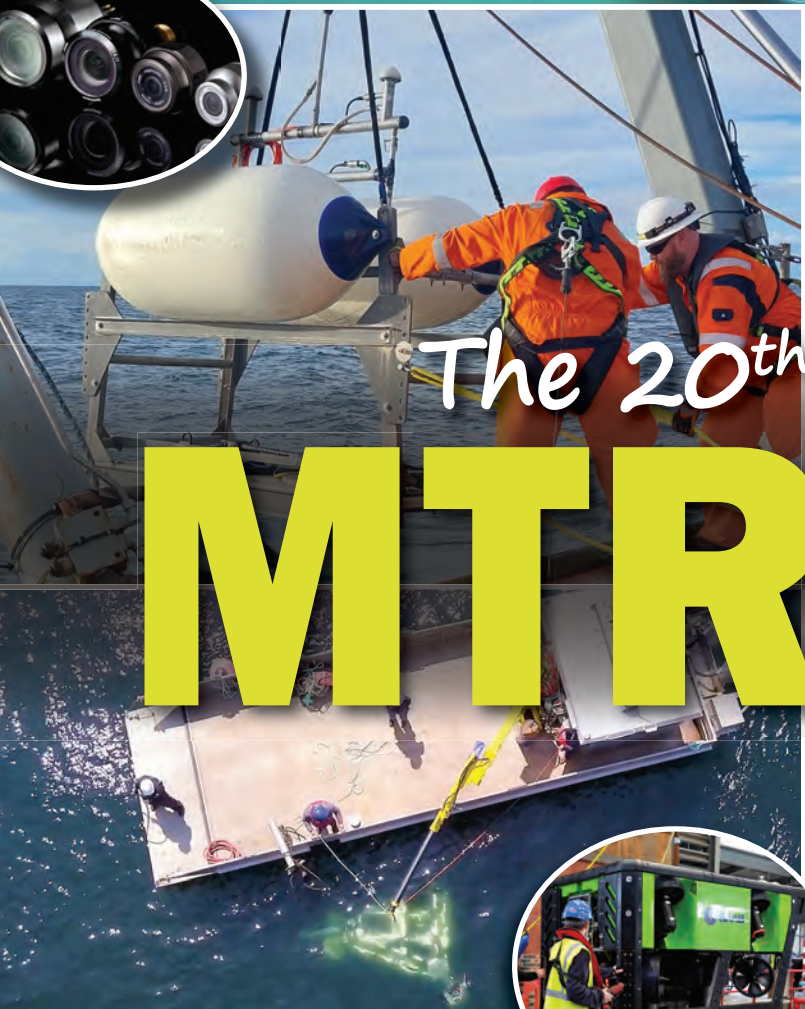


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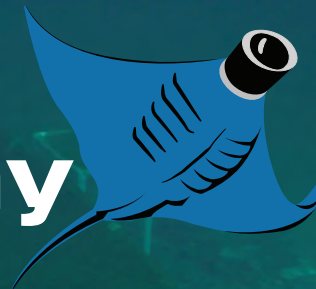
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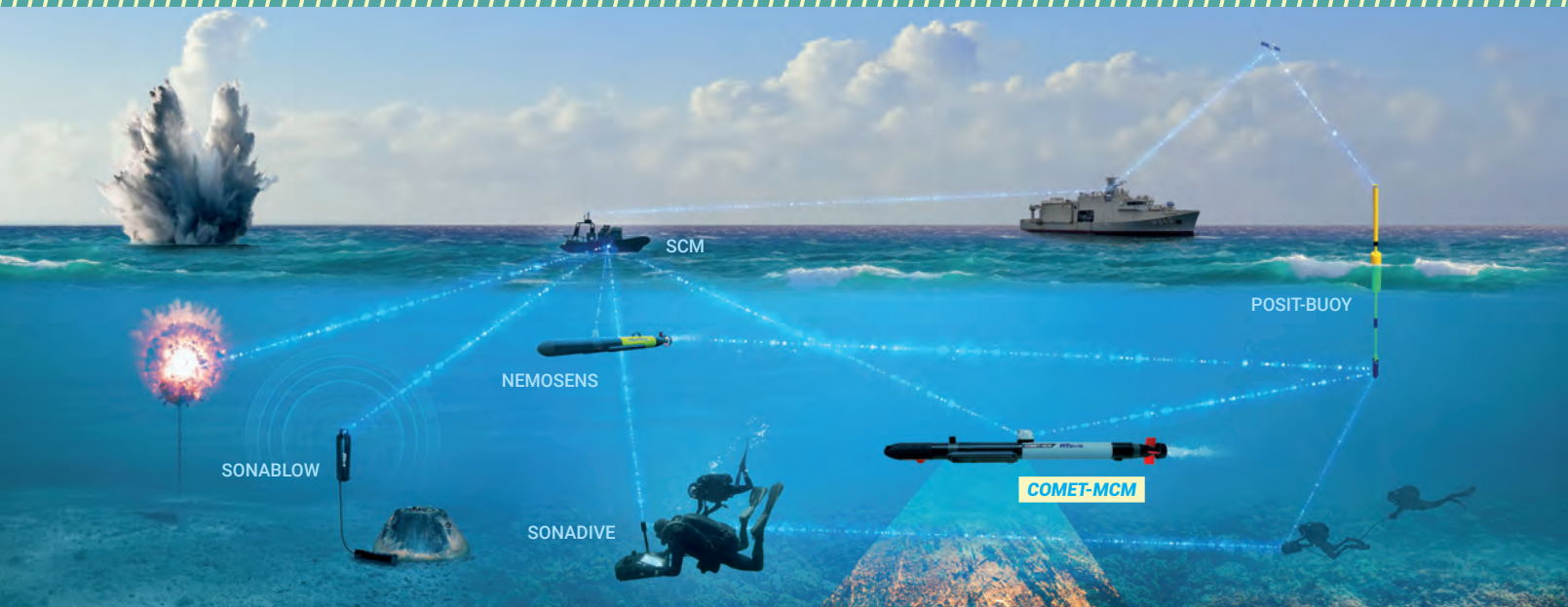


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My colleagues and I are honored to introduce our 20th MTR 100, our annual look at 100 technologies, companies and people driving the subsea market. We're excited for you to read about new updates from some of our regular submissions, as well as discover new companies, innovations and individuals.

Although the MTR 100 isn't an exact science — there is no commonly available measuring stick to rank each and every entry — it provides an overview of the trends and markets driving this industry forward. We cover the rise of autonomy and AI, the continued exploration of our oceans, the drive for climate adaptation and the miniaturization of technologies.

Additionally, we address some hard-hitting sectors and themes. David Strachan explores subsea defense technologies, while Kevin Hardy delves into the cost efficiency of baited ocean landers. Wendy Laursen, our contributor from Down Under, sticks close to home, exploring marine solutions in Australia and New Zealand. Retired U.S. Navy Captain Bobbie Scolley and retired Rear Admiral Tim Gallaudet celebrate 50 years of women in Navy diving. I give an overview of aquaculture technologies, an area that we've long neglected to tackle in depth, but one that plays a critical role in climate adaptation and feeding the world's growing population.

Aside from the stories within these pages, we spent the last week of September at the OCEANS conference in Chicago, collecting more ideas and exploring marine technologies on the edge of Lake Michigan.

If you missed us at OCEANS, never fear — our team will be at Underwater Intervention/ the International WorkBoat Show in New Orleans in early December. We'll be looking to make new connections and highlight your stories with onsite interviews and videos. If you're interested, drop me a note and we'll line something up.

I hope the 20th MTR 100 broadens your horizons and we'll see you next month.



Celia Konowe
Managing Editor



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Laursen

Wendy Laursen has 20+ years of experience as a journalist. In that time, she has written news and features for a range of maritime, engineering and science publications. She has completed a Master of Science research degree in marine ecology as well as diplomas in journalism, communication and subediting.

Scholley

Bobbie Scholley, Captain, US Navy(ret) was a deep ocean diving and salvage officer for 24 years, serving in key leadership position in several complex

Scholley



missions. Upon leaving military service, she engaged in non-profit work with veteran and diving organizations as well as providing expertise as a public speaker and frequent media subject matter expert. She is a member of the Women Divers Hall of Fame and has written for the Journal of Diving History and a variety of veteran publications. She holds a bachelor's degree from Illinois State University, a master's degree from the Industrial College of the Armed Forces, and an honorary doctorate from Illinois State University.

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Spiro

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Strachan



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The Honorable Tim Gallaudet, PhD, Rear Admiral, U.S. Navy (ret) is the CEO of Ocean STL Consulting and host of *The American Blue Economy Podcast*. He serves on several boards, is a fellow at The Explorer's Club, and is a strategic advisor for a few dozen startups, research institutions, and nonprofits in the ocean, weather, climate, and space sectors. Gallaudet is a former acting Undersecretary and Assistant

Secretary of Commerce, acting and Deputy Administrator of the National Oceanic and Atmospheric Administration (NOAA), and Oceanographer of the Navy. He has a bachelor's degree from the U.S. Naval Academy, and master and doctoral degrees from Scripps Institution of Oceanography.

Kevin Hardy is President of Global Ocean Design, creating components and subsystems for unmanned vehicles, following a career at Scripps Institution of Oceanography/UCSD. He holds patents in the field of ocean landers. He is on the academic advisory board of Instituto Milenio de Oceanografía at the Universidad de Concepción, Chile. Hardy received an honorary Doctor of Science degree from Shanghai Ocean University in 2018. He proposed making thick wall glass spheres to Nautilus Marine Service/Vitrovetex (Germany) that opened the hadal depths to routine exploration. He writes for the *Journal of Diving History* and the *MTR*.

Hardy



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DEEPLY INNOVATIVE DRIVERS IN SUBSEA DEFENSE



By David Strachan

Image above: Kraken Robotics has emerged as a global leader in synthetic aperture sonar (SAS). Its KATFISH system, integrated with a Towed Synthetic Aperture Sonar (TSAS), is already in use with multiple navies for MCM and change detection, providing unmatched resolution and area coverage rates. Image courtesy Kraken Robotics

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The undersea domain has never been more strategically important. From the proliferation of submarines and underwater vehicles, to the protection of subsea energy and communications infrastructure, maritime security now extends well beneath the ocean surface. As a result, defense agencies worldwide are investing heavily in underwater energy, navigation, sensing, autonomy, and communication systems to maintain domain awareness and respond to emerging threats. The companies featured in this year's **MTR100** are leaders in these areas, with innovations shaping a new era of persistent, distributed, and scalable subsea defense capabilities.

Power & Energy Systems: Enabling Persistence

As defense missions extend into deeper waters and demand longer endurance, reliable power infrastructure has become critical. Companies like **SubCtech** are at the forefront with rechargeable lithium-ion battery packs rated for depths up to 6,000 meters. Its modular SmartPowerBlock technology powers AUVs and ROVs on long-duration operations, while OceanPack monitoring systems support uninterrupted environmental data collection, capabilities that are essential for subsea surveillance and maritime domain awareness.

Teledyne Marine's Subsea Supercharger (SSC) is another breakthrough - a compact, fuel cell-based "mini power plant" engineered for long deployments in remote environments. The SSC can charge resident AUVs/ROVs, power control nodes,

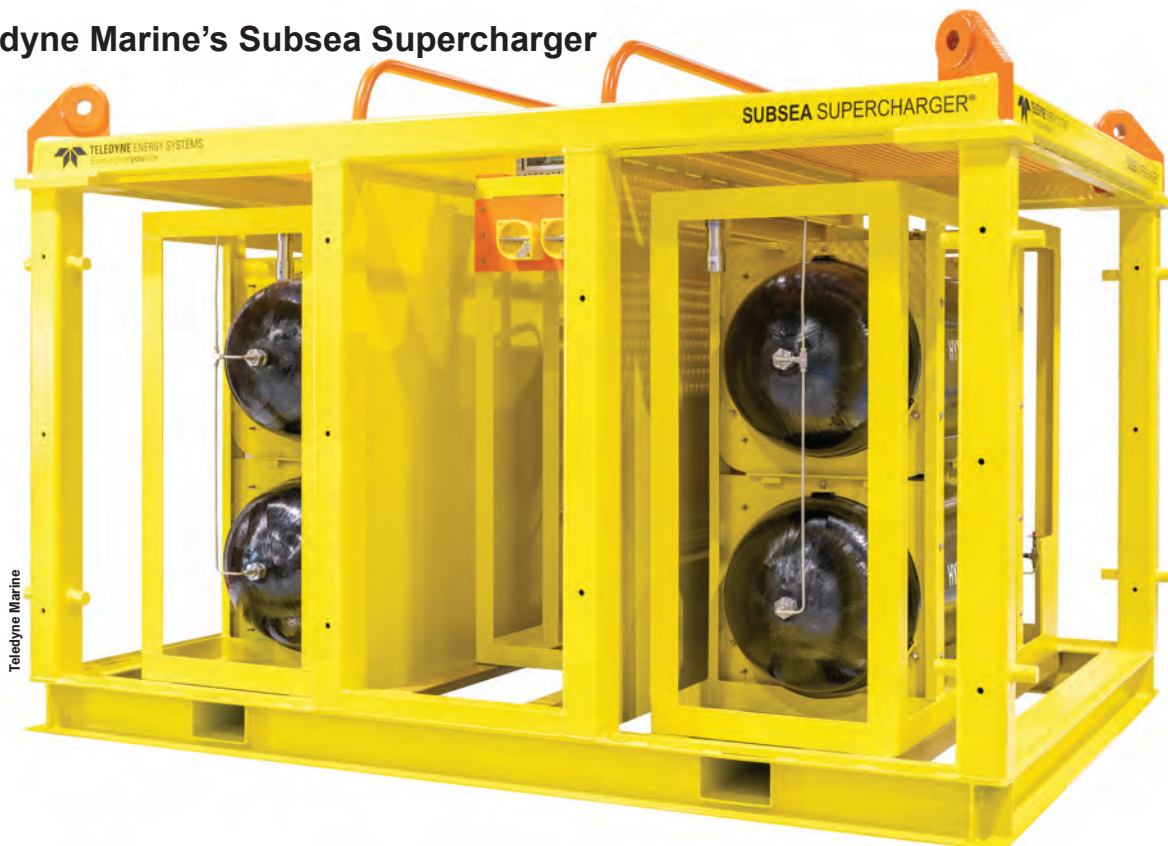
and support fully autonomous operations without frequent retrieval or servicing. Equally vital is the subsea connectivity backbone. **NOVACAVI's** hybrid fiber-optic cables, part of their Aquacable line, are powering and delivering real-time data for advanced surveillance systems like Image Soft's Underwater Surveillance System (UNWAS). And with decades of experience supporting defense and offshore customers, **MacArtney Underwater Technology Group** designs and integrates end-to-end underwater energy delivery systems. In addition to cables and connectors, MacArtney provides custom-engineered umbilicals, winches, slip rings, and subsea junction boxes that form the power distribution backbone for AUVs, ROVs, and fixed seabed installations.

Navigation & Positioning: Operating Without GPS

Defense planners increasingly expect to operate in GPS-denied environments where surface fixes may be unreliable or non-existent. Precision underwater navigation is therefore a critical enabler of subsea defense, which increasingly demands highly compact positioning and inertial systems that can fit into small, lightweight underwater vehicles without sacrificing accuracy or performance.

Tritech International has long been known for its Gemini imaging sonars, but its MicronNav USBL system is a stand-out in miniaturized navigation. Designed for small vehicles and diver applications, MicronNav provides real-time tracking, positioning, and data transfer in tight, cluttered spaces - critical

Teledyne Marine's Subsea Supercharger



for operations like mine countermeasures (MCM) and covert coastal operations.

SBG Systems is redefining inertial navigation with its MEMS-based Ekinox and Ellipse INS/AHRS units. These compact, low-SWaP (Size, Weight, and Power) systems provide highly accurate navigation and orientation data, even without GNSS input, enabling long-endurance autonomy and precise control for vehicles operating deep underwater or in contested environments.

Nortek's compact Doppler Velocity Logs (DVLs) and the Nucleus 1000 navigation system are enabling small AUVs and diver guidance systems to operate autonomously with remarkable accuracy. Paired with SBG Systems' MEMS-based inertial sensors, these solutions are shrinking the size and cost of precision navigation.

Sensing & Surveillance: Expanding Seabed Awareness

Subsea defense is shifting from intermittent seabed surveys to continuous surveillance, driving innovation in sonar and underwater imaging systems. Canadian firm **Kraken Robotics** has emerged as a global leader in synthetic aperture sonar (SAS). Its KATFISH system, integrated with a Towed Synthetic Aperture Sonar (TSAS), is already in use with multiple navies for MCM and change detection, providing unmatched resolution and area coverage rates.

NORBIT Subsea adds another layer of capability with its compact multibeam sonar systems and GuardPoint family of intruder detection solutions, enabling security teams to monitor harbors, naval bases, and underwater infrastructure in real time. Similarly, **EdgeTech** has a proven track record delivering side-scan sonar systems like the 4205 and 2205 payloads for allied MCM programs.

For close-range operations, **Klein Marine Systems'** high-resolution side-scan sonar provides detailed imaging of the seafloor, supporting MCM, salvage, and security missions. Paired with **BIRNS'** ruggedized underwater lighting systems, these tools provide exceptional

clarity in challenging environments, offering a comprehensive toolkit for detecting threats and anomalies in complex underwater settings.

Scaling Operations

Unmanned platforms continue to trans-

form maritime defense by expanding coverage and reducing operational costs. Portable ROVs from **VideoRay** have become standard equipment for U.S. Navy explosive ordnance disposal (EOD) teams, enabling rapid, expeditionary deployment with minimal logistical overhead.



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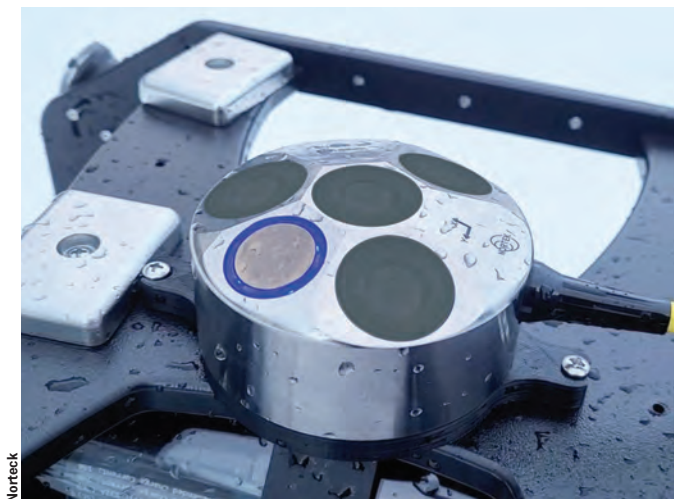


Tritech International

Oceaneering International is making waves with its Freedom AUV, recently selected by the Defense Innovation Unit (DIU) in 2024 as a prototype Large Displacement Unmanned Undersea Vehicle (LDUUV) for the U.S. Navy. The vehicle has already conducted successful Navy demonstrations—undocking, obstacle avoidance, precision payload delivery, and long-duration surveys—marking an important step in autonomous subsea capabilities. At the same time, **Boxfish Robotics** is pushing autonomy with ARV-i, its tetherless, resident underwater drone, which can stay submerged for months, and enable sustained surveillance and asset monitoring missions. And **ecoSUB Robotics** is democratizing subsea autonomy with its family of lightweight, affordable AUVs that can be deployed in large numbers. Their portability and ease of use make them ideal for a wide range of applications, from environmental monitoring, to asset inspection, to tactical swarm operations.

On the surface, **SeaTrac Systems'** SP-48 solar-powered USVs can serve as persistent communication relays or mobile

Nortek's Nucleus 1000



Nortek

SBG System's Ekinox



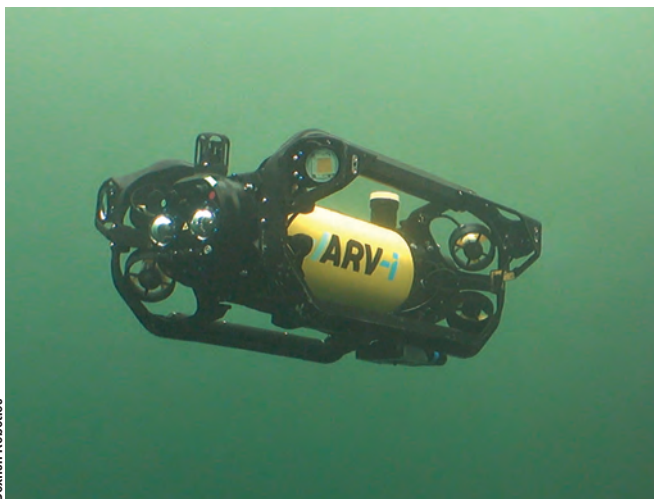
SBG

sensor hubs, extending the range and capability of underwater networks. And a particularly innovative concept comes from **SubSeaSail**, whose semi-submersible platforms combine stealth, energy-harvesting propulsion, and ultra-low-cost operation. HORUS is a semi-submersible observation platform capable of silent intelligence, surveillance, and reconnaissance (ISR), while HERMES is a rugged, self-righting trimaran for logistics and high-speed tracking.

Subsea Comms: Connecting the Underwater Battlespace

As unmanned underwater systems proliferate, reliable underwater communication is equally as critical as navigation and sensing, and MTR100 companies are pioneering solutions that enable navies to create highly integrated and distributed subsea networks. **Sonardyne** has long been a leader in subsea communications and positioning. Its BlueComm optical modem provides high-speed wireless data transfer between vehicles or from vehicle to surface, while their Ranger 2 USBL

Boxfish Robotics' ARV-i drone.



Boxfish Robotics

and Compatt 6+ LBL systems can double as communications networks, enabling AUVs, ROVs, and divers to share navigation data and mission updates. **EvoLogics** pushes acoustic communications further with its patented, dolphin-inspired S2C (Sweep Spread Carrier) technology, which offers simultaneous communication and positioning in challenging environments. This dual capability enables distributed AUV swarms, networked MCM systems, and diver guidance tools, all built on a common communications backbone.

Integration & Collaboration: The Ecosystem Behind the Innovation

The rapid pace of maritime defense innovation is fueled not only by trends in cutting-edge technologies, but also by collaborative ecosystems that accelerate the transition of commercial ocean technology into defense applications. These hubs, holding companies, and strategic alliances are helping to bridge the gap between commercial innovation and operational capability. Technology clusters like Nova Scotia-based **COVE (Centre for Ocean Ventures and Entrepreneurship)** provide a collaborative space for startups, researchers, and defense contractors to test and refine their products. **General Oceans**, formed in 2021, is a global ocean technology group

uniting leading subsea brands under one umbrella to leverage centralized R&D, engineering, and market support. Four of its companies - **Nortek**, **Tritech International**, **Klein Marine Systems**, and **RS Aqua** - are featured in this year's MTR100, underscoring its growing influence across defense, offshore energy, and ocean science. Meanwhile, **Forcys**, launched in 2022 by the UK-based Sonardyne Group, takes a similarly synergistic approach. Comprised of **Wavefront Systems**, **Chelsea Technologies**, **EIVA**, **Voyis**, and **Sonardyne**, Forcys technology partners pool expertise in sonar, navigation, autonomy, and mission systems to accelerate innovation for MCM, anti-submarine warfare, and seabed surveillance.

