New Orleans, Louisiana. www.workboatshow.com.

For more industry meetings, visit sea-technology.com/meetings. **ST**

Ocean Technology Poised for Bigger Role in Defense Spending—Brett Richards

Brett Richards is special counsel in Jones Walker LLP's Government Relations Practice Group in Washington, D.C. He works with businesses and industry associations to help shape emerging legislation and regulations. With more than a decade of service in legislative and political advocacy, he advises businesses and industry groups that have interests, investments, and operations in the U.S. Southeast and Gulf Coast.



There is considerable discussion in Washington, D.C., concerning the reduction of government spending. However, if Sen. Roger Wicker (R-Miss.), chairman of the Senate Armed Services Committee, has his way, the U.S. Department of Defense (DoD) will see a substantial increase in expenditures.

Wicker has released a comprehensive defense investment plan aimed at bolstering U.S. military capabilities, based on increasing the DoD budget to 5 percent of the nation's gross domestic product (GDP)—approximately \$200 billion. This initiative seeks to address emerging global threats and revitalize the defense industrial base, particularly maritime capabilities.

In a parallel effort, Wicker seeks to enact major acquisition reforms at the DoD. His proposal is a five-part plan for making the acquisition process more efficient: cutting red tape, unleashing innovation, increasing competition, enabling decisive action, and modernizing the budget process.

A notable aspect of the chairman's defense spending plan is modernizing U.S. naval forces and accelerating the procurement of advanced maritime technologies. Key components include: fleet expansion, unmanned systems, counter-unmanned aerial systems and directed-energy weapons.

The proposal aims to strengthen

the shipbuilding industrial base to achieve a 355-ship fleet, with a potential path to 357 ships by 2035. This includes increasing the production of *Virginia*-class submarines to three per year and developing a large-scale industrial base program for surface combatants.

The plan advocates for the accelerated procurement of UUVs and USVs. These autonomous systems are envisioned to enhance surveillance, reconnaissance and combat capabilities.

The focus on offering a cost-effective solution for modernizing naval operations is significant, particularly for newer, growing companies, such as Seatrec, an underwater drone manufacturer that operates the "infiniTE float" that, due to its novel energy harvesting system, can provide long-duration monitoring of ocean soundscapes in contested waters. Another example of innovation is LeVanta Tech, an aerial drone manufacturer whose sea-launched HALIA drone has numerous applications, including reconnaissance missions or missions with more lethal implications.

USVs have demonstrated their effectiveness in recent conflicts. For instance, Ukraine's use of weaponized drone boats against Russia's Black Sea Fleet underscores their potential in modern naval warfare. Increased funding could accelerate the development and deployment of such technologies.

Defense firms, such as Anduril, have secured significant contracts to develop systems capable of defending against small drones. These technologies are crucial for protecting naval installations and assets from emerging aerial threats.

There is also a push to integrate directed-energy weapons into naval platforms. For example, in response to hypersonic threats, the U.S. Navy plans to arm certain ships with Patriot Advanced Capability-3 Missile Segment Enhancement interceptors.

Despite significant investment, challenges remain in streamlining demand and establishing robust supply chains for effective deployment.

Wicker has also put a great amount of thought and planning into reforming how the DoD acquires new assets. These efforts have generally focused on improving efficiency, cutting waste, and ensuring faster delivery of capabilities to the U.S. military. Key acquisition reform priorities include: accelerating procurement, promoting innovation and emerging technologies, strengthening the industrial base and domestic manufacturing, enhancing accountability and oversight, and improving the acquisition workforce.

There is a push for reforms to streamline the Pentagon's often slow and bureaucratic acquisition systems. Wicker supports policies that allow quicker prototyping and fielding of innovative technologies, especially in the areas of hypersonics, unmanned systems, and cyber capabilities.

The chairman has advocated for greater integration of emerging tech, such as artificial intelligence and autonomous systems, into the defense acquisition process. He believes this will maintain U.S. military superiority over near-peer competitors, such as China.

There is emphasis on the importance of maintaining a robust defense industrial base, including supporting American shipbuilding, which is especially relevant to Wicker's home state of Mississippi. He has sponsored or supported legislation that bolsters domestic supply chains and incentivizes production of key components in the United States.

Wicker's defense investment plan would accelerate development and deployment of advanced maritime systems, ensuring the U.S. Navy can meet the challenges ahead. **ST**

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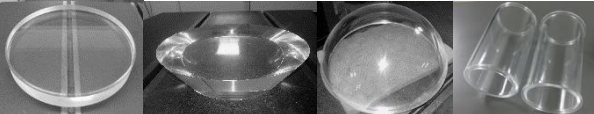
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