A New Era of Maritime Defense

From ruggedized cables to long-endurance autonomous platforms, the companies in this year's MTR100 represent more than engineering excellence; they are shaping the future of maritime defense. Advances in power systems, navigation technology, sonar imaging, and unmanned vehicles are converging to create an undersea domain that is more connected, persistent, and resilient than ever before. As subsea threats evolve, these innovators are delivering the situational awareness and operational superiority essential to securing the ocean depths.

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 Revealed

EdgeTech is a leading manufacturer of underwater technology solutions, such as side scan sonars, sub-bottom profilers, bathymetry systems, acoustic releases and on-demand (“ropeless”) fishing systems.

Notable solutions include:

- Full Spectrum CHIRP Processing and industry ecognized JSF file formats
- Multi-Pulse Technology
- Dynamically Focused Arrays
- Dual Simultaneous Frequencies
- Long Range Telemetry
- Modular Designs
- Compact/Low Power Electronics
- Application Customization
- Intuitive GUI's
- Multi Phase Echo Sounder (MPES) technology
- Proven and reliable Acoustic Release technology

The EdgeTech 4125i and 4205 are side scan sonar solutions for shallow water and deeper off-shore survey requirements. As one of the only combined side scan sonar/sub-bottom profiler systems offered in the world, the 2050 shines when simultaneous operations are a must.

The 3400 sub-bottom profiler line of products generates high resolution images of the sub-bottom stratigraphy in

oceans, lakes, and rivers and provides excellent penetration in various bottom types. The 3400 product line comes in a variety of frequencies and tow or pole mount configurations optimal for every use case.

Addressing the projects that require side scan sonar and bathymetry, EdgeTech's pole mount 6205s2 is the 4th generation fully integrated wide swath bathymetry and dual frequency side scan sonar system that produces real time, high resolution, side scan imagery and three-dimensional maps of the seafloor.

Recognizing the growing need for more buried UXO and MCM surveys, Critical Underwater Infrastructure (CUI) surveys and buried pipeline and cable tracking, the eBOSS continues to gain popularity. EdgeTech's Buried Object Sonar System (eBOSS) is a sub-bottom sonar system capable of penetrating the seabed to accurately detect, locate, classify, and identify buried and partially proud objects. This low-frequency acoustic imaging system provides data in real-time for general survey purposes such as cable and pipeline depth-of-burial tracking and route surveys. Data can also be post-processed utilizing synthetic aperture sonar (SAS) processing and beamforming to render 3-dimensional images of buried objects.

In the AUV, ROV and ROTV market EdgeTech offers the 2205 OEM-based solution to provide tightly integrated side scan, sub-bottom, bathymetry and combined systems for manufactures.

In addition to a broad range of deep sea, shallow water, and long-life acoustic releases, for the fishers and scientific communities, EdgeTech's on demand ("ropeless") fishing systems offer an easy-to-deploy, all-in-one caged system that includes an acoustic release, floats and recovery line. A cloud-based Trap Tracker app allows operators the ability to command, control, track and categorize the underwater systems.

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ACUA Ocean

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Founded in 2021, ACUA Ocean is a UK-based scaleup designing and developing unmanned surface vessels (USVs) for ocean monitoring and data collection. ACUA's autonomous systems deliver enhanced full ocean capabilities for the launch and recovery of sensor and system payloads.

ACUA Ocean's USV, which was nominated for the Concept Vessel Design of the Year award at the Electric & Hybrid Marine Expo 2024, and one of Fast Company Magazine's World Changing Ideas of 2025.

Launched in December 2024, USV PIONEER is a 47 ft., 25-ton unmanned surface vessel featuring advanced autonomous navigation, remote command capabilities, and a modular design tailored to a variety of offshore operations, including environmental monitoring, maritime domain awareness, and offshore infrastructure inspection.

The USV PIONEER platform can support the deployment of modular sensors and system payloads of up to 6.5 tons from a 20ft ISO footprint in the moonpool. The unique SWATH vessel design differentiates the Pioneer USV from competitors by delivering the stable platform necessary for robotic offshore over-the-horizon operations.

Wave tank testing and digital simulations conducted by the University of Southampton Marine and Maritime Institute show the USV PIONEER outperforming the stability of a 40-meter monohull vessel, meeting the increasing need of end-users for high-quality data and increased reliability in open ocean conditions.

In August 2025, Lloyd's Register (LR) issued the UK's first certification for a remotely operated and unmanned vessel (ROUV) under the Maritime and Coastguard Agency's (MCA) Workboat Code Edition 3 (WBC3) Annex 2, with PIONEER becoming the first vessel to achieve compliance.

BeeX Pte Ltd

<https://beex.sg>



BeeX, a deep tech spin-off from the National University of Singapore, is a leader in Hovering Autonomous Underwater Vehicles (HAUVs) and subsea robotics solutions, delivering intelligent systems for inspection and monitoring in challenging underwater environments across maritime, energy, and defense sectors.

BeeX has successfully deployed HAUVs in Singapore, Malaysia, Taiwan, and select European countries and a variety of real-world applications.

BeeX pioneers in providing Autonomous Robotics-as-a-Service (ARaaS). Its flagship HAUV, A.IKANBILIS, is powered by dual 500Wh hot-swappable batteries, delivering up to 7 hours of continuous operation—among the longest

in its class. Its modular design supports multiple sensors tailored to client needs. With strong current-fighting capabilities, it can perform detailed inspections in harsh offshore conditions. Equipped with a powerful underwater computing platform, its CPU enables real-time tactical decisions, while the GPU drives embedded machine learning.

In defense trials, A.IKANBILIS generated 2D sonar mosaics, 3D point clouds, and autonomously detected a limpet mine. It delivered results within minutes, cutting typical 12-hour processing times and enabling immediate on-site response.

In response to client needs, BeeX is developing BETTA, a next-generation HAUV with up to 10x power compared to A.IKANBILIS. It enables operations in harsher environments and unlocking new autonomous subsea work.

BeeX also offers the Sambal Portal, a cloud-based platform that turns raw underwater data into actionable insights through real-time monitoring, visualization, and seamless reporting.

BeeX's ISO 9001, 14001, and 45001-certified facilities integrate hardware, software, and algorithm development under one roof, featuring assembly bays, electronics benches secure integration areas, and a freshwater tank that allows the company to validate the vehicle's performance and core systems.

Looking ahead, BeeX aims to expand autonomy features such as fleet coordination and AI-driven mission planning.

Beyond Reach? Not Anymore.

How a robotics pioneer just redefined the dive cam for commercial divers

For decades, commercial dive cameras have been designed largely by divers themselves—practical and functional, but rarely the product of deliberate engineering aimed at pushing technology forward. That's changing.

Reach Systems, best known for rugged tether reels and winches for ROVs, USVs, and remote sensing platforms, has built its reputation on solving hard subsea problems with precision engineering. Now, the company has turned that same discipline toward human partners. The result is the Reach Digital Diver Camera System (DDCS), a purpose-built imaging suite that combines durability, clarity, and usability in a way the market hasn't seen before.

This isn't a knock on existing tools—divers have long relied on solid, workmanlike cameras. But Reach brings a different perspective: engineering-led innovation proven in the robotics sector. By applying that philosophy to commercial diving, they've produced a system that feels less like another option and more like a breakthrough.

The DDCS packs serious capability: 1080p HD video, scratch-resistant sapphire windows, a 300-meter depth rating, integrated LED lighting up to 1,500 lumens, and a daylight-viewable touch-screen controller. It's rugged, intuitive, and quick to deploy—the kind of tool that matches the skill and confidence of the divers who use it.

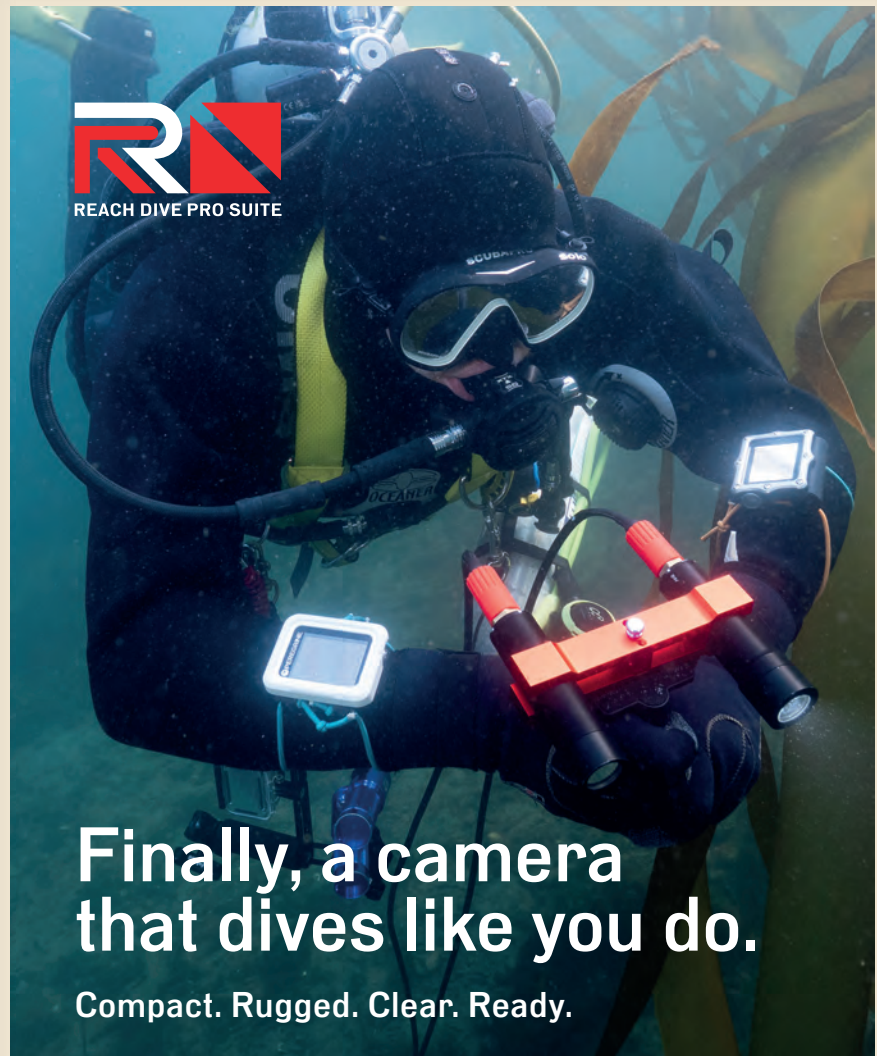
"This isn't about checking boxes—it's about elevating performance," says Jake Carine, Managing Director of Valor

Ocean Technologies, Reach's exclusive distribution partner. Valor's team has tested nearly every dive cam on the market. Their assessment of the DDCS? Five stars, no hesitation.

What makes this story compelling isn't just the launch of a new camera—it's the

shift it represents. The same innovation that makes uncrewed systems safer and more sustainable is now amplifying the capabilities of the divers themselves.

For professional divers who pride themselves on pushing limits, the next level is finally within reach.



REACH DIVE PRO SUITE

Finally, a camera that dives like you do.

Compact. Rugged. Clear. Ready.



Image courtesy of Reach Systems

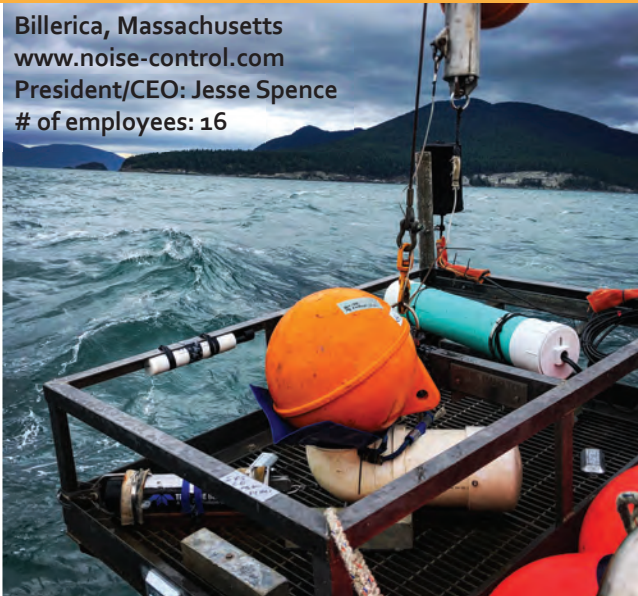
The Reach Digital Diver Camera System (DDCS) was engineered, not improvised. To fit in tight spaces. Take real-world hits. Deliver crystal-clear proof. All while keeping pace with you.

- ➔ Fast to setup, easy to handle
- ➔ Built tough for harsh conditions
- ➔ HD clarity, even in turbid water

Own the view. divecams.com

NOISE CONTROL ENGINEERING, LLC

Billerica, Massachusetts
www.noise-control.com
President/CEO: Jesse Spence
of employees: 16



Noise Control Engineering, LLC (NCE) is a specialized acoustical engineering consultancy headquartered in Billerica, Massachusetts. The firm specializes in noise and vibration design, control, and measurement for marine, industrial, and commercial applications.

NCE serves as a prime contractor for the US Navy and a wide range of commercial entities, and has contributed technical expertise to hundreds of vessels worldwide. The firm is known for its work in designing and evaluating quiet vessels across a wide range of types, including research vessels, high-speed craft, tugboats, offshore support vessels, military ships, dredges, icebreakers, submersibles, offshore structures, and both conventional and unconventional marine platforms.

NCE's client base includes naval architects, shipyards, government agencies, equipment manufacturers, private vessel owners, and commercial operators.

Beyond their technical expertise, NCE plays a role in shaping marine industry standards for underwater noise reduction. In early 2024, NCE joined the US Delegation to the IMO Sub-Committee on Ship Design and Construction, supporting the IMO's action plan to further prevent and reduce URN from ships.

NCE is actively engaged in US Maritime Administration studies contributing to the IMO's experience-building phase—an effort that invites Member States and organizations to share insights and best practices for implementing the Revised Guidelines. Additionally, NCE leads the EC-14

working group of the Society of Naval Architects and Marine Engineers (SNAME), which is developing guidance for designing quieter ships.

NCE has also developed multiple tools for the measurement of underwater noise from ships and other anthropogenic sources. One such tool is NCE's Buoy Acoustic Measurement System (BAMS). BAMS is a floating buoy that enables NCE engineers to perform underwater measurements to ANSI, ISO, and regulatory body standards, and characterize the acoustic output of vessels, airguns, pile driving, and all other human activities at close and long ranges. NCE's engineers employ the capabilities of BAMS to diagnose noise problems, including identifications of root causes of excesses to noise criteria, degraded sonar performance, and other operational or compliance concerns.

Noise Control Engineering (NCE) supported a U.S. Maritime Administration META study to assess the potential for battery-electric propulsion to reduce underwater radiated noise (URN). URN was measured from three tugboats in San Diego: two diesel-gear and one battery-electric. The electric tug showed a 5–6 dB URN reduction during transit and assist modes. Further analysis revealed that noise reductions during transit were due to the absence of structure-borne noise from engine mounts. During assist, differences in propeller design—not propulsion type—accounted for URN variation. The study underscores the importance of early-stage acoustic analysis to identify dominant noise sources and apply targeted mitigation strategies.



Established in 1954, BIRNS is a leader in the design and manufacturing of high-performance connectors, penetrators, and cable assemblies for deep ocean use.

BIRNS serves as an independent testing resource for the industry, including precision testing for deep submergence connectors and cable assemblies with an extreme

low temperature, extreme depth testing system. The test system successfully allows 48 hour+ continuous testing of connectors and cable assemblies at 6km in a controlled 2°C ($\pm 1^\circ\text{C}$)

BIRNS' Quality Management System is certified to AS9100:2016 and ISO 9001:2015 by DNV[®], including SUBSAFE. The company's Oxnard, CA molding facility is certified by the US Navy's Submarine Maintenance Engineering, Planning and Procurement (SUBMEPP) division to NAVSEA S9320-AM-PRO-020.

BIRNS 6km-rated interconnect assemblies boast 9.95 Gb/s data transfer rates with exclusive cable for Cat 8.2 use. This capability is ideal for high-definition video, monitoring and sonar digital downloads, or any subsea application requiring incredibly high data delivery.

BIRNS recently introduced low loss RF cable assemblies with 6km open face pressure resistance. The company has provided low UHF insertion loss at high frequencies a reality, at 8800 psi (607 bar). BIRNS Millennium 1C assemblies achieve attenuation of only -0.35dB at 3.0 GHz with a VSWR of 1.2. These cable assemblies, available in both 50 and 75 Ω configurations, provide high signal transmission and open face press resistance to 6km.

The 225 Amp BIRNS Meridian series offers a new pinnacle of high ampacity, with connectors that are open-face rated to 6km, and select configurations DNV Type-Approved for 6km rated crewed submersibles. The series is available in straight or 90° configurations and offers standard and reverse-gender options, all withstanding reverse pressure.



Phantom® T5 Defender

The Phantom® T5 Defender Applications:

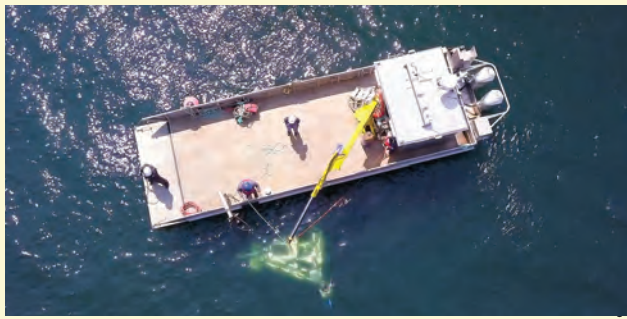
- Defense - Homeland Security, Law Enforcement, Military, Customs, Ports, Search and Recovery

Features:

- Powerful maneuverability and lift
- Incorporates an open architecture
- Hand-built on a rugged, resilient, non-corroding polypropylene chassis
- Chassis accommodates heavier payloads



www.deepocean.com • (408) 436-1102 • sales@deepocean.com



COVE

www.coveocean.com

COVE is a leading Canadian ocean tech hub. It supports the development, testing, and commercialization of marine technologies by providing access to waterfront infrastructure, collaborative workspace, and industry programs. Home to 65+ organizations, COVE fosters innovation, partnerships, and growth in the global marine economy.

COVE offers a range of specialized services to support the growth and success of the marine technology sector. These include access to a fully equipped waterfront facility with deep-water berths for vessel docking and technology testing, as well as collaborative office and lab space tailored for ocean-focused organizations. COVE's Start-Up Yard provides incubation and acceleration services for early-stage companies,

while its testing and validation infrastructure—such as the Stella Maris platform and SmartATLANTIC buoy—supports real-world trials of ocean technologies. COVE also facilitates industry-academic collaboration, R&D partnerships, and talent development through internship programs, challenges, and technical training. As a connector across the ocean innovation ecosystem, COVE actively supports commercialization, market entry, and global expansion for marine ventures.

COVE's key equipment includes advanced subsea sensor arrays like the Stella Maris platform, shore-based receivers for real-time data collection, autonomous vessel launch and recovery systems, prototyping workshops with fabrication tools, and extensive docking facilities with floating docks. These assets enable comprehensive testing and validation of marine technologies, supporting autonomous vehicles, underwater sensors, and dual-use defense applications.

COVE is proud to serve as one of the few North American test centers for the NATO Defense Innovation Accelerator for the North Atlantic (DIANA). This program is designed to fast-track dual-use technologies by linking startups and innovators with NATO's defense end-users, testing environments, and commercialization channels. As a NATO DIANA test site, COVE provides participating companies with access to its deepwater marine terminal facilities, real-time sensor platforms, and data analytics infrastructure in Halifax Harbor. The program supports rigorous, real-world testing of autonomous vessels, subsea sensors, and AI-powered ocean surveillance tools.

DeepSea

www.deepsea.com



Founded in 1983, DeepSea is a leader in subsea lighting, imaging, relief valves, and power. As part of SeeScan, Inc., they specialize in designing and manufacturing rugged, high-performance equipment for the most demanding underwater environments.

Their technologies have supported many expeditions, including the Titanic and Bismarck wrecks, and are used by institutions such as Woods Hole Oceanographic Institute, Scripps

Institute of Oceanography, the Monterey Bay Aquarium Research Institute, National Geographic, and many others.

The imagery of the Endurance wreck, discovered during the Endurance22 expedition in the Weddell Sea, was captured on a DeepSea 4k Optim SeaCam. The footage from the Optim shows the wreck's incredibly well-preserved stern and the diverse colony of organisms that are thriving within and on the ship's remains.

The DeepSea portfolio includes: cameras, LED Lights, SeaBattery Power Module, lasers, and pressure relief valves.

DeepSea's latest product, the SmartSight MV100, is the first in a new line of cameras purpose-built for machine vision applications. Optimized for systems integrating machine learning and AI, the MV100 enables object recognition, navigation, and inspection. The MV100 will be deployed on the Orpheus AUV of Orpheus Ocean, which builds small-footprint and cost-effective submersibles to explore the oceans. With the MV100, Orpheus will be able to identify objects of interest, re-profile its mission path to revisit key features, and synchronize its DeepSea SeaStrobe light to the camera's frame rate—reducing power consumption while improving data quality.



ALL AMERICAN MARINE

www.allamericanmarine.com

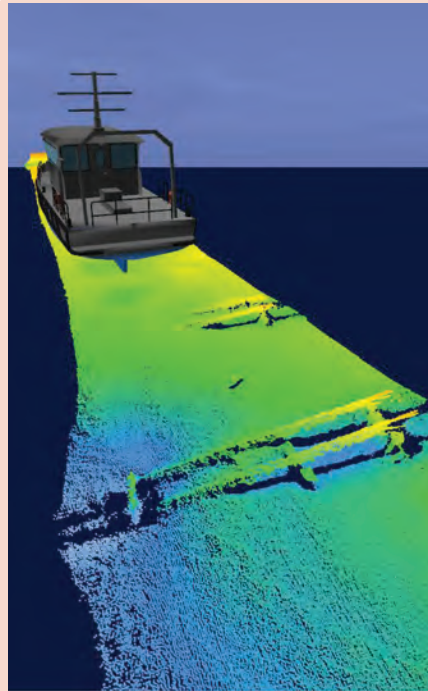
All American Marine (AAM) is a builder of custom aluminum vessels. For more than 30 years, they have delivered passenger ferries, commercial workboats, and research vessels to operators across North America.

AAM's exclusive partnership with Teknikraft Design allows them to deliver hulls and hydrofoil-assisted catamarans that are known for their speed, fuel efficiency, low wake, and passenger comfort. Every vessel is custom-designed to meet the unique mission of the operator, with propulsion systems ranging from diesel to hybrid-electric, lithium-ion, and hydrogen fuel cell.

In October 2025, AAM will deliver a 108' x 32' parallel-hybrid monohull for Harbor Breeze Cruises, designed for tours and entertainment. By December 2025, a 65' x 24' patrol catamaran will be completed for the LA Port Police. Looking ahead to March 2026, UNC Wilmington will take delivery of a 73' x 26.7' research catamaran.

In August 2026, Phillips Cruises and Tours will receive an 84.5' x 30.7' hydrofoil-assisted passenger and wildlife tour vessel. Rounding out the schedule, by December 2026 San Francisco Bay Ferry will receive a 100' x 26' fully electric passenger ferry, the first in a series for WETA.

All American Marine operates from a facility on Bellingham Bay, equipped with overhead cranes, CNC cutting, brake presses, and a laser-leveled build platform. Recent MARAD grants funded advanced CNC cutters, press machines, and upgraded tooling, boosting efficiency and precision.



BAYWEISONAR

www.bayweisonar.com

BayweiSonar offers entry level shallow water Multibeam Echosounder Systems (MBES). They systems are small and easy to use, providing high quality data.

Their M7 and M9 products, introduced at Intergeo 2024 and Ocean Business 2025, respectively, follow the "classic" hydrographic workflow.

The M1, launched in GeoBusiness Show in June 2025, is a World's First product which provides real-time underwater pointcloud, dedicated to hydrospatial and geospatial markets. M1 users don't need any hydrographic knowledge, just sailing out on a small platform (including even kayaks, canoes, or USV). Ideal for civil engineers, archaeologists, or environmental scientists.



BLUEPRINT SUBSEA

www.blueprintsubsea.com

Blueprint Subsea is a developer of underwater technology, specializing in the design and manufacture of advanced sonars, positioning beacons, and diver navigation systems.

The Starfish sidescan sonar is renowned for its compact design and high-resolution imaging, making it a go-to choice for hydrographic surveys and underwater inspections. The SeaTrac USBL positioning system provides real-time positioning for underwater vehicles and divers, supporting the safety and monitoring of underwater assets. The company's Oculus multi-beam imaging sonar offers high-definition data with seamless dual-frequency operation.

Blueprint Subsea has expanded its Artemis range and introduced several new products engineered specifically for the underwater defense market. The company is also preparing to launch several key product developments in 2025.



**BOXFISH ROBOTICS LIMITED**

www.boxfishrobotics.com

Boxfish Robotics is a New Zealand based manufacturer of underwater robotics and imaging solutions.

Boxfish Robotics's flagship ROV, the Boxfish Luna, is the world's first system purpose-built for high-end underwater filmmaking. Today, it is used by scientists and documentary teams worldwide to capture breathtaking 8K footage at depths of up to 1,000 meters. Luna's imagery has featured in productions for major global broadcasters.

In North America's Great Lakes, invasive mussels have severely damaged lake ecosystem. Documentary filmmakers from Inspired Planet used the Boxfish Luna to film lakebeds, fish behavior, and historic shipwrecks screened by the TVO series All Too Clear.

Boxfish Robotics's autonomous systems product line includes the man-portable hovering Boxfish AUV and the resident ARV-i. Both systems inherit imaging capability combined with advanced autonomy. The ARV-i can stay underwater for extended periods, autonomously undock and recharge in its subsea station, and perform inspections continuously.

In Scotland, the Boxfish ARV-i was tested by Mocean Energy alongside a wave energy generator. Operating from a subsea docking station with its own battery pack, the vehicle was able to undock, complete missions, and recharge without human intervention.

Boxfish Robotics' headquarters feature:

- Manufacturing and Customer Support Workshop – for building, servicing, and testing ROVs and AUVs.
- R&D Department – focused on pressure-resistant materials, electromechanical systems, integrations, robotics tools, and advanced imaging technologies.
- Software Development Department – focused on engineering control systems, autonomy algorithms, and sensor integration.

**DEAD CALM SEAS MARINE SERVICES LLC**

www.dcsmarineservices.com

Dead Calm Seas Marine Services LLC specializes in surface supplied air/Nitrox/mixed gas commercial diving, marine construction, ROV/AUV, saturation diving, rope access/Non-Destructive Testing (NDT), underwater archeology/QMA, and salvage (diving/topside/marine firefighting).

Recent and ongoing projects include:

- Weeks Marine/Kiewit/Skanska/Equinor – South Brooklyn Marine Terminal (2024–Ongoing)

o Scope:

- Coded Welding – Nelson Studs/anodes/bonding bars/sea welds
 - Underwater burning – Three generations of sheet pile removal
 - DPAA & HJF – Global Recovery Operations (Ongoing)
- o Scope:
- Material & soil sampling; hydrographic survey & mapping (sidescan sonar, mag particle);
 - Salvage diving to recover fallen service members; saturation & surface supplied mixed-gas operations
 - Smit Salvage – Naga 7 – Offshore Rig Salvage (2023)

o Scope:

- o Welding, fabrication, cutting, salvage diving; subsea demolition; heavy equipment and rigging operations; surface-supplied mixed gas

**DETYENS SHIPYARDS, INC.**

www.detyens.com

Detyens Shipyards, Inc. (DSI), a privately-owned small business, operates on the historic Charleston Naval Shipyard site along the Cooper River, seven miles north of downtown Charleston, South Carolina.

Features of the shipyard include:

- Drydocks and Piers: Three graving dry-docks, one floating dry-dock, and five outfitting piers accommodating program ships up to 1,000 feet.
- Cranes and Equipment: Rail cranes (56-ton max radius), four tower cranes, and floating cranes (up to 100-ton capacity).
- Power Supply: Continuous shore power (460V, 60Hz, up to 16,000 amps).
- Specialized Shops: Electric motor rewind, high-level machine shop, valve repair, sheet metal/aluminum fabrication, steel fabrication.

In December 2024, Detyens secured two contracts totaling \$34.7 million: \$17,443,181 firm-fixed-price contract (N3220525C4003) for a 135-day shipyard availability for the midterm availability and dry docking of the MSC fleet replenishment oiler USNS Leroy Grumman (T-AO 195).

In January of this year, a \$17,794,821 firm-fixed-price contract (N3220525C4113) was awarded for a 103-day shipyard availability for the regular overhaul and dry docking of the MSC fleet replenishment oiler USNS Kanawha (T-AO 196).

In February 2025, Detyens was awarded a \$21,145,267 firm-fixed-price contract (N3220525C4144) for a 180-day shipyard availability to perform a regular overhaul and dry docking of the MSC fleet replenishment oiler USNS John Lenthall (T-AO 189).

Digital Edge Subsea

www.digitaledgesubsea.com



Digital Edge Subsea is a provider of digital video recording and inspection systems to the global subsea industry.

Their primary products are in the form of 2u, 3u and 4u rack mountable hardware, a standalone workstation with three built-in monitors (upgradable to six monitors) and a laptop solution.

The Edge Software is available in Lite, Standard and Pro

versions and their suite of software products allows customers to manage data backups, projects spread across several DVRs or offshore trips and edit video as required.

Their workpack creator tool allows project personal to create a component and task based workpack for use offshore. Video and data can be recorded in the workpack database, making reporting a simple process.

Recent developments include support for photogrammetry projects. In response to a customer request, the Digital Edge Subsea software team worked to develop a solution for exporting image frames from the Edge DVR with a UTC time-stamp and associated data, ready to be imported in to third party photogrammetry software.

Through their strategic partnership with Harvest Technology, Digital Edge Subsea can also offer live video streaming directly from the DVR to the cloud without the requirement for additional hardware.

TRANSFORM YOUR CAPABILITY

REAL-TIME IMAGING
IN ALL CONDITIONS

Oculus Multibeam Imaging Sonars

High resolution imaging in turbid water for improved situational awareness and target identification. Available in 375kHz to 3.0MHz. Depth rated to 500m, 1000m, or 4000m.

oculus



bp blueprint
subsea



www.blueprintsubsea.com
enquiries@blueprintsubsea.com

SUBSEASAIL, INC.

San Diego, CA

www.subseasail.com

President/CEO: Michael Jones

of employees: 16



SubSeaSail, Inc. (SSS) is changing human interaction with the ocean and ocean warfare with two lines of 100% energy harvesting, long-duration, ultra-low-signature Autonomous Undersea & Surface Vehicles (AUSVs).

The ability to submerge to hide will be increasingly important in a world impacted with climate change, which will result in more frequent/violent storms, more lighting storms/strikes, and more rogue waves all of which will be able to disable and/or destroy unmanned surface vehicles (USVs). The ability to be invisible above water and submerge when desired will be a game changer that will allow these vehicles to function in contested environments.

SSS has developed two AUSVs. The first is lightweight (32 kg. base) semi-submersible ISR vehicle, HORUS, which

will be first to market. The second is trimaran HERMES, for cargo/energy delivery.

Common attributes include:

1. 100% energy harvesting: wind driven + solar powered for communications, sensors & thrusters (can add primary power on HERMES for peak power needs, longer underwater duration, etc.)
2. Affordable: low CAPEX, OPEX and Total Cost of Ownership (TCO)
3. Edge computing: AI collection/distributed AI nodes representing Maritime Domain Awareness (MDA) collection points-at-scale
4. Flexible/multi-mission: scalable designs, sizes and capabilities that can be mass produced

5. Lightweight, reduced infrastructure requirements: HORUS is 32kg; HERMES depends on the mission
6. Long duration capable: 6+ months expected
7. Low draft: easy to launch
8. Servicing: field repairable/designed for fast on/off of modular parts on deck & dock
9. Software architecture: designed to support fleets/swarms of thousands of AUSVs
10. Submerging capability: hide from bad actors/ weather, decoy, listen/monitor then report, etc.
11. Ultra-low-signature: negligible acoustic, heat, radar, visual, wake signatures makes the AUSVs virtually invisible

In Sept 2024, SSS signed a contract with DoD agency National Security Innovation Capital (NSIC is part of Defense Innovation Unit) to move its previously hand-built TRL7 HORUS vehicle to TRL9 contract manufacturing by March 31, 2026. SSS will start taking orders for HORUS in the 4th quarter calendar 2025 for delivery beginning in 2nd calendar quarter 2026.

SSS is in a light industrial facility, split between office and mechanical/electrical/software engineering space and a prototype development workshop. By early 2026, SSS will add a global monitoring center to manage company and customer owned vehicles and likely be occupying an additional facility to support further development.

GENERAL OCEANS

Empowering the Blue Economy
Through Advanced Ocean Technology.

High resolution sonar system solutions for Mine Counter Measures and other military applications.

Advanced instruments used in oceanography and subsea navigation to help measure movement in underwater environments.

Adaptive robotic arms for intervention and control in offshore energy and modern naval landscapes.

Supporting ocean scientists, engineers and the maritime industry by providing top underwater technology.

Mission-ready Hybrid ROV system with fully integrated sensors for fast deployment.

Robust, reliable underwater sensors for the planet's harsheet environments and most difficult applications.

Find out more

D2

www.d-2.com

D-2 Incorporated specializes in sensor technologies across multiple industries, from oil & gas to and the ink industry to free water detection and filtration for jet fuel.

Their primary products are Conductivity (Salinity), Temperature and Depth Sensors, or CTDs. Additional products include salinometers, pressure rigs, and equipment to measure the triple point of water.

D-2 Incorporated has a line of standard equipment, as well as custom solutions and engineering services. Their facility is 10,000 square feet, with its own ISO certified calibration laboratory.



ecoSUB ROBOTICS

www.ecosub.uk

ecoSUB Robotics' AUVs serve a wide range of sectors, with the capability to deploy high accuracy ocean science sensors for measuring CTD, DO, Chlorophyll-a, CDOM, backscatter, turbidity, pH, PAR. They also offer Side Scan & Multibeam Sonars, 4k cameras and high accuracy navigation payloads for survey applications.

ecoSUB is the world's first manufacturer of micro-AUV's and now offers the largest range of micro-small AUV's capable of operating to 3000m.

Next up is the ecoSUBm30-V2, offering more payload capacity, longer endurance, and higher speeds.

GENERAL OCEANS

www.generaloceans.com

General Oceans is a technology leader, dedicated to improving underwater operations and advancing ocean science. Our portfolio includes a range of brands, from well-established entities to innovative startups.

Its brands include: Nortek (Norway), Tritech (UK), Klein Marine Systems (USA), Reach Robotics (Australia), Strategic Robotics Systems (USA) and our most recent acquisition RS Aqua (UK).

Recent achievements include:

- A new strategic partnership between Nortek and RS Aqua, under which RS Aqua's WaveRadar Rex2 — a non-directional radar for wave and tide measurement — will be available through Nortek's global network. The product complements Nortek's ADCPs, enabling integrated wave and current measurement solutions.



- Tritech released the Gemini 1200id, a dual frequency version of the industry standard Gemini 720is. The sensor is primarily used on Workclass ROVs and is a standard fit in the Energy sector.
- Nortek's Generation 2 version of our Vector velocimeter is now available.

“Changing the Math” with Autonomous Undersea & Surface Vehicles (AUSVs)

SubSeaSail[®], Inc. is developing two lines of disruptively affordable, 100% energy harvesting (wind + solar), long-duration, ultra-low-signature Autonomous Undersea & Surface Vehicles (AUSVs) able to function above/below water down to 100 meters. These will be low CAPEX, low OPEX sailing vehicles with solar rechargeable batteries for thruster, sensors and comms designed for low Total Cost of Ownership (TCO).

The ability to submerge is a game-changer across commercial and defense realms as humans deal with increasingly frequent violent storms, lightning more powerful than on land, and rogue waves. The ocean is an “anvil” and waves are “hammers” that can destroy USVs. Submerging avoids danger and permits return to mission when bad actors/weather disappear. As tens of thousands of USVs are deployed – and bad weather/destructive lighting destroy meaningful numbers – TCO will become better understood.

Semi-submersible, monohull HORUS[™] is an ultra-quiet observation AUSV perfect for Passive Acoustic Monitoring and ISR sensors. It is an ideal long-duration “sentry” to remain on station for months monitoring above/below water and reporting back. It will go on sale Q4 calendar 2025 with first deliveries in Q2 2026.

HERMES[™] is a fast, logistics trimaran to carry traditional and non-traditional loads long distances and deliver to beach, harbor or vessel. Multihulls are not traditionally used in long-distance logistics given the risk of capsizing in high winds. SSS has developed, patented and demonstrated an underwater self-righting capability to address this liability. HERMES[™] will represent secure, offshore, underwater storage to avoid bad weather and for cargo pre-positioning. Among other applications, it will be applicable for cargo delivery in humanitarian crisis, to remote islands, for expeditionary forces and to create FedEx-like ocean delivery.

SubSeaSail[®] has a growing IP portfolio with 11 issued, 8 pending, 4 provisional patents. To learn more, contact CEO Michael Jones, mbjones@subseasail.com.

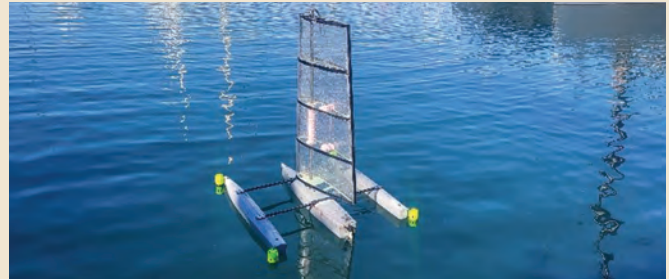


Image courtesy of SubSeaSail[®], Inc.



SubSeaSail[®]

Changing the Math with the Small, the Agile, the Many, the Invisible, the Attritable.

Introducing SubSeaSail[®] HORUS[™], a disruptively affordable, 100% energy harvesting (wind+solar for sensors & thruster), long duration, low-signature Autonomous Undersea & Surface Vehicle (AUSV). HORUS[™] can function for months at sea with the ability to repeatedly submerge to depths of 100M.

**Taking orders in Q4 2025
for delivery in Q2 2026!**

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SubSeaSail.com



DeepWater Exploration Inc.

www.dwe.ai

DeepWater Exploration provides visual data for autonomous applications by addressing core issues with the industry standard of repurposing dry lenses in wet housings.

The facility is equipped with high-precision CNC machines, lathes, and multiple 3D printers for accurate machining and rapid prototyping of housings and mounts. Live microscopes ensure meticulous sensor cleaning during assembly, ensuring optical precision for our subsea vision systems.

In June 2025, DWE partnered with Blue Robotics to feature the exploreHD camera in The Reef, their curated collection of innovative products complementing BlueROV2 and BlueBoat vehicles. This collaboration enhanced their platforms with vision technology, enabling seamless integration for subsea research and inspections via Blue Robotics' global distribution network.

Another milestone was Seasats' Lightfish ASV trans-Pacific voyage, completed July 2025 after 150 days and 7,500 miles. Equipped with multiple exploreHDs, it streamed live above- and below-surface video daily, proving our cameras' durability in extended autonomous missions.

DWE's exploreHD and stellarHD vision lines are backed by their interfacing modules, open-source software, and upcoming SDK. Crafted from aerospace-grade aluminum and titanium housings, and complemented by sapphire lenses, the cameras deliver crystal-clear video with onboard AI processing for color-accurate imaging capable of full-ocean depth.

The exploreHD line offers highly-scalable solutions for plug & play multi-camera setups, whereas stellarHD line provides enhanced features such as 60FPS global shutter and frame synchronization for when precise visual data is mission-critical.

Additionally, the explore3D boasts advanced subsea stereo vision, both pocket-sized and affordable. When complemented by our SDK, the explore3D gives capabilities for 3D reconstruction, depth mapping, and SLAM, drastically cutting integration and deployment times for advanced autonomy capabilities underwater.

The Aquagon is a 7-element lens designed to eliminate distortions and chromatic aberrations caused by the light diffraction in water, providing sharp and geometrically accurate views for 3D reconstruction and object tracking.

PrecisionSync enables millisecond-accurate synchronization between cameras and other onboard sensors, enhancing autonomous navigation and mapping, while streamlining inspections and various other operations.

Klein Marine Systems

www.klein.com



Klein Marine Systems is a leader in side scan sonar technology, known for pioneering the world's first commercial side scan sonar and delivering high-resolution imaging systems to defense, commercial, and scientific markets for over 55 years.

From mine countermeasures (MCM) and UXO detection to hydrographic survey and deepwater exploration, our flagship, System, 5900, is widely recognized in side scan sonar technology, offering image clarity, speed, and reliability in

challenging marine environments.

Recent developments include a partnership with Saab Kockums AB to integrate its Synthetic Aperture Sonar (SAS) hardware on Saab's AUV62 MR autonomous underwater vehicles, part of a contract awarded by Sweden's Defence Materiel Administration.

Additionally, Klein recently appointed SPRY Technocon Pvt. Ltd. as its Authorized Representative in India, significantly boosting its global market reach.

Klein's Sonar Innovation Lab at the University of New Hampshire serves as a real-world research hub, giving students hands-on access to cutting-edge systems while fostering the next generation of marine technologists. They also support the University of New Hampshire's Hydrographic Field Course. Contributions included providing a winch-equipped MA-X View 600 towfish, installation assistance, and training aboard UNH research vessels.

In 2026, Klein will launch "Mantis" in 2026, our most advanced sonar system to date.



HOHONU

www.hohonu.io

Hohonu provides communities with affordable, hyperlocal water monitoring through a combination of rugged sensors and a user-friendly cloud platform. Their primary product is a compact, solar-powered water level sensor designed for easy installation in rivers, estuaries, lakes, and coastal areas.

The data streams directly into Hohonu's web-based platform, where users can view current and historical water levels, set customized alerts, and integrate data with emergency management tools. This service equips decision-makers with actionable intelligence to prepare for floods, storm surges, and sea-level rise, while also supporting long-term planning, environmental research, and infrastructure resilience.

In 2025 alone, Hohonu's network has grown to more than 200+ monitoring locations across 15 U.S. states, generating over two million hours of real-time water level data. Their community-driven approach ensures that underserved and at-risk areas—often left out of traditional monitoring systems—gain access to life-saving insights.



HYDROMEAL

www.hydromea.com

Hydromea enables subsea data harvesting at scale with high-bandwidth communication technologies and inspection robots.

Products include free space optical modems and networks (LUMA), inspection robot, EXRAY, and ultra-thin rimless thrusters (DISKDRIVE).

LUMA modems can now be joined into a smart network, Cell Network. Cell Network allows an uninterrupted high-bandwidth data stream between a moving vehicle and a network of modems located on subsea infrastructure.

LUMAfex is a new, small optical modem designed specifically for the integration into OEM sensor or robotic systems. This was demo-ed together with RBR at Ocean Business 2025.



IMPACT SUBSEA LTD

www.impactsubsea.com

Celebrating a decade, Impact Subsea delivers a range of underwater sensor solutions, engineered for seamless integration and long-term reliability. Every product is designed with the end user in mind—featuring emulation capabilities and a software development kit (SDK) that allows for smooth deployment into both new and legacy systems. A variety of housing configurations, dependent on material and connector, ensure compatibility across a wide range of operational and budgetary requirements.

Impact Subsea offers a comprehensive portfolio, encompassing sonars, altimeters, depth sensors, attitude and heading reference systems (AHRS), and flooded member detection systems:

- Altimeter & Echosounders: 1mm Accurate, Long Range with Sonar backscatter
- Depth & Temperature: Survey Grade Pressure Measurement
- AHRS: $\pm 0.07^\circ$ Pitch & Roll readings. Immunity to temporary magnetic interference

- Sonar: World's most compact imaging sonars with crystal clear image quality using IS3 acoustic signaling

- Profiler: Survey Grade high speed profiling via IS3 acoustic signaling technology

Impact Subsea has also been honored with the prestigious King's Award for Enterprise in International Trade.

In 2024, Impact Subsea moved headquarters. Now within the Aberdeen Energy Park, the premises encompasses 12,000 sq ft of modern office, production, training, calibration and demonstration space.



EvoLogics GmbH

www.evologics.com

EvoLogics is a marine technology company headquartered in Berlin, Germany, with a U.S. sales office in Yorktown, Virginia. Founded in 2000 by a team of engineers and scientists, the company develops underwater robotics, acoustic communication and positioning networks, diver navigation systems, and advanced sensor platforms. Its technologies combine engineering with bionic concepts and focus on creating an underwater “Internet of Things” for cooperation between vehicles and sensors.

At the core of EvoLogics’ product portfolio is the patented S2C spread-spectrum communication technology, delivering reliable bidirectional data links with integrated positioning, broadcasting, and networking functionality. This technology forms the IT backbone for complex subsea operations.

The company offers a broad range of acoustic modems for short-, mid-, and long-range communication, as well as ultra-short baseline (USBL), long baseline (LBL), and hybrid positioning systems. These can be integrated into custom underwater networks for a wide range of applications. EvoLogics’ robotics lineup of autonomous vehicles and platforms is designed to work seamlessly with its communication technologies.

Flagship systems include the Sonobot 5 uncrewed surface vehicle (USV), a compact platform for bathymetric and sonar surveys that delivers high-precision results with minimal logistical effort. The Diver Navigation System, launched in 2024, improves mission coordination by enabling real-time diver tracking, mapping, and communication for tasks such as search and rescue, recovery, and environmental cleanup. The Quadroin autonomous underwater vehicle, modeled on penguin locomotion, combines sonar, cameras, and environmental sensors with AI-based analytics for rapid surveys, object detection, and swarm operations.

In July 2025, EvoLogics marked its 25th anniversary with the expansion of its Berlin headquarters at WISTA Adlershof Technology Park. A newly constructed, purpose-built facility dedicated to serial production is nearing completion, set to add manufacturing capacity and support accelerated development pipelines.



Falmouth Scientific, Inc.

www.falmouth.com

Falmouth Scientific, Inc. (FSI) is a leader in oceanographic instrumentation and marine acoustic technology, holding an ISO 9001:2015 certification for its Quality Management System (QMS). It was founded in 1989 based on technology licenses from the Woods Hole Oceanographic Institution (WHOI).

FSI specializes in a portfolio of marine sensors, acoustic systems, and transducers designed to support a range of oceanographic and geophysical applications. Their product offerings include seismic, sub-bottom, and integrated sub-bottom and side-scan sonar imaging systems, such as the HMS-621/622 Chirp Sub-Bottom Profilers, available in single or dual-channel configurations for both towed and hull-mounted deployment. They also provide dual-frequency side-scan sonar systems with operational capabilities down to 2,000 meters, and the ACM-PLUS series for precision current, wave, and tide measurements in both coastal and deep-sea environments.

In addition, FSI offers acoustic relocation systems for accurate subsea positioning, as well as a broad selection of piezoelectric and electromechanical-acoustic transducers. Their transducer range includes standard models covering frequencies from 1 kHz to 500 kHz, alongside fully custom-designed transducers tailored to meet specific technical and environmental requirements.

Among FSI’s products is the AquaPulse Acoustic System. The AquaPulse system provides low-frequency acoustic pulses for sediment profiling and seismic surveys, delivering high-resolution data while being environmentally friendly. It generates a range of low-frequency pulses (70Hz – 1700Hz Plus or 20Hz – 1700Hz Plus) without the need for compressors, high-pressure air or water. The AquaPulse is suitable for water depths ranging from less than one meter to 2000 meters or more, making it effective for shallow surveys and sediment studies in various environments.

FSI operates out of a purpose-built, 10,000-square-foot facility with testing infrastructure, including an acoustic test tank, pressure chamber, environmental chamber, and calibration lab.

Norwegian Subsea

<https://norwegian-subsea.no/>



Norwegian Subsea designs and manufactures Motion Reference Units (MRUs) that deliver accurate roll, pitch, and heave measurements for use in challenging marine environments. They offer a product range including the MRU 3000,

6000, and 9000 series, scaled for use in everything from basic motion monitoring to survey-grade multibeam sonar compensation. These systems are engineered to eliminate data drift, resist environmental interference, and maintain precision over long-term deployments.

Their MRUs stand out for being calibration-free, maintenance-free, compact, and cost-effective. Built on proprietary algorithms and MEMS sensor integration, they require no external correction signals, making them ideal for offshore use where external corrections like RTK or GNSS signals

may be unavailable. The MRUs also perform with up to 0.01° accuracy in pitch and roll, even in irregular sea states.

Norwegian Subsea's MRUs were recently integrated into WASSP multibeam sonar systems to deliver RTK-level heave accuracy offshore, without RTK. This development emerged from fieldwork by Canadian shipwreck hunter Sid Hynes and is now formally adopted by WASSP as their recommended motion compensation solution.

In parallel, the updated MRU 9000, launched at Ocean Business 2025, now includes heading and velocity aiding.

In addition to Norwegian Subsea's in-house facilities, they have access to use third party test facilities. One example is the Norwegian Motion Laboratory at the University of Agder. Equipped with a Bosch Rexroth eMotion-8000 hexapod Motion reference platform with laser position measurements providing an exact truth, which allows the testing of MRUs in real sea conditions while having access to the exact reference measurements. Another example is the use of external EMC test facilities for IEC 60945 compliance tests.

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FarSounder Inc

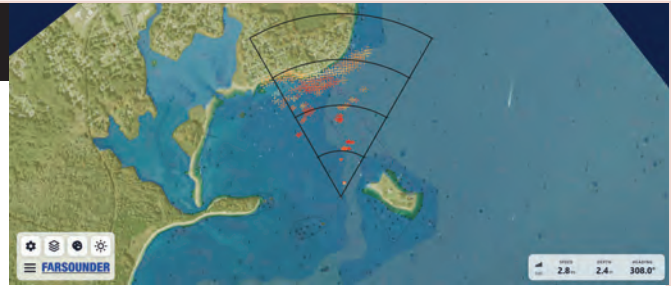
www.farsounder.com

FarSounder was founded more than two decades ago to combat whale strikes and oil spills. Knowing what is under the water ahead is critical to reducing accidents.

They develop the Argos 3D Forward Looking Sonar (FLS) systems, the only products on the market capable of generating a real-time, 3-dimensional image at navigationally significant ranges of what is under the water ahead of a vessel. These systems are operational and reliable at ranges of up to 1000 meters (1/2 nautical mile) and speeds up to 25 knots. This provides users with important information to navigate safely and avoid whales, reefs, ice, rocks, shipping containers, and more. There are 3 models, Argos 1000, Argos 500, and Argos 350. They can detect hazards 1000m, 500m, and 350m ahead, respectively.

Local History Mapping (LHM) is an Argos capability that gives users the ability to build a map of the seafloor as they sail. Since Argos has a wide horizontal field-of-view ahead of the vessel, a single pass of the sonar users can map a much wider swath of the seafloor than a standard echosounder. This data is automatically recalled when returning to a place previously mapped.

By default, each vessel's LHM lives onboard the Argos



bridge computer. However, FarSounder's data sharing program allows users to anonymously share data across the fleet. Program participants are able to back up their LHM data to FarSounder's cloud service, anonymously share it with other FarSounder customers, and receive a tide-corrected, aggregate map built from LHM contributions. Additionally, this data is shared with the global community via the IHO's crowdsourced bathymetry database and Seabed 2030.

At the heart of the next software release, FarSounder is rolling out a web app with a reimagined User Interface (UI). It features a 3D environment with aerial imagery and nautical charts, layered with Argos Sonar data. Overlays of AIS and ARPA targets are included, allowing operators to see moving and static hazards in context. For those that have SEA.AI cameras, those targets are also integrated in the new app's UI.

GeoAcoustics Ltd

www.geoacoustics.com

GeoAcoustics Ltd is a UK-based developer and manufacturer of advanced hydroacoustic systems for seafloor mapping, subsurface imaging, and seabed characterization in marine and inland water environments.

Bathymetric Sonar

- The GeoSwath 4 provides simultaneous bathymetry and side scan data with real-time quality control and ultra-wide swath coverage. Its compact transducer heads and flexible integration options make it ideal for hull or side mounting on diverse crewed and uncrewed surface vessels. The system is optimized for hydrographic surveys, port and harbor mapping, environmental monitoring, and inland waterway surveys, with AI-assisted data processing to accelerate survey-to-product timelines.

Side Scan Sonar

- GeoAcoustics offers a family of side scan sonar systems designed for high-resolution seabed imaging in both inland and offshore environments. The new GeoScan 2491 and compact GeoScan 2361 towfish systems offer dual-frequency imaging and flexible deployment options. These systems are suited to applications including marine infrastructure inspection, object detection, habitat mapping, search and recovery, and archaeological surveys.

Sub-Bottom Profiling

- For sub-seafloor characterization, the GeoPulse 2 delivers



high-resolution sediment layering and object detection in complex geological conditions with minimal acoustic footprint. The system complements the GeoPulse Compact, offering a balance of penetration and resolution for geotechnical, archaeological, pipeline route, and dredging surveys. These systems are trusted for their data clarity, rugged build, and repeatable results across offshore, nearshore, and inland settings.

GeoAcoustics received the King's Award for Enterprise in 2023 and was most recently recognized as a Medium Business of the Year at the Eastern Daily Press (EDP) Business Awards in November 2024. At Ocean Business 2025, it launched two new side scan sonar systems, GeoScan 2491 and compact GeoScan 2361.

GeoAcoustics' Great Yarmouth facility includes sonar test tanks and electronics assembly capabilities to calibration setups tailored to hydroacoustic system development. On-site resources support system integration, performance validation, and service. GeoAcoustics also has extensive subsea cable molding facilities at its HQ and another specialist facility located nearby.

Linden Photonics, Inc.

www.lindenphotonics.com

Linden Photonics, Inc. designs and manufactures rugged, compact fiber optic and hybrid cables for extreme environments for subsea, defense, aerospace, and industrial applications.

Their signature product line, STFOC (Strong, Tetherable Fiber Optic Cable), features ultra-lightweight cables with high tensile strength, utilizing Liquid Crystal Polymer (LCP) jackets for superior durability in harsh conditions. These cables are crush-resistant, water-blocking, and kink-resistant—ideal for use in ROVs, underwater communications, and tactical deployments.

Key product categories include:

- ROV (Remotely Operated Vehicle) Tether Cables – Engineered for underwater environments, these tethers deliver communications and power while withstanding pressure, corrosion, abrasion, and strain
- Buoyant Cables (Fiber/Hybrid/Copper) – Designed to float
- Hybrid Cables – Integrating fiber optics with power conductors or other elements
- Precision wound fiber optic spools for critical underwater applications – Free standing spools integrated into underwater deployable canisters. The precise winding ensures smooth payout (fast or slow), prevents cable tangling, and allows reliable deployment during time-critical operations.
- Jam-Proof Fiber Optics for Drones
- Fiber Optic Cables for Harsh Environments – Offered in both single mode and multimode formats, these cables are optimized for highspeed data transmission across long distances in harsh industrial or military setting
- Drone/Aerial Tether Cables – Lightweight, power-and-data tethers that extend drone endurance and enable continuous real-time operations; used in surveillance, infrastructure inspection, broadcasting and more



- Aerospace – RadHard low outgassing fibers, AVNOC, fiber ribbons, phase stabilized fiber
- Land-based/Defense STFOC (Strong fiber Optic Cables)

On the Endurance22 Antarctic expedition, Linden provided a single continuous 25 km fiber-optic cable (LINDEN-

SPE-7098) that transmitted the live imagery and video from the ROV exploring the shipwreck of Shackleton's Endurance under the ice.

Their manufacturing facilities are equipped with extrusion tools, precision spoolers, pressure chamber, and production labs.



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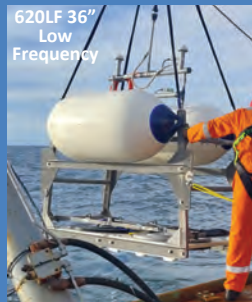
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Vanessa Blake

Takes on the Role of CEO

By Celia Konowe

This May, the UK Hydrographic Office (UKHO) appointed Vanessa Blake as its chief executive, a role she had filled on an interim basis since May 2024. Blake first joined the UKHO in 2023 as chief customer officer, drawn by how the role leveraged all her experience and skills while still presenting a new challenge.

Employing a marketing tack

“I love the variety, the passion of the people here to share our expertise and help mariners across the globe to navigate safely,” said Blake. “It’s an amazing organization, delivering a strong purpose for safe, secure and thriving oceans – and one that I am proud to work for.”

“Prior to taking up the role of chief executive, my role as chief customer officer enabled me to gain a critical understanding of how our partners and customers trust and rely on us to be a leading source of guidance and assurance, helping them to stay one step ahead in a rapidly evolving maritime landscape.”

Her career started in sales and marketing, becoming managing director for a fundraising marketing agency. “I have specialized in customer experience and transformation for the last 25 years and I have extensive experience of the commercialization of new products,” she added. “This strong commercial customer-centric

background brings a fresh perspective to the leadership of the UKHO at an exciting and important time for the organization.”

Ahead of the currents

The UKHO boasts a rich and longstanding history of providing trusted navigational charts and information for more than 230 years. To date, 90% of ships trading internationally rely on the UKHO’s ADMIRALTY products. In 2024, the UKHO received and processed 123 terabytes of bathymetric survey data, collected through partnerships with over 120 other hydrographic offices across the globe and over 250 ports in the UK and Ireland.

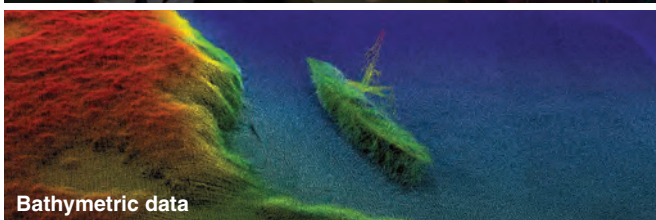
“This collective effort enables us to produce the 20,000 Electronic Navigational Charts (ENCs) that are currently in service via our ADMIRALTY Vector Chart Service (AVCS),” she said. “Distributed by a network of 100 distributors, our portfolio of ADMIRALTY products and services are used on over 80,000 vessels worldwide and around 3,000 Defence Service Delivery customers – supporting safe navigation and enhanced situational awareness.”

More data, better navigation

In particular, the UKHO is engaged in the introduction of the International Hydrographic Organization’s (IHO) forthcom-



ADMIRALTY ENC being used on board.



Bathymetric data

ing S-100 framework, which will help standardize the way maritime data is collected, shared and used.

“Building on the foundations laid by S-57 (the standard for today’s ENC), S-100 will bring together interoperable data layers including high-resolution bathymetry, surface currents, tides and more,” explained Blake. “This will provide an enhanced view of the marine environment to support more efficient and precise decision making for a range of users. That richer picture could enhance situational awareness, enable greater efficiencies and even support greener operations.”

The UKHO is currently testing S-100 data in sea trials to better understand its benefits, as well as contributing to the conversation through panel discussions and education resources.

Mapping, particularly on the seafloor, also plays a crucial role in maritime defense and subsea infrastructure. “As part of the Ministry of Defence, the UKHO plays an important role in supplying the Royal Navy and all UK defense vessels with the information needed to support its operations and navigate safely.”

To provide the most comprehensive picture of UK waters, the UKHO works closely with other government partners to promote the sharing of seabed mapping data. “This includes leading initiatives such as the UK Centre for Seabed Mapping, which brings together over 30 organizations across the public sector to share vital seabed data – from rich bathymetry to pipelines and cables. This data not only supports marine planning, resource management and environmental planning, but certainly has an important role to play in national security.”

Adapting to change

The UKHO is no stranger to rapidly evolving trends like autonomy and artificial intelligence. “Autonomous technologies are certainly poised to transform our operations – not only in how we collect and process incoming seabed mapping data, but also in how we support safe autonomous navigation in the future,” Blake said.

The UKHO, leading the IHO’s Maritime Autonomous Surface Ships (MASS) Project Team, is working alongside international partners to identify present and future navigation needs and to ensure that hydrographic data is standardized to support autonomous technologies.

“One of the most promising developments in autonomous technologies is to support safer and more sustainable data col-

ADMIRALTY ENC



XOCEAN USV at sea.



lection methods,” she said. “Our recent work with XOCEAN, a company specializing in Uncrewed Surface Vessels, demonstrated the possibilities for more efficient, less intrusive autonomous surveying methods. As part of our Civil Hydrography Programme, XOCEAN’s USVs were able to gather high-quality bathymetric data of the seafloor, all while being operated remotely by an onshore team.”

AI is also poised to transform the maritime industry in the coming years. “For the UKHO, AI presents an opportunity to modernize the way marine geospatial data is collected, processed, and delivered,” Blake explained. “By leveraging AI, the UKHO can improve the speed and accuracy of our chart production, improve the accuracy of data interpretation, and it also has the potential to enable predictive analytics for safer navigation.”

Looking ahead

Beyond adapting to evolving needs and demands, Blake recognizes the UKHO’s technology and solutions must keep up with the industry. “Through a combination of targeted investments and a collaborative approach, we have invested to stabilize and secure our technology estate,” she said. “The result has meant we have increased service availability by 37% compared to the previous year, ensuring that we deliver faster, more efficient and higher-quality products to our customers and partners.”

“We have also invested in our data-processing capabilities, improving efficiencies in how we receive and process data from ports – which are among the most dynamic maritime environments. Surveys and data received by the UKHO are now processed and published more than 50% faster than before.”

Despite rapid and often unforeseen technological developments, Blake’s mission as an agency serving industry and government is clear.

“My focus is to work alongside my colleagues in ensuring the UKHO delivers its vision to be the beacon for quality, innovative maritime navigation solutions, trusted by customers and partners worldwide. We will continue to support safe, secure and thriving oceans, while playing our critical role in delivering the defense plan to make our country secure at home and strong abroad. We remain committed to delivering value for our customers and the global hydrographic community, as a proactive and collaborative partner.”

DOWN UNDER



Australia and New Zealand are home to a range of unique subsea technologies and expertise.

Source: Greenroom Robotics

By Wendy Laursen

As an island nation, Australia has one of the largest marine jurisdictions in the world and is responsible for around 4% of the world's oceans. The nation is also home to the world's largest iron ore port, Port Hedland, and the world's largest coal port, Port of Newcastle.

Greenroom Robotics navigation system GAMA displayed on a handheld tablet.



Source: EGS Australia

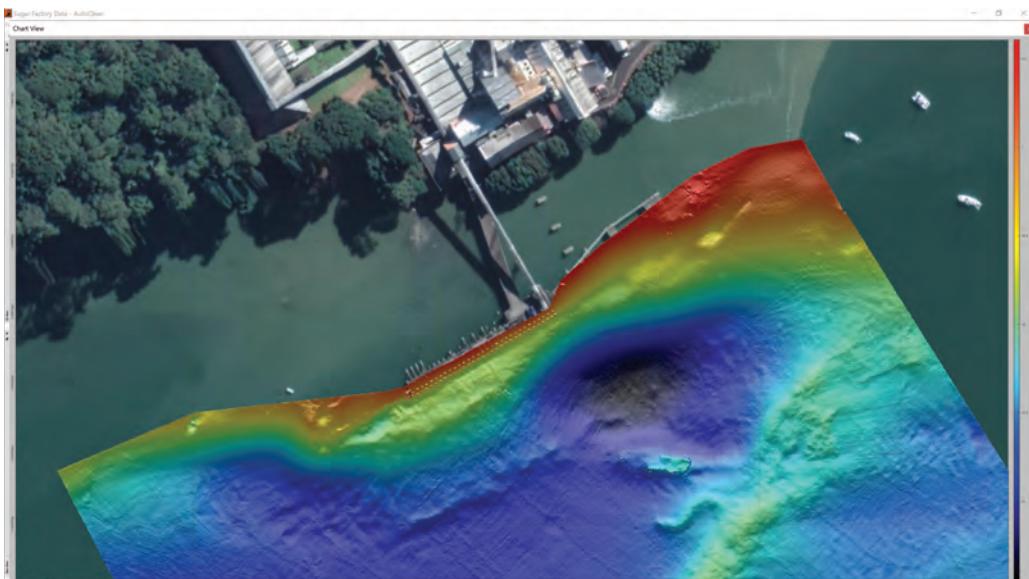
GREENROOM ROBOTICS

Hydrographic survey is very critical for a country like Australia, and we're not keeping up with the pace of demand of having key areas mapped, says Peter Baker, Director of Growth at Greenroom Robotics. The company offers a software solution for autonomous navigation that is suitable for new and existing USVs and workboats. The solution can increase utilization of these platforms by enabling them to undertake autonomous assignments.

Using small autonomous craft for hydrographic survey can improve accuracy and dramatically reduce fuel consumption, and Baker is seeing much wider acceptance and adoption of autonomous systems in Australia's maritime domain. In May, a USV developed by EGS Australia successfully completed its first major deployment offshore Western Australia, powered by Greenroom Robotics' GAMA autonomy system. Deployed 100 kilometers east of Esperance for a 42-day mission, the USV Fremantle 01 was tasked with conducting extended hydrographic survey operations in remote offshore waters. The vessel operated through rough conditions, including swells of up to 5 meters and winds exceeding 30 knots, and mapped over 1,900 km² of seabed in high resolution.

FRONTIERSI & AUSSEABED

In October 2024, Geoscience Australia committed to providing data to Seabed 2030 in support of global efforts to compile seabed mapping data into a seamless digital map of the



WASSP multibeam solutions are operating in over 40 countries.

world's ocean floor. This includes data from the AusSeabed initiative. FrontierSI's spatial development lead, Lachlan Hurst, recently received the Hydrographic Excellence Award for his involvement in AusSeabed. Hurst was pivotal in developing a quality assurance tool and a survey coordination tool which aims to get everyone who is interested in seabed data on the same page regardless of whether they are interested in bathymetric data, seabed samples, water column or backscatter data. "Sending a vessel out to capture this data is expensive, so it's absolutely critical to understand where the priority areas are, who needs the data, and what types of data need to be collected in order to maximize value," says Hurst.

WASSP

In New Zealand, WASSP Ltd offers a multibeam sonar solution that is now widely adopted in hydrographic and survey operations, offering wide swath coverage, real-time 3D seabed mapping and efficient shallow-water performance.

"WASSP multibeam solutions are operating in over 40 countries. Over the last three years, we've seen growing demand from the hydrographic sector due to WASSP's performance and price," says Haydon Webster, Regional Sales Manager, WASSP. The WASSP S3pr integrates easily with small vessels. It features

RTK GNSS positioning, sound velocity profiling and intuitive data tools, achieving survey-grade results without the complexity or expense typically associated with hydrographic systems.

Locally, Bay of Plenty Regional Council has become the sixth in New Zealand to implement WASSP technology for coastal monitoring, deploying the WASSP S3pr system for bar soundings in Whakatāne and Ōpōtiki. Previously reliant on single-beam point measurements, the council now gains full multibeam coverage producing a detailed, continuous view of the bar and surrounding seabed. Beyond bar soundings, the system will be used to monitor channels and waterways, guide the strategic placement of navigation aids and investigate reported underwater obstructions, submerged hazards, and approaches to boat ramps and landing sites.

BAY DYNAMICS NZ

New Zealand's Bay Dynamics NZ designs and manufactures custom ROVs and USVs for customers worldwide. "We started doing this custom build work in 2019 on a project for the University of Indiana, funded by the US Navy, to develop a hybrid autonomous ROV/AUV that could self-navigate and avoid in-water objects on its own," says Director and Founder Matthew Mooney. "It had a number of sonar systems onboard,

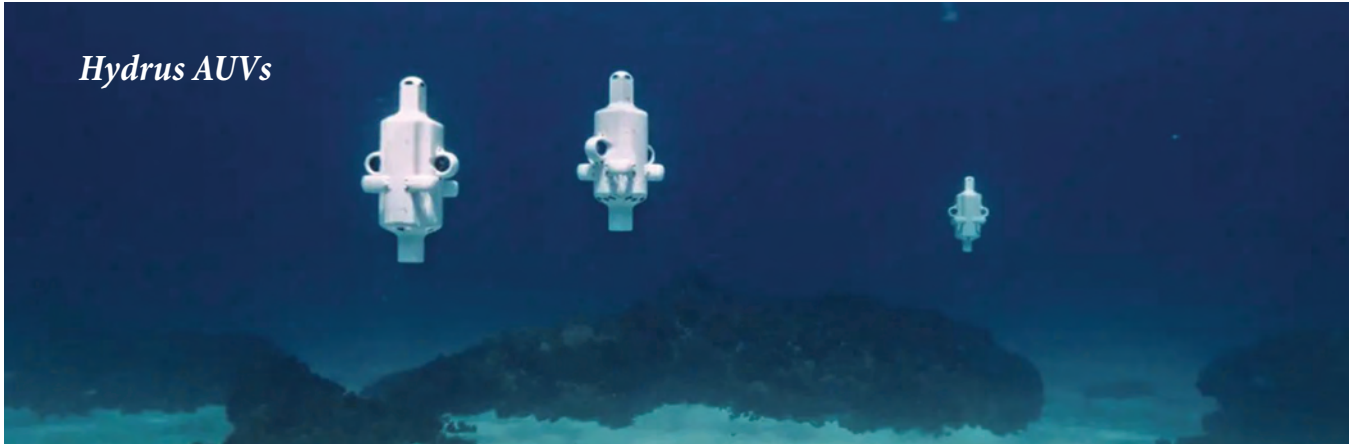


Bay Dynamics NZ designs and manufactures custom ROVs and USVs for customers worldwide.



Hydrus AUVs

Source: Advanced Navigation



and depth sensing cameras, and its own processing system that we designed and worked in collaboration with the team at Indiana University to create. It's still being used for research purposes to this day in the US."

The company is currently making a ROV for an oil and gas client which wants to use it in high flow waters off the coast of Taranaki. Its next custom ROV after that is a research ROV for the University of Waikato which will use it all over New Zealand and take it annually to Antarctica for under ice research.

"We have also been involved with defense applications in terms of USVs, and we are actively working on an open ocean monitoring and defense system that can live at sea, dynamically shift locations and submerge itself for severe weather events," says Mooney. "This creates a dynamically shifting detection system across huge areas of water. It's a blend of a USV, observation platform, with ROV tech, all mixed into one, aimed at the detection of submarines and surface vessels in the Pacific."

ADVANCED NAVIGATION & O2 MARINE

Back in Australia, a collaboration between Advanced Navigation and marine consultancy O2 Marine saw three Hydrus AUVs deployed in May to capture high-resolution, geo-referenced imagery and video of the Hall Bank reef site in Western Australia. And in June, Hydrus was deployed across shallow reefs off the coast of the Florida Keys as part of a NOAA program aimed at providing a robust picture of the condition of coral reef ecosystems in the region.

"As we look towards more deep-sea missions, we are preparing Hydrus to handle challenging environments more effectively," says Dr. Alec McGregor is a senior AI engineer at Advanced Navigation. "A key focus area is adding more on-board intelligence by integrating AI-driven navigation and adaptive survey behavior, which allows Hydrus to respond dynamically to unexpected terrains, and GNSS or acoustic signal loss. As global entities double down on underwater surveying for both commercial and scientific research purposes, we can expect AI-powered AUVs to play a vital role."



Source: Q-CTRL

Australian quantum software company Q-CTRL has demonstrated its software-ruggedized quantum sensing for navigation technology in a major field trial onboard the Royal Australian Navy's multi-role aviation training vessel, MV Sycamore.

Q-CTRL

Australian quantum software company Q-CTRL has demonstrated its software-ruggedized quantum sensing for navigation technology in a major field trial onboard the Royal Australian Navy's multi-role aviation training vessel, MV Sycamore. Quantum navigation promises a robust and reliable GPS backup that cannot be jammed or spoofed.

Quantum sensing leverages the physics of light and matter on the smallest scales to enable the detection of tiny signals. Because these devices work based on the fundamental laws of physics and are not affected by drift like other GPS alternatives, their outputs do not change over time, enabling new opportunities where long-term stability is essential.



Source: Q-CTRL

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ONE FISH, TWO FISH: AQUACULTURE TECHNOLOGIES ADAPT TO A CHANGING WORLD

Source: FiiZK



By Celia Konowe

Aquaculture plays an important role for the world, feeding billions around the planet. As the climate changes, fish stocks decrease and migrate to warmer waters, threatening species and global food security. Companies are adapting their technologies to combat these issues, including developing solutions to provide farmers with insight on fish health and welfare, encouraging sustainable farming practices, and adjusting to climate impacts.

The FiiZK Protectus



Source: FiiZK

FiiZK

FiiZK specializes in closed fish farming technology in sea, and specifically in post smolt (salmon) production facilities. They provide a complete solution for the fish farmer/operator by integrating various technologies to secure fish welfare through high quality water free from sea lice/other parasites, predators and shelter for juvenile salmon.

The FiiZK Protectus is a steel floating collar which supports a closed containment bag and a net. This gives two barriers to prevent fish escape from the facility. Water is collected from a depth of at least 25, and circulated in the system through six water inlets. The full water volume is 30,000 cubic meters and is replaced every 72 minutes.

The water circulation systems secure a good production environment free from sea lice and parasites, jellyfish, other predators. It also reduces the risk of contamination and diseases. The water is also monitored for temperature, salinity and oxygen saturation.

At the bottom of the bag is a water outlet system, where sludge and feces can be collected. The sludge is transported through the sludge handling system to another system for handling, storing and disposal.

Aquabyte

Aquabyte provides AI and camera-based decision support for fish farming of salmonides. Their system leverages AI and machine learning to deliver real-time data for fish farmers while reducing the amount of physical handling of the fish. They provide data on fish weight and growth, welfare indicators such as skin health and fin damage, and data on the behavior of the fish in the pen.



**Aquabyte
Hammerhead camera**

Aquabyte's camera-based monitoring of welfare and behavior plays a crucial role in submerged production, where it is otherwise challenging to observe the fish. A key component of Aquabyte's behavior module includes monitoring the fish's swim speed.

"Stress can be caused by poor oxygen levels, but also by intruder fish, algal blooms, or boats passing too close to the pen. With our behavior monitoring, farmers get hourly updates on swim speed," said Kristin Aase, insight manager. "Having clear insight into the fish's stress level is crucial before making decisions about delousing, population splitting, or harvest timing."

Breathing index is also an important indicator of a fish's health. "There is a clear correlation between low oxygen levels and a high breathing index. But it's when oxygen levels remain consistently high and the breathing index still increases that warning lights should go off," Aase explained. "A high breathing index in oxygen-rich water may indicate health-related issues in the fish – most likely linked to gill health. In such cases, behavior monitoring functions as a vital early warning system."

Aquabyte's technology also automatically counts sea lice, enabling farmers to better monitor levels and take preemptive measures when needed, thus reducing the total impact of lice treatments.

Their newest modules on short term planning and feeding are in development and beta-testing.

Bauta Fishfarms

Bauta Fishfarms designs and delivers closed fish farms and cages, made of steel to ensure a long lifespan, low emissions and production capacity on an industrial scale. Their design can work both for salmon and trout, primarily in Norwegian waters, but can be applied for other types of fish in other waters.

Closed fish farms eliminate salmon lice, gather waste and sludge, and increase the growth rate of the fish. On an indus-

trial scale, this could have significant impacts for the industry. They reduce environmental impact, lower fish mortality, and open new value chains with the waste.

"At the same time, it prepares the industry for growth," explained Gjermund Kvernmo Langset, general manager. "The world is in large demand for proteins, produced in a sustainable way. Seafood and fish is a big part of that solution, and we will make it possible." Bauta Fishfarms has significant building capacity in Norway, but their design can be built around the world.

Bauta Fishfarms' technology could also fill a critical niche as aquaculture faces the realities of warming waters. "We collect water from larger depths, where the temperature is lower than on the surface. This opens new waters for fish farming, and can secure production even in times with changing water temperatures due to climate change," said Langset.



VARIG closed cage system.

Source: Bauta Fishfarms

FP AQUA

FP AQUA develops underwater monitoring technologies for the aquaculture industry, focusing on tools that provide fish farmers with real-time insight into biological risks for aquaculture, such as harmful jellyfish and phytoplankton. Combining imaging hardware with AI-driven analytics allows for the potential to strengthen fish health, reduce risk, and improve sustainability in aquaculture operations by giving farmers time to act before damage occurs.

Their technology is an underwater microscope with integrated AI designed to detect jellyfish and phytoplankton in aquaculture facilities. Certain jellyfish species can pose significant threats to farmed fish.

Unlike traditional monitoring tools, which rely on manual water quality sampling, their system can capture high-resolution images of microscopic organisms directly in the marine environment, before they attach or go near the fish. AI then analyzes these images in real time, detecting the presence of jellyfish and even distinguishing between species.

“Designing a microscope for depths of up to 200 meters meant tackling saltwater corrosion, pressure and biofouling,” explains Knud Poulsen, FP AQUA’s technical lead. “We solved this with marine-grade aluminum housing, quartz glass windows, and integrated UV-C illumination, a germicidal wavelength that stops microorganisms from attaching to the glass. This keeps the optics clear and extends deployment time.”

While FP AQUA’s current focus is on the Atlantic salmon sector, potential for the technology ranges. Beyond farm management, it could contribute to the broader monitoring of Norway’s coastal waters. From a regulatory perspective, the system may one day provide continuous documentation of events such as sea lice escapes from aquaculture sites, while for re-

search, it could generate long-term datasets on phytoplankton dynamics and biodiversity in Norwegian coastal waters.

“The images we analyze daily for AI training reveal far more than just harmful species of interest,” says Zandra Maria Skandrup Sigvardt, lead biologist at FP Aqua. “We also detect a wide variety of other taxa, including crustaceans, echinoderms, polychaetes, and marine snails. These findings could provide valuable insights into ocean health, biodiversity, and long-term ecosystem monitoring.”

FP AQUA’s technology is currently being piloted with leading salmon farmers.

Ace Aquatec

Ace Aquatec focuses on creating welfare-first products to make fish farming and marine industries more efficient and sustainable, backed by blue growth fund Aqua-Spark, Chroma Ventures, deep tech fund Earth Capital, Stolt Ventures and Scottish Enterprise.

Ace Aquatec’s A-BIOMASS is an underwater AI camera that transforms the way farmers monitor their fish. With millimeter accuracy, it provides real-time insights into fish biomass measurements and distribution in a pen, and individual fish status and performance, avoiding the need for handling or manual intervention which can cause stress.

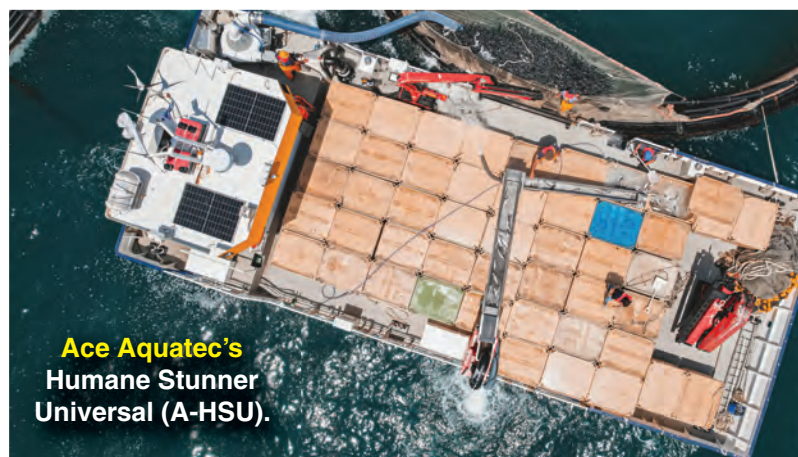
Using stereoscopic imaging and advanced machine learning, the A-BIOMASS can record tens of thousands of fish measurements daily, giving farmers access to precise, high-volume, quality data which helps optimize feed conversion, grading regimes and growth rates.

It also helps farms effectively monitor fish welfare, prevent mortalities, and provide transparency and traceability throughout the fish lifecycle. Developed for the harshest environments, the marine grade system is lightweight at 8.5kg and easy to deploy.

Ace Aquatec’s Humane Stunner Universal (A-HSU) delivers a rapid, humane, stress-free and safe method of fish stunning, ensuring compliance with the highest welfare standards set by regulators and retailers.



Photo by Callum Stewart on Unsplash.



Source: Ace Aquatec

The system works by gently pumping fish into the unit, where they are briefly dewatered before entering the electrified stun tube. Inside, 100% of fish, regardless of size, are stunned within one second, minimizing handling and stress before slaughter.

Designed for versatility, the A-HSU is compatible with a wide range of species including salmon, trout, cod, yellowtail, sea bass, sea bream, and shrimp. It can be installed in processing facilities, RAS farms, and even on vessels or rafts for dead haul.

Ace Aquatec recently collaborated with Filosofish, one of Greece's leading fish farming companies and the second biggest Greek producer of Mediterranean fish. Filosofish wanted to uphold the highest fish welfare standards and to provide an easier harvesting process for its staff. The producer's goal was to invest in the future of fish farming and to transform their boats into harvesting vessels.

Ace Aquatec installed the A-HSU on Filosofish boats. The first was fitted to an existing boat in Rhodes, which was repurposed to accommodate the equipment. The second stunning system was incorporated into a new boat that was built, designed, and constructed by Stamatiou Aquaculture in collaboration with Ace Aquatec.

After installation, fish appeared to have less skin damage and the system seems to have increased the fish quality and freshness. The producer also highlighted the easy installation and maintenance of the system.

Innovasea

Innovasea designs aquatic solutions for fish farming. Within the aquaculture division, they focus on creating full end-to-end solutions that deliver real-time visibility into all farm aspects.

Innovasea's aquaMeasure solution offers real-time updates for instant visibility into changing water conditions. Leveraging this setup, farms gain a solution to track conditions impacting fish health and growth, including temperature, dissolved oxygen (DO) levels, salinity, and turbidity.

The data is then sent to their cloud-based aquaculture platform, Realfish Pro, where it can be viewed in real-time.

Innovasea's AI-powered biomass solution automates the sampling process using the BiomassPro camera, which is wireless and battery operated, and uses stereoscopic imaging with AI to estimate the size and weight of fish stocks. Today, Innovasea offers biomass algorithms for seven species: Atlantic salmon (*Salmo salar*), cobia (*Rachycentron canadum*), European sea bass (*Dicentrarchus labrax*), gilthead seabream (*Sparus aurata*), king salmon (*Oncorhynchus tshawytscha*), red snapper (*Lutjanus peru*), and yellowtail (*Seriola rivoliana*).

Innovasea collaborated with New Zealand King Salmon, the largest producer of farmed King Salmon – supplying over 50% of the world's species. New Zealand King Salmon routinely tracks fish growth to meet critical production benchmarks in advance of each harvest. Doing so requires meticulously tracking their different strategies of fish across numerous sites.

Previously, New Zealand King Salmon relied on a hard-wired biomass camera technology. Using Innovasea's BiomassPro camera resulted in:

- Precise forecasting: 97% biomass accuracy allowed New Zealand King Salmon to track progress and streamline logistics.
- Improved efficiency: The lightweight, battery-operated camera autonomously monitors fish growth and can be moved quickly from pen to pen with no requirement for hard-wired deployment in the marine environment.
- Optimized production: Improved data collection and processing makes it easy to track performance and address areas of concern
- Faster data collection: Automatic data collection and biomass analysis allows the team to set up and collect data in just 15 minutes each day.

As waters warm and food security needs evolve, aquaculture companies are well placed to be at the forefront of technological advances. Solutions to better support the welfare of fish, broaden farming scope, and adjust to a shifting climate are necessary to feed the world in a sustainable and humane way.



Source: Ace Aquatec



Source: Innovasea



Innovasea's aquaMeasure sensors (above) & BiomassPro camera aquaMeasure sensors (left).



SUBSEA COMPRESSION AND THE ORMEN LANGE MOON LANDING

Source: Shell

The inauguration of a world-record subsea compression system in Norway in August 2025 marked a pioneering leap in engineering. Yet according to OneSubsea CEO Mads Hjelmeland and Project Director at Shell, Richard Crichton, its success hinged on one key ingredient: the close collaboration between operator Shell and the delivery alliance of OneSubsea, Subsea7, and Aker Solutions.

By Josefine Spiro

When we carried out the final commissioning, it only took us 20 days from starting the compressors until we reached full power, which is quite extraordinary.

– Richard Crichton,
Project Director at Ormen
Lange, Shell



Source: Shell

This collaborative culture was put to its ultimate test in early 2023, at a test facility on Horsøy, an island outside Bergen. Here, the engineering team gathered for the first full-power run of the Ormen Lange Phase 3 subsea compression system. It was a pivotal moment in the multi-billion-dollar project, the culmination of five years of intensive work since the contract was awarded in October 2019. A massive 800-tonne compression station, submerged in a test pit, were connected to a simulator designed to mimic the 120-kilometer distance from the onshore gas plant at Nyhamna.

“The tension level in the room was quite high as we prepared to press the button for the first time. When we did and nothing happened, the anxiety rose even more,” said Mads Hjelmeland, CEO of OneSubsea.

That tense moment became emblematic of the Ormen Lange Phase 3 project. The resolution — diagnosing and fixing a software bug — was a testament not just to world-record engineering, but to a collaborative culture that Hjelmeland believes was essential to the project’s outcome. The groundwork laid during that onshore test led to a remarkably smooth startup offshore, a success echoed by Shell’s Project Director at the Ormen Lange Phase 3 project, Richard Crichton. “When we carried out the final commissioning, it only took us 20 days from starting the compressors until we reached full power, which is quite extraordinary,” he said.

THE INEVITABLE CHALLENGE

The Ormen Lange field, Norway’s second-largest gas field, has been a cornerstone of Europe’s energy supply for over two

decades. After years of production, however, the natural reservoir pressure was steadily declining, making it increasingly difficult to recover the remaining gas volumes. This presented Shell, OneSubsea and their partners with a significant challenge: how to maximize recovery and extend the life of a critical deepwater asset.

The mandate from the Norwegian government was established in the early 2000s, reflecting a forward-thinking approach to resource management. When the field’s initial Plan for Development and Operation was approved, it included a specific condition that the operator must do everything possible to maximize recovery. “Subsea compression was set as a requirement when the time was ripe,” Hjelmeland said. When that time came, two main concepts were evaluated: a conventional floating platform and an advanced subsea compression system. After rigorous assessments, Shell and its partners concluded that the subsea option was superior, promising a higher recovery rate, greater energy efficiency, and a more favorable investment cost.

CRACKING THE “IMPOSSIBLE” NUT

The project’s defining technical challenge was the 120-km step-out distance, which set a new world record for power transmission to a subsea compression system. “The longest distance we had delivered on similar systems before was around 35 kilometers,” Hjelmeland said, adding that there was considerable skepticism from some within the industry during the early verification phase. “There were people at the time who said this was not possible,” he recalled.

I believe a large part of the success was because we managed to break down the barriers in the commercial framework and share information openly, ... I don't think we would have succeeded without this collaboration.

– Mads Hjelmeland, CEO, OneSubsea



Source: OneSubsea

The technical crux was the power and control umbilical and the placement of the variable frequency drive (VFD) 120 kilometers away from the motor and its controls. To de-risk this, the alliance built a full-scale simulator of the umbilical and connected it to the actual subsea system for extensive on-shore testing. “This is a unique capability that gives us the confidence to tell our partners that even if the technology is new, we can verify it together,” Hjelmeland said. It was this achievement that he described as the project’s “moon landing” moment—proving the impossible was, in fact, possible.

While the technology was groundbreaking, Hjelmeland emphasized that the project’s success was equally dependent on its collaborative framework. Facing unforeseen challenges like the COVID-19 pandemic and geopolitical turmoil, the alliance between OneSubsea, Shell, Subsea7, and Aker Solutions functioned as a single, integrated team.

“What I really want to emphasize is the ‘soft’ side of the collaboration,” Hjelmeland stated. From the outset, the partners established a clear platform for how they would work together, moving beyond a traditional client-contractor relationship.

A key tool introduced by Shell was the “learner mindset”.

“As things emerge or incidents occur, we take a step back and learn from these events. That is the essence of the entire collaboration,” explained Shell’s Project Director, Richard Crichton, who championed the philosophy. He said the goal was to build such a high level of trust that the lines between companies would blur into a true ‘one team’ approach. “In the end, you can’t tell if someone works for Shell or for OneSubsea,” Crichton stated. “That’s when you get real collaboration.”

Underpinning this was a foundation of psychological safety—the assurance that team members could report bad news

unfiltered, without fear of blame. “A ‘blame game’ about why something didn’t work would simply not have worked,” Crichton noted. This sentiment was shared by Hjelmeland. “I believe a large part of the success was because we managed to break down the barriers in the commercial framework and share information openly,” he asserted. “I don’t think we would have succeeded without this collaboration”.

From the tense moment of the initial failed test at Horsøy, the project culminated in a seamless inauguration on August 26, 2025. This success established several new industry benchmarks. It’s the world’s first subsea processing project that completely removes the need to build and maintain a platform, a true subsea-to-beach solution. Moreover, its 120-kilometer step-out distance from shore sets a new world record for power transmission to a subsea compression system. By providing compression energy close to the reservoir, the technology increases the recovery rate in Norway’s second-largest gas field from 75% to a world-class 85%. This unlocks an additional 30 to 50 billion cubic meters of gas, which is enough to power all households in a city the size of Barcelona, and could generate up to 70 billion NOK in additional revenue for the Norwegian state.

Powered by Norwegian hydropower and processed in a closed system, the facility also has one of the lowest carbon footprints per unit of energy in the world. The legacy of Ormen Lange Phase 3 is a proven toolkit that is now replicable globally.

“The first lesson is technology,” Hjelmeland concluded. “Subsea processing has enormous value. The second is the new way of working—in partnership, with a learner mindset. Taking this lesson with us, together with our technology portfolio, makes the future very exciting”.

2026

Editorial Calendar

01 | Jan/Feb 2026
Ad close Jan 31

Underwater Vehicle Annual

- Research Vessel Fleet & Technology
- Subsea Defense
- Autonomous Navigation
- Battery Technology

Event Distribution

Oceanology International London – London, UK
Subsea Expo 2026 – Aberdeen, Scotland
IPF 2026 – New York, NY
IADC/SPE Intl Drilling Conf & Exhibition – Galveston, TX

DEEP DIVE

PODCAST: Underwater Vehicle Tech

02 | February 2026
Ad close Feb 4

Oceanographic

e-Magazine Edition

Tech Focus: Sonar, Telemetry & Data
Processing Software

DEEP DIVE

PODCAST: Digitalization

03 | Mar/Apr 2026
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Oceanographic Instrumentation & Sensors

- Port Security
- Offshore Energy
- Seismic & Geotechnical Surveys
- Workclass ROVs: IMR

Event Distribution

Port of the Future 2026 – Hilton University of Houston
OTC 2026 – Houston, TX
UDT 2026 – Excel, London
Sea-Air-Space – National Harbor, MD, USA
Wind Europe 2026 – Madrid
Japan Energy Summit & Exhibition – Tokyo Big

DEEP DIVE

PODCAST: Subsea Survey Technology

05 | May/Jun 2026
Ad close May 21

Dredging Technology

- Universities Review
- Hydrographic Survey
- Scientific Deck Machinery
- Cables & Connectors

Event Distribution

Underwater Technology Conference – Norway
WEDA Dredging Congress & Exhibition – Montreal, Canada

DEEP DIVE

PODCAST: Dredging Technology

07 | Jul/Aug 2026
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Autonomous Vehicle Operations

- Underwater Tools & Manipulators
- GPS, Gyro Compasses & MEMS Motion Tracking
- Deck Machinery & Cranes
- Battery Technology

Event Distribution Oceans 2026

DEEP DIVE

PODCAST: Subsea Defense

08 | August 2026
Ad close Aug 4

Hydrographic

e-Magazine Edition

Tech Focus: Underwater Communications

DEEP DIVE

PODCAST: Research Vessels

09 | Sep/Oct 2026
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21st Annual MTR 100

Focus on 100 Leading Companies, People
and Innovations in the Subsea Space

DEEP DIVE

PODCAST: Inside NOAA

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Ocean Observation: Gliders, Buoys, & Sub- Surface Networks

- Instrumentation: Profilers, Samplers & Sediment Corer
- Subsea Defense: The U.S. Navy
- Subsea: Electrification
- Cameras & Multibeam Sonar

Event Distribution

Underwater Intervention – New Orleans, LA

DEEP DIVE

PODCAST: Ocean Observation

12 | December 2026
Ad close Dec 4

Subsea Vehicles

e-Magazine Edition

Tech Focus: Underwater Imaging: Lights

DEEP DIVE

PODCAST: Subsea Vehicle Technology

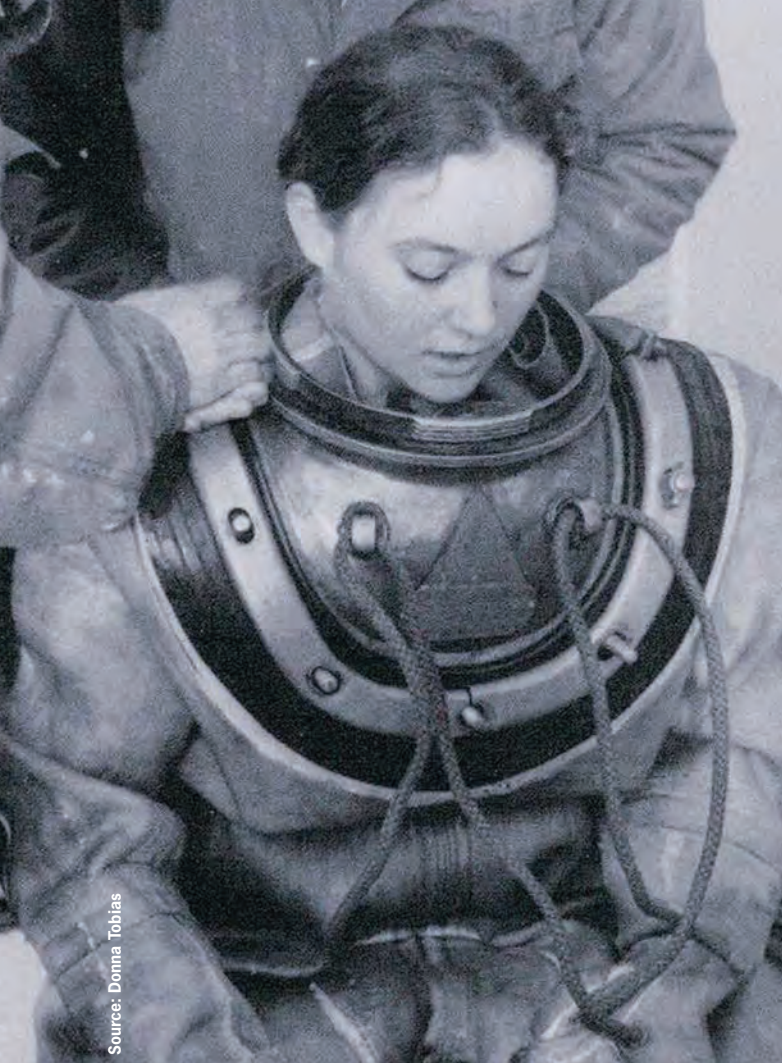


Source: US Navy/Released

Advancing Opportunity in Tandem with Technology

*By Captain Bobbie Scolley, U.S. Navy (ret.) and
Rear Admiral Tim Gallaudet, U.S. Navy (ret.)*

Image above: Commander Bobbie Scholley and Captain Chris Murray in Mk 21 with DUI hot water suits in preparations to dive to 240 fsw during MONITOR Expedition 2001.



Source: Donna Tobias

Hull Technician Firemen **Donna Tobias**, the first woman to achieve the status of US Navy Deep Sea Diver, in the 200-pound Mk V diving suit in air configuration on March 1975. At 5'5" and 135 pounds, she acknowledged that her most persistent challenge was working with the Mk V diving rig.

For more than six decades, spanning from 1905 to the late 1970s, the U.S. Navy's diving apparatus for deep ocean operations and salvage remained fundamentally unchanged. During this period, the demographic of navy divers also saw little alteration. However, beginning in the mid-1970s and continuing to the present day, a series of developments initiated a gradual transformation in both areas with significant implications for contemporary Navy diving.

Donna Tobias, standing at 5'5" and weighing 135 pounds, became the first woman to achieve the status of US Navy Deep Sea Diver upon her graduation from Second Class Dive School in Little Creek, VA, on March 14, 1975. She acknowledged that her most persistent challenge was working with the Mk V diving rig, the standard hard-hat apparatus introduced in 1905, itself derived from the Siebe-Gorman Davis Six-Bolt Admiralty Pattern helmet used by the British Navy. The Mk V air dive helmet and suit weighed approximately 200 pounds,



Source: Sue Trukken

Ensign **Sue Trukken**, the first woman to attend diving officer training at the Washington Navy Yard in 1980, fully suited out in the 200-pound Mk V dive helmet and suit during training dives at Basic Diving Officer training, Washington Navy Yard in 1980.

with the mixed gas version being roughly 100 pounds heavier. For early women divers such as Tobias, the substantial weight of the equipment, often exceeding their own body weight, posed considerable difficulty. Furthermore, the equipment's design failed to accommodate female physiques, resulting in issues such as uneven weight distribution and compromised watertight seals. Nevertheless, pioneers like Tobias and those who followed persevered, contributing significantly to the successful integration of women within Navy diving ranks over the past fifty years.

Sue Trukken, the first woman to attend diving officer training at the Washington Navy Yard in 1980, described how she and her team frequently modified Mk V suits onsite to ensure safety and effectiveness. At 5'2" and 125 pounds, Trukken needed to improvise solutions such as wearing tennis shoes and padded socks inside oversized boots and sewing towels into her t-shirt to add 2 additional inches under the breast plate



Source: Mary Bonnin

Enginemen First Class **Mary Bonnin** dressing in the 300-pound Mk V diving suit during First Class Dive school at Naval Diving and Salvage Training Center, Panama City, FL in 1980.



Source: Deb Bodenstedt

Ensign Deb Bodenstedt in the Mk 12 dive helmet with full dive dress during training at Basic Diving Officer training, Naval Diving and Salvage Training Center, Panama City, FL in 1983.

Lieutenant Karin Lynn preparing to don the Mk 12 dive helmet in the swimmer's mode with a harness during training at Basic Diving Officer training, Naval Diving and Salvage Training Center, Panama City FL in 1983.



Source: Karin Lynn

so that she could raise her arms. Further solutions included choosing the most flexible older suits that more easily folded to adjust to her shorter stature and allowed for triple strapping her wrist to keep her gear—an experience later generations would miss due to its decommissioning after 1983.

By 1981, the Navy had replaced the Mk V with the newly developed Mk 12 lightweight free-flow fiberglass dive helmet. This unit could be configured for swimmer or full suit modes and supported both air and mixed gas applications, bringing the combined gear weight down to approximately



Navy Diver Chief Petty Officer (retired) **Becky Jones** prepared to make a dive in the Mk 21 helmet with a wet suit garment.

120 pounds. While lighter, the Mk 12 still presented ergonomic and fit challenges for many women divers, requiring similar onsite modifications. A unique feature to the helmet was the nose clearing rod across the front of the helmet which was especially difficult to reach for divers with smaller heads and shorter necks. Having a hard time clearing using this bar in the Mk12 at Naval Diving and Salvage Training Center at Panama City, FL in 1991, Caren Gallaudet (nee Ritter) was helped by an instructor. He suggested she use her upper lip to help clear. "Put your upper lip around the clearing bar, then jam your nose down on your lip and blow out as hard as you can!" This simple change allowed her to make an on-site adjustment to the helmet technology which would ultimately be upgraded in the MK-21.

The introduction of the Kirby Morgan Mk 21 in 1993 marked notable progress. Adapted from the Superlite 17B used in commercial diving, the Mk 21 included an internal demand regulator and an adjustable oronasal mask, addressing many previous fit issues. Its inner liner allowed customization for various head sizes, significantly improving overall comfort and security.

The Mk 21 further featured a horse collar neck ring sealed by a neoprene neck dam. While generally effective, it could become less reliable if overstretched from prior use by larger divers. The flexibility to pair the helmet with a variety of garments, such as a simple harness, wet suit, or coveralls, as well as using a Diving Unlimited International (DUI) hot water suits during deep dives, improved adaptability. Nevertheless, sizing challenges persisted with the navy's use of the DUI



Chief Navy Diver **Melissa Nguyen-Alarcon**, assigned to Mobile Diving and Salvage Unit One, prepares to dive in the KM 37 NS during a joint dive-and-salvage exercise with the Republic of Korea divers at Chinhae Naval Base, May 30, 2023.

hotwater suit during deepwater dives, particularly with those designed for male proportions. Nonetheless, incremental advances were evident, such as a wider range of boot sizes compared to earlier models.

In 2007, the Navy adopted the KM 37 NS helmet, another Kirby Morgan design building upon the Mk 21 with enhancements including a neck ring/neck dam system that provided a more secure seal and increased wearer comfort, alongside improvements to the inner liner. The acquisition process is now underway for the latest KM 97 helmets.

Over the last 50 years, continual improvements to the Navy's deep-sea diving helmets and suits have benefited not only women divers but all personnel, enhancing operational safety and mission effectiveness. Importantly, ensuring proper fit and function of equipment has supported the long-term health and well-being of service members, potentially reducing healthcare and disability costs among veterans. These factors underscore the importance of leveraging technological advancements to optimize equipment design for all military personnel.

This year is the 50th Anniversary of Women Navy Divers. We are celebrating the milestone at the Diving Equipment and Marketing (DEMA) Show, Nov. 11-13, 2025, in Orlando, FL, including a reunion dinner on Nov. 13 at Ole Red restaurant. We cordially invite all veteran, retired, and active-duty women Navy divers to attend, as well as their families, friends, and supporters. For more information, please visit our website at **AWND.net**. HooYah DeepSea!



MacArtney Underwater Technology Group

www.macartney.com

MacArtney Group is a privately owned global market leader known for solutions for the marine and offshore, ocean science, and naval industries.

They specialize in the design, manufacture, sales and service of various products and system solutions from sub-sea cables and connectors to integrated packages, including fibre optic telemetry, underwater cameras and lights, oceanographic instruments, and remotely operated, towed vehicles. Also included in their offerings are project management, global after-sales and service, workshop facilities, molding, production and test capabilities.

MacArtney Group has recently appointed Håkan Sundin to lead their Sweden office. This appointment reinforces the company's dedication to local engagement and collaboration with Swedish customers. They also expanded their global footprint with a hub in the UAE, serving a growing customer base in the MENA region.

They have also launched the newest SubConn Micro Circular series member: the 9-contact connector, designed to minimize signal interference and ensure optimal data accuracy.

The new LUXUS camera introduces IP capabilities, enabling direct network connection for remote viewing and management. This feature enhances versatility, simplifies integration into various systems, and improves usability in diverse underwater applications.

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The Eyes and Ears of Our Warfighters at Sea

Massa Products Corporation designs, engineers, and manufactures SONAR and ultrasonic sensing technologies, serving both the defense and commercial markets for over 80 years.

Currently, they provide about 60% of the SONAR technologies for the US naval submarines in addition to our full line of commercial oceanographic and industrial ultrasonic sensing technologies.

Massa's portfolio includes solutions for both underwater and in-air applications such as low-frequency/high-power SONAR, mid-frequency SONAR, passive and active arrays, navigational sensors, sub-bottom profilers, acoustic communications, level-sensing, proximity detection, and more.

Massa's facility is ISO 9001:2015 certified, and the company is currently cleared Secret (in the process of upgrading to Top Secret). The Massa plant contains an engineering laboratory, manufacturing facilities, an engineering model shop, a growing rubber vulcanizing and plastic molding facilities, a growing model machine shop and production machine shop, a clean/humidity controlled area, hydrostatic pressure testing facilities, and an underwater acoustic test facility.

JW Fishers Manufacturing

www.jwfishers.com



JW Fishers Manufacturing specializes in the design and manufacture of high-performance underwater search equipment. With over five decades of innovation, JW Fishers offers a comprehensive product line including underwater metal detectors, boat-towed detectors, side scan sonar, scanning sonar, magnetometers, remotely operated vehicles (ROVs), underwater video systems, acoustic pingers, and transponders.

JW Fishers' products are used worldwide by police dive teams, fire departments, commercial diving companies, marine archaeologists, and the military. Their tools have helped locate everything from buried pipelines and sunken vessels to criminal evidence and lost treasures. The company has been featured in Hollywood movies and on popular media like *The Curse of Oak Island*.

Their flagship product, the Pulse 8X underwater metal detector, has earned a #1 rating from the U.S. Department of Homeland Security.

The latest product, the SeaLion-3 ROV, is ideal for inspections, search operations, and video documentation. It has twice

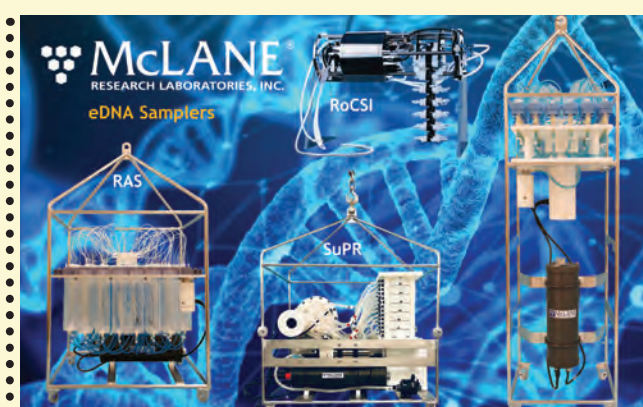
as many thrusters for horizontal movement and is twice as powerful as its predecessor. The four vectored thrusters allow horizontal motion in any direction and the ability to rotate in place. Vertical power is also increased, with three thrusters for diving and lifting. The unique vertical thruster placement provides the ability to adjust the pitch and trim of the ROV. The SeaLion-3 is depth rated to 1000' with the option of up to 1500' of tether.

The SeaLion-3 has 2 two full HD video cameras and recording capability. The new topside console has 2 monitors for viewing and controlling the ROV. The top viewing monitor is a large 15.1" screen that uses picture-in-picture functionality.

In the sonar category, JW Fishers manufactures side scan sonar systems for detailed seabed imaging, the SCAN-650 sector scanning sonar for locating submerged targets in zero visibility, and the SBP-1 sub-bottom profiler to detect buried objects and map geological layers beneath the seafloor.

For magnetic detection, the Proton 5 magnetometer is used to locate ferrous metals such as anchors, pipelines, or shipwrecks.

Additional tools include acoustic pingers, transponders, and a CT-1 cable tracker, rounding out the equipment portfolio.



McLane Research Laboratories

www.mclanelabs.com

McLane Research Laboratories is a long-time leader in time-series in-situ oceanographic samplers and profilers.

McLane Research Laboratories' product lines include a range of bio-geochemical/physical oceanography sampling and profiling instruments for use in oceanographic research, HABS detection, and environmental monitoring.

For more than a decade, McLane has been manufacturing environmental DNA (eDNA) instruments that collect multiple in-situ samples. McLane offers four lines of deep-rated eDNA samplers, all with preservation capabilities, and a range of sample capacities to suit various research needs including collecting

genetic material, fine particulates and material for biosecurity monitoring. Their eDNA, particle and multi sample instruments range in volume, with depths of 5000 to 6000 meters.

In addition, McLane maintains a line of samplers such as the Imaging FlowCytobot (IFCB) as well as their flagship product, the Sediment Trap, and a line of wire crawling profilers.

McLane instruments are all designed to withstand the rigors of long-term time-series open ocean and freshwater deployments. McLane products are central to many long-term global research projects and cruises including such initiatives as OOI, GEOTRACES, and the RAPID array.

McLane's most recent instrument is the Suspended Particulate Rosette Sampler (SuPR), a high-volume time-series sampler that autonomously collects 14 water samples onto 142 mm membrane filters. A technology transfer from Woods Hole Oceanographic Institution (WHOI), SuPR provides high volume capacity of 1000-2000 Liters per sample and flow rates between 2000-6000 mL/min. The dynamic pump speed algorithm adjusts to protect the sample as material accumulates on the filter.

McLane operates from a fully equipped manufacturing facility designed to support the complete lifecycle of oceanographic instrumentation from concept and prototyping to manufacturing, testing, and service. Their space includes a 50ft deep water filled test tank, precision machining and fabrication areas, dedicated electronics and assembly areas, and specialized pressure testing equipment.



Kraken Robotics

www.krakenrobotics.com

Kraken Robotics, Inc. offer 3D imaging sensors, power solutions, and robotic systems, providing critical insights into ocean safety, infrastructure, and geology. Their pressure tolerant batteries deliver high energy density power for UUVs and subsea energy storage.

Their products include:

- **Kraken Synthetic Aperture Sonar (SAS):** Kraken Synthetic Aperture Sonar (SAS) is a technology evolution, integrating the capability to perform imaging and bathymetric mapping simultaneously

- **KATFISH Towed SAS System:** Kraken's KATFISH high speed, actively stabilized synthetic aperture sonar towfish operates at speeds up to 10 knots providing increased area coverage rates.

- **SeaPower Pressure Tolerant Subsea Batteries:** Kraken's SeaPower has the highest energy density on the market for subsea batteries.

Their services include:

- **Subsea LiDAR Solutions:** Kraken's LiDAR solutions deliver millimeter-resolution metrologies, enabling informed decision-making on underwater assets and infrastructure.

- **Sub-Bottom Imaging:** Kraken's Sub-Bottom Imager delivers 3D data, providing a clear understanding of subsea stratigraphy, undersea infrastructure, and hazards.

- **Acoustic Coring:** Kraken's Acoustic Corer delivers a 3D acoustic core with a 14 m diameter and depths exceeding 50 m.

- **Towed SAS Survey:** Kraken's KATFISH towed SAS surveys acquire higher quality, wider swaths of data at faster speeds than towed sidescan sonar.

In March 2025, Kraken completed a \$17 million acquisition of 3D at Depth inc., a U.S based subsea LiDAR imaging company. It greatly expands Kraken's offerings by integrating LiDAR with its sonar and sub-bottom tech, supporting growth into new U.S markets.

In February 2025, Kraken announced \$34 million in SeaPower battery orders and a new 60,000 sq ft Nova Scotia facility to support increased defense demand. Operational by late 2025, it will triple capacity and support 200+ new jobs.

In April 2025, Kraken announced the launch of a high-resolution KATFISH towed SAS service for the global offshore energy market, expanding its portfolio to deliver unmatched value to energy clients worldwide.



NORTEK

www.nortekgroup.com

Nortek designs, develops and produces acoustic underwater sensors that are used to measure motion in the marine environment. Our ocean technology is used in many applications, from understanding climate change impacts to providing navigation assistance for underwater vehicles. For example, engineers use our sensors to conduct offshore operations, including construction, maintenance and surveying; underwater robotics developers use our sensors to provide new solutions that aim to increase safety and efficiency of these operations; and scientists use our sensors to learn more about our marine environment and discover the unexplored depths of our oceans.

Nortek's Acoustic Doppler Current Profilers (ADCPs), which measure currents, waves, turbulence and other oceanographic phenomena, range from shallow-water short-range sensors to deep-water instruments which can collect current profiles over a distance of up to 1000 m.

Doppler Velocity Logs (DVLs), navigational aids to subsea and surface vehicles, provide vehicle velocity information relative to the sea floor as part of a navigation system. Because GPS and other traditional navigation systems can't function underwater, velocity information from DVLs is essential for reliable navigation of subsea vehicles.

Nortek recently launched the Generation 2 version of the Vector velocimeter, an advanced turbulence measurement tool. The Generation 2 Vector builds on the capabilities of Nortek's original Vector velocimeter, using acoustic technology to detect very small changes in water velocity. With a sampling rate of 64 Hz, new features including a short-range echosounder, and modern electronics and capabilities improving per-ping precision and power consumption, the Generation 2 Vector makes high-resolution current measurements possible in a wide range of environments and deployment setups. Its small form factor enables flexibility in both field deployments and in large flumes.

Nortek's headquarters in Norway are home to a production facility, and every Nortek instrument is created and tested fully in-house. Nortek also has ten other offices spread across five continents.

Surflin Coastal Intelligence

www.surflincoastalintelligence.com

Surflin Coastal Intelligence delivers a suite of coastal monitoring solutions built on the foundation of Surflin's global network of more than 1,200 coastal cameras. By combining computer vision, AI, and advanced modeling, SCI transforms conventional video feeds into actionable datasets that help municipalities, coastal engineers, and public safety agencies better understand, manage, and protect their coastlines.

Conventional coastal monitoring often requires in-person field surveys, expensive hardware, and operationally burdensome deployments. As a result, many solutions have struggled to scale, leaving critical gaps in how we measure and understand our coastlines. With a single CCTV camera, coastal engineers and municipalities can access continuous data at 1Hz—capturing shoreline change, nearshore bathymetry, wave climatology, vessel traffic, beach and ocean participation and more. The system is fully self-rectifying, requiring zero in-person field work to calibrate, and delivers these insights at high temporal frequency for a fraction of the cost of traditional approaches.

Their services span several key domains:

- **Shoreline and erosion monitoring:** SCI cameras measure shoreline position continuously at 1Hz, providing near-real-time visibility into how storms, tides, and seasonal cycles impact erosion and accretion. Instead of waiting months for survey updates, clients can observe coastal change as it happens.
- **Bathymetry and wave dynamics:** Using computer vision, our system detects and models nearshore bathymetric shifts, surf zone morphology, wave climatology, and breaking wave condi-

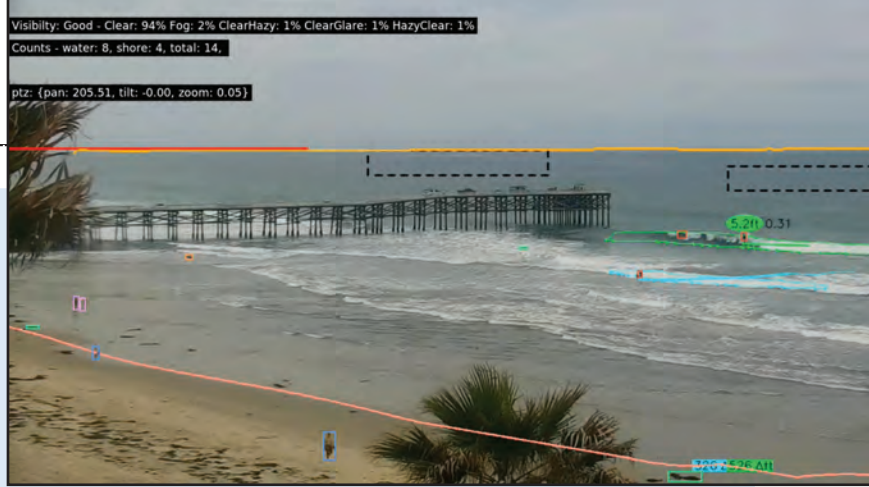
tions. This allows clients to understand sediment transport, surf amenity quality, and hazard zones in unprecedented detail.

- **Beach and ocean participation:** SCI counts and classifies people on the beach and in the water, producing reliable estimates of attendance and usage patterns. This helps quantify the economic value of beaches, plan for life-guard staffing, and assess recreational trends over time.

- **Vessel and traffic monitoring:** By analyzing vessel movements near-shore, SCI provides insights into small boat traffic, surf zone encroachment,

and more.

Surflin Coastal Intelligence is partnering with the City of Oceanside on the RE:BEACH project to establish a real-time coastal baseline ahead of major shoreline restoration efforts. Using AI-enabled smart cameras, SCI provides continuous data on shoreline position, bathymetry, wave dynamics, and beach participation. This persistent monitoring approach delivers insights at a fraction of the cost of traditional surveys, supporting erosion planning, surf amenity protection, and long-term coastal resilience while creating a model for other municipalities.



An advertisement for Detyens Shipyards, Inc. featuring a large propeller and the text "We Fix Ships". The background is a dark, industrial setting. The propeller is large and metallic, with the words "We Fix Ships" written in white on a red background. The text "Ship Repair | Conversions | Drydocking" is at the bottom. The top left corner has the website "detyens.com" and email "drydock@detyens.com". The top right corner has the company name "Detyens Shipyards, Inc." and location "Charleston, South Carolina". A QR code is in the top center.



NORBIT SUBSEA

norbit.com/subsea

NORBIT Subsea is part of the NORBIT Oceans segment, delivering technology solutions to survey companies, research institutions, military and governmental agencies, dredging operators, rental providers, offshore construction specialists, and marine contractors. They design and develop a range of sonar technologies—from wideband multibeam and 3D side-scan sonars to sub-bottom profilers and long-range surveillance systems.

NORBIT Subsea offers a family of cylindrical, low-power, high-resolution multibeam sonar systems, designed for rapid mobilization and available with integrated GNSS, yaw stabilization, and dual-head configurations and more.

Their sonar systems support a wide range of applications, including:

- Bathymetric surveys in rivers and oceans
- Cable and pipeline inspections
- UUV- and USV-based surveys
- Quay wall, bridge, and structural inspections
- Harbor surveys
- Archaeological surveys

NORBIT Subsea introduced a new paradigm within the sonar industry when they launched the WBMS X in Jan 2025. This latest addition to their multibeam sonar family is an ultra-compact system. Built with flexibility and adaptability in mind, the WBMS X family can be customized to fit any operational environment.



NOVACAVI

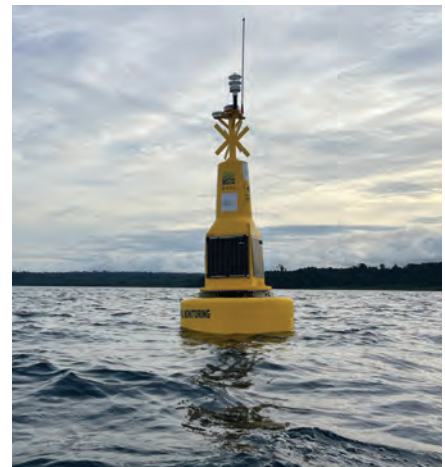
www.novacavi.it

Since 1975, NOVACAVI has specialized in the design and manufacturing of custom electrical cables for demanding and diverse applications. With nearly 30 years of experience in the underwater sector, we offer advanced technological solutions through our AQUANCABLE line.

AQUANCABLE is our range of specialized underwater cables, designed for high-tech applications across a wide variety of marine environments. Our tethers, tows, and umbilicals serve as strategic components in the most advanced underwater systems and technologies.

Our umbilical cables, 21GAX207 and 1GAX211, have been selected as strategic components of a semi-submersible robotic system, designed to carry out inspections, diagnostics, and maintenance operations beneath the sea surface—while keeping port infrastructure fully operational above water.

The robot is monitored in real time from a floating control pontoon. All water and waste residues are collected and treated onboard, ensuring zero discharge into the sea. Surface operations continue without interruption, significantly reducing intervention time, costs, and environmental impact.



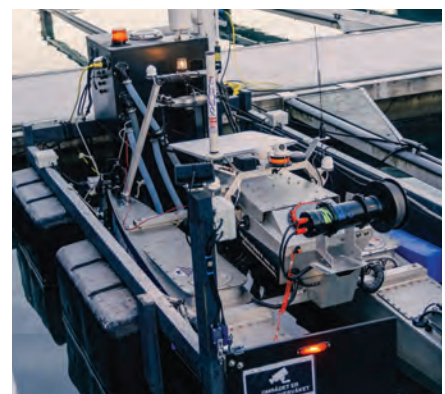
OCEAN SCIENTIFIC INTERNATIONAL LTD

www.osil.com

OSIL is a privately owned business with a product line for marine environmental and offshore monitoring and investigation. Based in the UK, OSIL was initially established in 1989 to take over operation of the IAPSO Standard Seawater service from the Institute of Oceanographic Sciences, but quickly incorporated the sale of oceanographic instrumentation into its business model.

OSIL has a range of profiling winches for deploying instrumentation from Uncrewed Surface Vehicles (USVs) and data platforms, and the Mini Vibrocorer for shallow/coastal water off-grid sediment sampling.

The Midi Vibrocorer is a compact and stable self-contained sediment coring system capable of delivering cores up to 3m in length in 50m water depth.





NV5

www.nv5.com

NV5 has completed more than one hundred hydrographic surveys as a contractor for clients including USACE Baltimore District, USACE Norfolk District, USACE Wilmington District, the USACE Coastal Inlets Research Program, the NOAA Office of Coast Survey, the USGS, and numerous other commercial clients.

Geodynamics is currently a prime contractor providing hydrographic surveys for the NOAA Office of Coast Survey, holds several IDIQ contracts with multiple USACE District Offices, and have Master Service Agreements in place with coastal engineering firms requiring hydrographic and beach profiling surveys along the Atlantic and Gulf Coasts. We have also supported the dredging and reclamation industry providing shoreline singlebeam surveys, condition surveys, BD/AD surveys, offshore disposal site multibeam surveys, and pipeline corridor surveys with sidescan and multibeam for some of the largest firms in the U.S. including Great Lakes Dredge and Dock Company.

NV5 has a fleet of nine vessels that can

be deployed on intercoastal waterways, shorelines, and offshore 24hr operations. NV5 owns all of its own sensors including MBES, SBP, SSS, and Magnetometers. NV5 also has a large partner network that enables vessel chartering and sensor rentals enabling us to deploy in worldwide geographies.

In celebration of the 25th year anniversary of the Thunder Bay National Marine Sanctuary, Coast Survey is collaborating with NV5, NOAA Sanctu-

aries and Great Lakes environmental Research Lab (GLERL) to complete modern hydrographic surveys. The Sanctuary is located in the northwestern waters of Lake Huron and is described as “one of the most treacherous stretches of water within the Great Lakes system.” Data collected will replace the 1970’s vintage data and allow exploration of this historic area at a higher resolution, and support habitat analysis and environmental modeling.

Get the job done faster, safer, and more efficiently with **Oceanbotics easy-to-use Professional Remotely Operated Vehicles (ROVs)**.



SRV-8 ROV

We offer **intuitive software and easy ROV operation** through a simple, straightforward design —visit us at booth **UI-4533** to see it in action.

OCEANBOTICS



All-in-one ROV software



REACH ROBOTICS

www.reachrobotics.com

Reach Robotics specializes in subsea robotic manipulators and intervention systems.

Their product range includes the Reach Alpha, Reach Bravo, Reach X, and the Reach X AIS package, each engineered to meet varying mission requirements across defense, offshore energy, infrastructure inspection, and scientific research.

Their product range includes:

- Reach Alpha – Compact and affordable manipulator for entry-level ROVs.
- Reach Bravo – Mid-range arm, balancing performance and accessibility.
- Reach X – High-precision, 7-function manipulator designed for complex intervention.

- Reach X AIS – A complete advanced intervention system package, combining manipulators, controllers, and tooling.

Reach manipulators are lightweight and engineered to integrate with portable ROV platforms. They deliver high lift capacity, extended reach, and advanced dexterity at a smaller size and weight of traditional work-class arms.

Their facilities are equipped with subsea testing tanks, precision CNC machining, 3D printing, and robotics test rigs.



REMOTE OCEAN SYSTEMS

www.rosys.com

Celebrating 50 years in business, Remote Ocean Systems is a leader in the development and manufacture of technology camera, lighting and positioning systems for extreme oceanographic, industrial and military applications and environments.

The primary product line includes underwater video cameras, lights, a line of rugged pan and tilt positioning systems, video inspection systems and control systems manufactured primarily for the oceanographic, nuclear and defense industries.

The SeaStar is a high-powered compact LED light that delivers 10,000 lumens output with full-range dimming capability and is depth rated to 6,000 meters. The Accu-positioner is a new technology addition that features computer controlled accuracy to ± 0.1 degree (6 arc minutes). This new positioner is controlled with COTS controllers, devices and ROS GUI and operates with zero backlash and is depth rated to 6,000 meters.



SBG SYSTEMS

www.sbg-systems.com

SBG Systems is a leader in inertial navigation and GNSS technologies, delivering solutions for demanding applications for the marine, robotics, geosciences, automotive, aerospace, and defense industries.

SBG Systems made a breakthrough in maritime navigation by introducing the world's first MEMS-based gyrocompass, a compact and lightweight alternative to traditional systems.

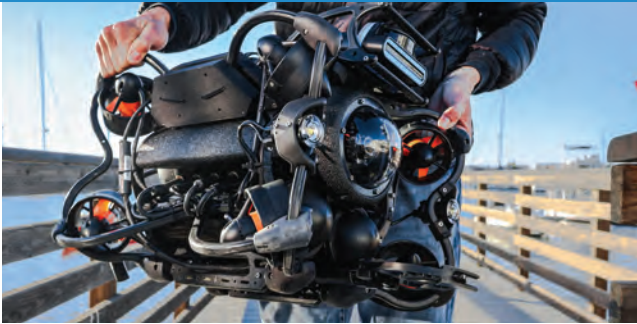
SBG Systems' hardware portfolio includes compact Inertial Measurement Units (IMUs), Attitude and Heading Reference systems (AHRS), and Inertial Navigation Systems (INS) with embedded GNSS, fit for land, air, and marine applications.

SBG Systems also provides software solutions, like Q inertia, their post-processing software that enhances GNSS and inertial data to deliver centimeter-level accuracy, even in challenging conditions. Their intuitive interfaces, SDKs, and configuration tools ensure seamless integration, fast deployment, and long-term reliability.

SBG Systems has introduced Pulse-80, a tactical-grade MEMS IMU designed for the highest accuracy and robustness. It features redundant gyros and accelerometers with continuous built-in test (CBIT), ultra-low noise and bias instability (0.1°/h gyro, 6 μ g accel), up to 2 kHz output, and wide-temperature calibration (-40°C to $+71^{\circ}\text{C}$). In a 56x56x50.5 mm, ~260 g, <1.8 W package, Pulse-80 is ITAR-free and engineered for harsh vibration with ultra-low VRE—ideal for stabilization and navigation across marine, aerospace, and robotics. Available September 2025.

OCEANBOTICS

www.oceanbotics.com



Oceanbotics designs and manufactures ROVs that are built to perform in real-world conditions while remaining easy enough for non-technical users to operate with confidence.

The SRV-8 and SRV-8X ROVs are deployed globally by military & government agencies, public safety dive teams, infrastructure inspectors, offshore workers, marine researchers, and more. With handheld controls and a three-minute deployment time, Oceanbotics' vehicles allow users to launch missions quickly with minimal setup or training.

SRV-8 completes underwater tasks—retrieval, inspection, surveillance, and testing—faster, easier, and in a more cost-effective manner. The SRV-8 ROV's 8 vectored thrusters deliver maneuverability. It is depth-rated to 305m and powered for up to 8 hours.

SRV-8X completes critical missions in deeper, high-cur-

rent waters. The SRV-8X is built for professionals needing greater payload capacity without sacrificing portability. Depth-rated to 305m (500m option available) and powered for up to 6 hours, this ROV is engineered for tough conditions and mission versatility.

At the heart of every Oceanbotics system is SubNav OS, a closed-source software developed by Oceanbotics for all underwater ROV operations, offering intuitive piloting, mission recording, navigation, and post-processing with free periodic updates and the fastest technical support.

This year, Oceanbotics was featured for the third year on Discovery's Shark Week in the special "Black Mako of the Abyss." Using the SRV-8X ROV equipped with high-definition cameras, imaging sonar, and advanced lighting, the film crew was able to safely explore ocean waters, diving to depths of 500 meters (1,600 feet), to locate, track and document one of the ocean's rarest sharks.

The intuitive controls and easy deployment of our system made it possible for the team to get the ROV in the water quickly and operate in difficult conditions, all while filming on a tight production schedule.

Oceanbotics operates out of a dedicated facility where they design, manufacture, assemble, and test all ROV systems. Their facility includes an in-house engineering lab, production floor, R&D space, and an indoor test tank for quality control and training.



SeaView Systems, Inc.

www.seaviewsystems.com

SeaView Systems, Inc. specializes in custom electronics that elevate capabilities for ROV communications, metrology, and a wide range of oceanographic industrial and research applications worldwide.

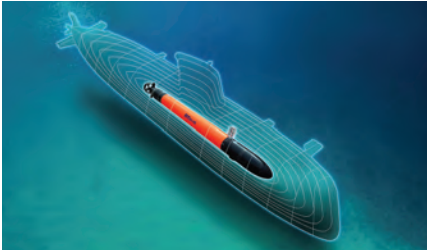
Their flagship product, the SVS-603HR wave sensor, has become the standard for a new generation of compact wave buoys and as well as ASVs/USVs. The SVS-603HR wave sensor has been deployed on buoy hulls ranging in size from

about 0.3 to over 6 meters as well as autonomous surface and submersible vehicles at locations around the globe. The SVS-603HR includes onboard algorithmic support for capabilities including offsets and non-ideal platform motion correction, platform motion diagnostics (including ship-strike and mooring constraint alerts) as well as 3D Response Amplitude Operator (RAO) support.

SeaView's SVS-708 and SVS-709 surface and subsea power supplies enable intelligent power management, doubling the umbilical power transmission capabilities for Observation and Inspection Class ROVs.

Beyond the core products, their expertise extends to custom ROV development and specialized services. They design and build custom ROVs for missions where standard platforms cannot address specific requirements. They also provide services such as ROV tunnel or structural inspections, using high-precision techniques like HD video and 3D sonar mapping.

SeaView's workshop includes a pressure tank for testing electronic housings, a 40,000-gallon tank for ROV and subsea equipment testing and a mechanical wave motion simulator for the qualification of every wave sensor. They also have capabilities for electronic design and prototyping, mechanical fabrication, 3D printing, NC router and more.



RTsys

<https://rtsys.eu/>

Part of the Sea Vorian group, RTsys specializes in underwater acoustics and autonomous vehicles for civil, science and defense applications.

Their solutions include:

- PAM: acoustic recorders and acoustic buoys with AI for Passive Acoustic Monitoring
- AUV: compact Autonomous Underwater Vehicles for inspection, offshore survey and oceanology
- ASW: Anti-Submarine Warfare recoverable training targets
- MCM: Manned-Unmanned teaming ecosystem for Mine Countermeasures

RACAM Repositioning and Communication Acoustic Module is a lightweight and compact acoustic modem (multiband over 18kHz) natively installed on all RTSYS products (Sonadive, AUV, SCM, PRB, etc.). It offers real time digital data: status, position, speed, heading, and payload, and subsea positioning.

RTsys has been awarded two significant contracts to deliver multiple autonomous underwater vehicles (AUVs) to a major Navy in Southeast Asia, for Mine Countermeasures and ASW training.

The first contract equips the customer with a fleet of COMET-MCM, light AUVs dedicated to mine reconnaissance. The second contract provides SEMA recoverable ASW targets designed to emulate realistic submarine behaviors and acoustic signatures.

Both programs include comprehensive training, in-country support, and logistics packages to ensure rapid operational uptake and sustained availability. Deliveries will commence this year, with phased capability rollouts aligned to the Navy's operational schedule.

In 2025, RTsys invested in a new facility, doubling its production area.



SAAB UK

www.saabseaye.com

Saab UK Ltd, a legal entity of Saab AB, is a leading defense and security company. Through its Seaeeye portfolio, Saab UK addresses the needs of subsea exploration, research, and commercial operations with a range of subsea vehicles and autonomous underwater vehicles (AUVs).

Saab UK's Seaeeye eM1-7 seven function electric manipulator offers precision, dexterity, and lifting power. Its compact modular electric joints enable smooth control with capacities of up to 122 kg at full 2m extension and 454 kg at minimum reach. Built from lightweight aluminum, it weighs 116 kg in air, 84 kg in water, and operates to depths of 4,000m. With adaptable jaws, and intelligent power management, the eM1-7 serves applications ranging from deep-sea research and delicate specimen handling to subsea construction, environmental monitoring, and habitat protection.

The Seaeeye SR20, engineered for versatility across a wide range of subsea tasks—including inspection, maintenance, repair, survey, construction, drill support, and decommissioning—delivers high thrust and payload capacity. It supports an extensive toolkit, from manipulators and torque tools to cutters and survey equipment. Its modular electric design offers precise control, reduced maintenance, and simpler mobilization. Deployment from lightly crewed vessels aims to improve safety while minimizing cost and emissions. It has a depth rating of 3000 meters and a construction built to endure tough offshore conditions.

Saab UK has facilities in the UK and Sweden, along with substantial water tank and lake test facilities.



SEAFLOOR SYSTEMS, INC.

www.sea floorsystems.com

Founded in 1999, Seafloor Systems, Inc. is a leader in hydrographic survey solutions and uncrewed marine technology. The company's core products include uncrewed surface vessels, sonar systems, and integrated survey equipment designed to make data collection faster, safer, and more accurate. Beyond the technology, they provide custom system integration, training, and operational support to ensure our customers can maximize efficiency and reliability in their hydrographic projects.

Seafloor Systems' key equipment includes their uncrewed surface vessels, HyDrone series, integrated with singlebeam, multibeam, and side-scan sonar systems. They also utilize GNSS positioning, LiDAR, and advanced autonomy software, as well as Teledyne BlueView 2D imaging sonar for high-resolution underwater mapping.

Seafloor Systems recently introduced the HyDrone 4.5 Generation, their newest portable hydrographic survey vessel designed for enhanced performance and versatility. To demonstrate its capabilities, they partnered with the El Dorado County Sheriff's Department in a field demo, pairing the HyDrone 4.5 with a Teledyne BlueView 2D imaging sonar. The system delivered clear, real-time underwater imagery, showcasing its effectiveness for search and recovery as well as hydrographic survey applications.

Seafloor Systems operates from a facility that supports the design, manufacturing, testing, and integration of uncrewed surface vessels and hydrographic survey systems. The facility includes fabrication and assembly areas, sensor integration labs, and testing spaces for vessel trials.



Oceaneering delivers engineered services and products and robotic solutions to offshore energy, defense, aerospace, and manufacturing.

Since 1964, they've supported the full offshore asset life-cycle—from first survey to life-extension and decommissioning. They pair the industry's largest work-class ROV fleet (~250 systems; ~99% uptime) with a remote-operations model (55k+ hours from dedicated centers in Stavanger, Aberdeen, and Morgan City) to reduce HSE exposure, mobilization time, and carbon footprint. C-Nav delivers centimeter-level GNSS accuracy for build-right execution. Their Asset Integrity services apply RBI engineering and INFORM digital tools to turn inspection data into action. And their Manufactured Products group—from 3,000+ km of umbilicals to Grayloc metal-to-metal sealing connectors—lighten, speed, and de-risk critical connections across the asset's life.

Oceaneering's Onshore Remote Operations Centers (OROC) transition ROV and uncrewed surface vehicle (USV) pilots and industry experts back to shore-based offices, enhancing safety, reducing environmental impact, and improving collaboration among teams and clients. From commissioning to decommissioning, their OROCs offer support for offshore operations, including USV and autonomous underwater vehicle (AUV) operations, UWILD, surveys, rig positioning, subsea

asset inspections, and IMR services.

Vehicles include:

- Millennium Plus ROV: Features a dual-manipulator, 220-hp work class system with an enhanced thruster configuration.
- Isurus ROV: Enables activities in severe current conditions and is ideal for renewables and high-speed surveys.
- Freedom AUV: Conducts rapid subsea autonomous pipeline inspections at low altitudes, providing detailed external pipeline views, all in a single pass.
- Liberty Resident System is a battery-operated solution that will go subsea with a surface buoy. Works with any WROV.

Oceaneering has upgraded its Ocean Intervention II (OI2) vessel to enable simultaneous autonomous survey operations. Purpose-built in 2000 for geophysical and geotechnical surveys, OI2 underwent 2025 enhancements: expanded hull-mounted sensors, upgraded navigation and positioning, a new Launch and Recovery System for USVs and AUVs, modernized data infrastructure with Azure integration, and engine room improvements. The vessel now supports AUV, towed geophysical, and geotechnical surveys in one campaign. Paired with Oceaneering's USV capabilities and global Onshore Remote Operations Centers, OI2 delivers integrated, low-risk, crew-light surveys for faster data acquisition and improved decision-making.

SEEQUENT

www.seequent.com



Seequent, The Bentley Subsurface Company, builds technology that is at the forefront of Earth sciences. Seequent has a presence in over 100 countries and a user base that includes marine engineering firms, government agencies, and research institutions. Moreover, Seequent invests in education and capacity-building, offering training programs and resources that empower the next generation of marine geoscientists.

Seequent's solutions support a wide range of applications, including:

- Offshore wind farm development: By modelling seabed conditions, Seequent helps developers identify optimal turbine locations and mitigate geohazards.
- Subsea cable routing: Accurate subsurface models reduce the risk of cable damage and ensure long-term reliability.
- Marine mineral exploration: Seequent's tools enable efficient targeting of mineral-rich zones, supporting sustainable resource extraction.

At the heart of Seequent's impact is its flagship product, Leapfrog, a 3D geological modeling software that enables users to visualize and analyze subsurface data with clarity. In marine environments, where data is often sparse and conditions unpredictable, Leapfrog helps geoscientists, engineers, and decision-makers to build dynamic models that integrate seismic, geophysical, and geotechnical data.

Their primary products include:

1. Leapfrog Suite

- a. Leapfrog Geo: 3D geological modelling for mining and exploration.
- b. Leapfrog Works: Tailored for civil and environmental projects.

- c. Leapfrog Energy: Designed for energy projects including geothermal, offshore wind, CCUS, and hydrocarbons.
- d. Leapfrog Viewer: Enables viewing and interaction with Leapfrog models.

2. Seequent Central

- a. A cloud-based platform for collaborative data management, real-time model sharing, and workflow integration.

3. Seequent Evo

- a. A geoscience data and compute platform that enables integrated workflows across Seequent and third-party tools

4. Imago

- a. A cloud-based solution for managing and analyzing geoscientific imagery, transforming visuals into actionable insights.

5. MX Deposit

- a. A platform for drill hole and sample data logging, ideal for exploration teams.

6. GeoStudio Suite

- a. Includes tools for geotechnical and geoenvironmental analysis, such as slope stability, groundwater flow, and contaminant transport.

7. Oasis montaj

- a. A geophysical data processing and visualization platform, with extensions like:
 - i. VOXI Earth Modelling: Cloud-powered geophysical inversions.
 - ii. GM-SYS Modelling: Integrates seismic, gravity, and magnetic data.
 - iii. UXO: For unexploded ordnance detection and classification.

8. Aarhus GeoSoftware (AGS)

- a. Specialized in electromagnetic (EM), electrical resistivity tomography (ERT), and induced polarization (IP) data processing and inversion.

In November 2024, Seequent announced a strategic partnership with the International Geothermal Association (IGA) to accelerate global adoption of geothermal energy. The collaboration promotes best practices, supports events like the 2026 World Geothermal Congress, and enhances Seequent's software with new physics capabilities to trace subsurface fluids more accurately.

OCEAN SENSOR SYSTEMS

www.oceansensorsystems.com

Ocean Sensor Systems specializes in ocean wave sensors and instrumentation. Their sensors include submersible pressure wave gauges, capacitive wired and wireless wave staffs, wave loggers, and ultrasonic wave sensors for the engineering and environmental community. Their ocean sensors and instruments can be used to take measurements of tides, wave action, wakes and water levels.

Their products include:

- Submersible pressure wave gauges from 1, 3, 10 bar for up to 150 meters depth, self-powered with months of data logging capability.
- Capacitive wired and wireless wave sensors with staff of 0.5 meters up to 20 meters and interchangeable. These sensors have high

accuracy along with high linearity and repeatability.

- Capacitive wired and wireless wave loggers with of 0.5 meters up to 20 meters and interchangeable. These loggers have high accuracy along with high linearity and repeatability. Wireless options with low power battery operated capability allows for months of logging.

- Ultrasonic wired and wireless wave sensors that are easy to install and provide highly accurate results.
- Data Loggers with battery, solar and cell network capability for data collection from network of sensors.
- Wave Sensor Synchronizers to control and synchronize data collection from multiple wave staff sensors.



RAMPART PRODUCTS

www.rampartproducts.com

Rampart Products provides hermetic and ruggedized interconnect systems and components to many industries including underwater, military/aerospace, oil & gas, space, medical, pipeline inspection and nuclear.

Rampart Products is now manufacturing the M24231 connector used in the hull penetration in a submarine and working with the Navy's warfare centers.

Their facility houses machining centers, injection molding machines, and mechanical assembly stations.

SEATRAC SYSTEMS, INC.

www.seatrac.com

SeaTrac's broad array of compatible sensors and intuitive software controls provide access to a wide range of environments and marine data in environmental, defense and energy sectors.

SeaTrac's SP-48 is an uncrewed surface vehicle (USV) that performs real-time data collection and communications in all marine environments. Capable of days-to-months-long missions and equipped with a large payload capacity, SeaTrac's platform facilitates combinations of payloads including high-powered sensors during any one mission. An open, sensor-agnostic platform excelling in ocean observation, intelligence, surveillance and reconnaissance missions, the SP-48 operates autonomously or remotely with a person in the loop.

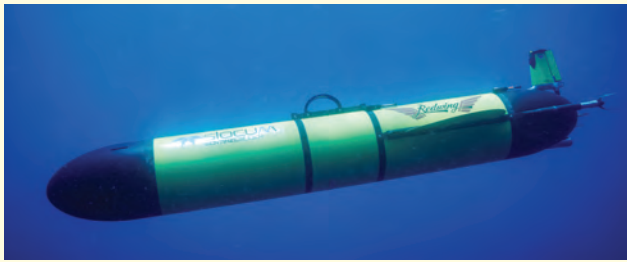
Recent collaborations include:

- SeaTrac collaborated with Sonardyne to remotely



measure currents and gather oceanographic data in the U.S. Gulf of Mexico's LCS on behalf of the University of Rhode Island (URI), as funded by the U.S. National Academy of Sciences. The technology replaced manned vessels to enable continuous data collection without the need for on-site human intervention.

- In a project with JASCO Applied Sciences, the two companies deployed an advanced passive acoustic monitoring (PAM) system aboard SeaTrac's SP-48 USV to demonstrate a method for real-time marine mammal monitoring.
- SeaTrac will continue to partner with USM in an ongoing hypoxia mapping mission in the U.S. Gulf of Mexico.



TELEDYNE MARINE

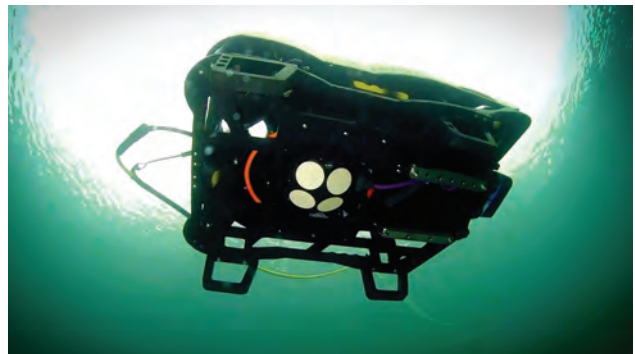
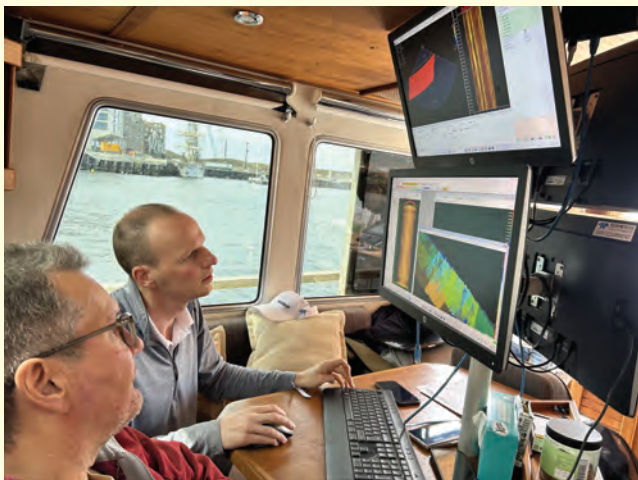
www.teledynemarine.com

Teledyne Marine is a group of subsea technology companies that are part of Teledyne Technologies Incorporated. They provide oceanographic and hydrographic instruments, including multibeam and single beam sonars, ADCPs, acoustic modems, underwater cameras and lights, AUVs, gliders, and seismic systems. Their products are used for object detection, pipeline inspection, marine construction, dredging, environmental monitoring and marine defense applications. They also offer interconnect solutions and software platforms for data acquisition and analysis. Services include global technical support, training, and system integration, and customers range from government agencies, research institutions, energy companies, and defense contractors worldwide.

Teledyne Marine recently launched the Compact Navigator, a navigation solution for compact platforms. Their sonar and glider technologies have been deployed to protect historic waterways and detect marine mammals.

They also contributed to NATO's REPMUS 25, supporting and enhancing the effectiveness and integration of unmanned systems for defense missions in complex maritime environments.

Teledyne Marine operates 15 global manufacturing and service center. Their facilities house advanced sonar calibration systems, pressure testing chambers, acoustic labs, CNC machining, and AUV testing pools to ensure product reliability and performance.



Sonardyne International

www.sonardyne.com

Sonardyne is a leader in the development of underwater technology, consistently delivering innovations that redefine the boundaries of marine operations.

One of the company's recent technological advancements is the SPRINT-Nav U, a compact navigation instrument engineered for bringing survey-grade capability to small underwater vehicles, especially small ROVs and AUVs. This system integrates an inertial measurement unit (IMU), Sonardyne's SPRINT INS algorithm, a Doppler velocity log (DVL) and a high-accuracy pressure sensor into a single, streamlined housing.

The SPRINT-Nav U is designed for optimal performance and ease of integration. Its small, lightweight form factor makes it ideal for vehicles where space and payload are critical constraints. By co-locating the core navigation instruments, the system eliminates complex and time-consuming alignment procedures. The instrument delivers data on vehicle attitude and velocity and position.

Sonardyne has also recently inaugurated a new, purpose-built facility in Camaçari, Brazil. The facility is part of a collaboration between industry partners including Shell Brasil Petróleo Ltda, Petrobras and SENAI CIMATEC, supported under the Research Development and Infrastructure funding clause of the Brazilian National Agency for Petroleum, Natural Gas and Biofuels (ANP). Its main focus is the production of on-demand ocean bottom nodes (OD OBNs).

Using their optical and acoustic communications technologies, the nodes represent the next generation of geophysical monitoring systems in the offshore oil and gas industry.

Used alongside AUVs, OD OBN will provide a versatile, lower cost, more resilient solution for time-lapse seismic and subsidence monitoring of producing reservoirs with better data and the capacity to be placed on the ocean floor for up to five years without human intervention.

Sonardyne has also earned dual King's Awards for Sustainable Development and International Trade, underscoring their role in the global subsea sector.

R.M. YOUNG COMPANY

www.youngusa.com



R.M. Young Company provides precision meteorological sensors and systems designed for use in demanding environments. Their product line includes wind sensors (propeller, ultrasonic, and cup anemometers and vanes), barometric pressure sensors, temperature and humidity probes, precipitation sensors, and all-in-one weather stations.

A cornerstone of their offerings is the Wind Monitor series, engineered for low-power operation, high durability, and dependable data capture across marine and atmospheric research applications. These sensors are routinely used on ocean buoys, offshore rigs, ships, and coastal research stations.

R.M. Young Company's all-in-one weather station, the Re-

sponseONE, delivers a full suite of atmospheric data in a single, rugged unit—simplifying system integration without sacrificing accuracy. Their sensors are designed to interface easily with data loggers, SCADA systems, and satellite communications, ensuring flexibility and interoperability for our clients.

In addition, they provide tailored instrumentation packages for specialized environments, including the Marine Wind Monitor.

R.M. Young's new Model 93000 ResponseONE-PRO is a compact, all-in-one weather transmitter that measures wind speed and direction, temperature, humidity, and pressure. An access port allows fast replacement of the internal sensor module or filter, restoring performance to factory standards without returning the unit.

R.M. Young has also acquired SNOdar—one of the only snow depth sensors using LIDAR. SNOdar offers precise, real-time snow data (even during winter storm events) with a Bluetooth-enabled mobile app for easy configuration and monitoring.

R.M. Young's headquarters in Traverse City, Michigan houses their engineering, manufacturing, quality control, and customer support operations under one roof. They maintain environmental testing capabilities, CNC machining, injection molding, tooling, assembly, calibration labs, and in-house R&D prototyping—all tailored for sensor innovation and ruggedization.

RBR

www.rbr-global.com

RBR has been designing and manufacturing oceanographic instruments in Ottawa, Canada since 1973. Its instruments track a wide range of water parameters—from temperature and depth to turbidity and dissolved gases—supporting research from deep ocean trenches to polar ice.

RBR offers a range of oceanographic instruments designed for flexibility, precision, and durability. Its product line spans from individual sensors to fully integrated systems, all built to support accurate and long-term water measurements across diverse environments.

At the core is instrumentation that measures ocean parameters such as temperature, salinity, pressure, dissolved gases, pH, and turbidity. These instruments are designed for long-term stability, low power consumption, and seamless integration.

RBR's compact and standard data loggers provide modular platforms for deploying multiple sensors. Compact loggers are ideal for small platforms and tight deployments; standard models offer higher capacity and longer deployment times.

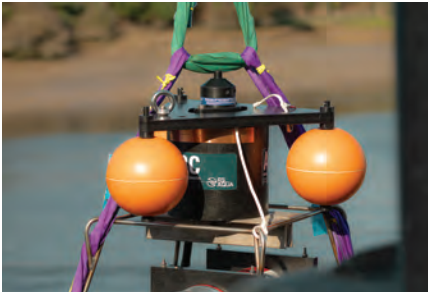
For autonomous and remote operations, RBR provides low-power consuming CTDs and sensors tailored for floats, gliders, and AUVs, enabling extended missions with minimal maintenance.

RBR also offers integrated systems for complex deployments, OEM solutions for custom integration, and a full suite of accessories to support mounting and operation in the field.



Calibration tools and services ensure long-term measurement accuracy and intuitive software and mobile apps help users configure instruments and manage data efficiently.

In 2025, RBR launched a range of new and upgraded sensors and instrumentation. The RBRcoda Tu is a real-time turbidity sensor with two optical channels for optimizing linearity and sensitivity. Its sensitivity and depth rating are tailored for a wide range of environmental monitoring applications. The RBRtridente is a three-channel fluorescence and backscatter sensor with fast sampling rates and extended wavelengths for enhanced oceanographic optical sensing. The new RBRfermata battery canister enables extended deployments by providing up to 2.8kWh of additional energy. Finally, the next-generation RBRlegato CTD designed for gliders and AUVs offers multi-rate sampling capabilities, an increased depth rating, and greater depth accuracy.



RS AQUA

www.rsaqua.co.uk

RS Aqua are the UK & Ireland's largest provider of ocean science technology, providing market-leading sensors and systems for monitoring all ocean environments.

RS Aqua supplies and develops ocean technologies across multiple sectors. In aquaculture, they provide water quality systems and smart load sensors. Their services include installation, rental, and project support. For the defense sector, they offer UUVs, USVs and ROVs for diverse naval applications, including ISR, ASW and more. Their fish tracking solutions include acoustic telemetry equipment and ARC (Acoustic Release Canister) for reliable gear recovery. They also supply WaveRadar system for accurate wave measurements on vessels, offshore platforms, and in ports.

Project MARLIN harnesses the power of advanced Machine Learning to identify and alert its end users to a preset Event of Interest (EOI). One application is detecting marine mammals in the presence of an offshore development site, where work can be instantly halted upon alert from the MARLIN app. Illegal fishing vessels can also be flagged up in Marine Protected Areas (MPAs) by cross-referencing the sound source with the ship's Automatic Identification System (AIS). RS Aqua has recently hit an exciting landmark, shipping their first pre-production units to an ambitious marine monitoring project.

Their workshop features a water tank, a laboratory for research and development, and testing facilities for WaveRadar sensors, passive acoustic recorders, buoys and more.

In late 2024, RS Aqua was acquired by General Oceans - an underwater technology group that includes five other major brands.



SIDUS

www.sidus-solutions.com/contact

SIDUS' primary subsea products are comprised of video image capture, transmission, storage, and retrieval systems. These products allow for observation and evaluation of the customers' assets and the safety of their personnel. SIDUS Solutions are fully capable of operating in any industry requiring remote surveillance systems, particularly in underwater, subsea, and hazardous areas.

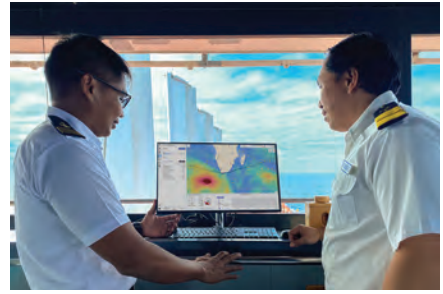
SIDUS' customers also can take advantage of complete start to finish solutions including:

- Project Management
- System Integration
- Installation Support
- Commissioning Service
- Customer Manufacturing
- Project Engineering
- Research & Development
- Superior Customer Support

Their primary products include:

- Subsea Cameras and Video Imaging
- Subsea LED Lights & Lasers
- Subsea Positioners & Rotators

SIDUS has demonstrated its expertise in designing surveillance and security systems for US Navy and Coast Guard ships, earning sole-source status on two U.S. Navy multiple vessels, ship-build contracts, maintaining its record as a General Dynamics – National Steel & Shipbuilding ("NASSCO") subcontractor. Recently, SIDUS delivered multiple integrated video, security, and power conversion systems for ten Navy ships (seven ships under the Navy Expeditionary Mobile Base program and three under the Fleet Replenishment Oilers program) and expects to continue deliveries for at least another 18 ships to be constructed under these two programs.



SOFAR OCEAN

www.sofaroccean.com

Sofar Ocean is a leader in ocean intelligence platforms. They've built the world's largest real-time ocean network, turning billions of measurements into insights by scientists, governments, and shipping fleets. Their technology aims to help customers lower costs, cut emissions, and unlock insights that were once out of reach.

They recently made two new additions to their suite of Spotter Platform solutions:

- **Spotter Sound:** Enables the addition of a hydrophone—enhanced with onboard AI—to intelligently monitor underwater acoustics in real time.
- **Spotter Water Quality:** Enables the addition of dissolved oxygen and temperature sensors to monitor subsurface water quality in real time.



SubCtech GmbH

www.subctech.com

Founded in 2010 in Kiel, Germany, SubCtech GmbH designs, manufactures, and services advanced subsea power systems, ocean monitoring solutions for marine science, offshore energy, and defense applications. The company's core expertise lies in high-performance subsea lithium-ion battery modules, intelligent sensor integration, and autonomous monitoring systems.

SubCtech systems operate in extreme environments—from polar ice to tropical waters—supporting missions such as deep-sea exploration, climate monitoring, offshore wind construction, and subsea defense operations.

Their in-house engineering, production, and testing ensure full control over quality and innovation. They work closely with leading research institutes, offshore operators, and government agencies.

SubCtech's flagship product line includes:



- Subsea Lithium-Ion Battery Systems — modular, pressure-compensated, and proven in depths beyond 6,000 meters.
- Ocean Monitoring Buoys & Landers — integrating multi-parameter sensors, data analysis, and real-time telemetry.

The company is currently manufacturing its next major project: a 1 MWh Battery Storage Skid designed for subsea deployment. This powerful energy storage solution (scalable up to 6 MWh) will play a crucial role in powering underwater applications, contributing to a greener energy future.



SOUTH BAY WIRE AND CABLE COMPANY, LLC

www.southbaycable.com

South Bay Cable offers solutions that withstand the most challenging marine environments. Advances in material chemistry have increased SBC's ability to build cables that are lighter and stronger, which in turn allows for exploration at greater ocean depths. Their primary product is raw bulk custom cable and their facility offers 80,000 feet of manufacturing space. SBC is investing in new and more efficient equipment for the future.

Water Linked

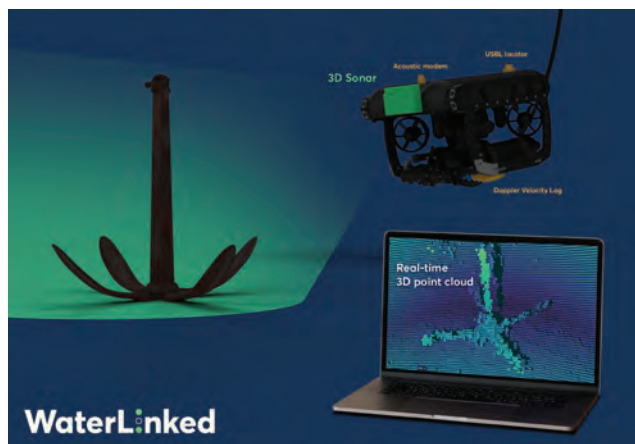
www.waterlinked.com

Water Linked creates sensor technology, allowing divers and underwater vehicles to explore and communicate underwater.

Water Linked's Sonar 3D-15 is a 3D multibeam imaging sonar with a range of 15 meters. Shallow water, often characterized by low visibility and high turbidity, typically renders optical cameras ineffective. While traditional 2D sonars offer some improvement, they fall short in providing a comprehensive understanding of the surrounding environment.

The Sonar 3D-15 delivers a clear, three-dimensional acoustic image in even the murkiest of waters.

Their expanded facility includes an innovation lab, a wet lab, and a production area.



UNIQUE GROUP

www.uniquegroup.com



Unique Group has six divisions—Unmanned Surface Vessels (USVs), survey equipment, buoyancy and water weights, diving and life support, lifting and mooring, and subsea innovation—delivering integrated solutions that enhance efficiency, safety, and sustainability.

Unique Group's products include:

- USVs
- Survey Equipment: surface and subsea positioning, ROV tooling and sensors, Inertial Navigation Systems, hydrographic and geophysical solutions, oceanographic and environmental solutions, NDT and inspection equipment, navigation buoys and lanterns, subsea and merchant marine solutions
- Buoyancy and water weights: Seaflex branded buoyancy bags to support salvage, pipe lay, and cable lay. As pioneers of the Water Weights proof load testing system, Unique Group has bags from the Water Weights range available for rent or sale across our global network.

- Diving and life support: Unique Group manufactures customized diving and life support equipment designed to provide robust support to clients' requirements. Surface diving systems, saturation diving systems (including DSV + HRF), general diving equipment, naval diving and life Support, Uni-Heal Hyperbaric Oxygen Treatment (HBOT) System, specialized boats

- Lifting and mooring: seabed excavation solutions winches, spoolers and back deck equipment lifting, hoisting and lashing products, Lifting Equipment Inspection (NDT), equipment recertification and management

- Subsea Innovation: design and build of technology and equipment for the global offshore energy markets such as J-tube seals, EPRS Clamps, LARS, etc.

Notable projects include:

- MATSYA 6000-Engineered and delivered a DNV-compliant Human Support and Safety System (HSSS) for India's first manned submersible rated for a depth of 6000 meters.

- Uni-Mini Unmanned Surface Vessel (USV) was deployed for a shallow-water hydrographic multibeam survey in Australia. The project involved the first commercial deployment of the Norbit iWBMS multibeam sonar onboard the Uni-Mini in WA.

New Solutions include the Uni-FlowX Controlled Mass Flow Excavator, Uni-Count, and Uni-PPS Splitter.



YellowScan

www.yellowscan.com

YellowScan is a leader in UAV LiDAR solutions. Founded in 2012 in the South of France, the company now serves customers in 64+ countries across surveying, mining, forestry, infrastructure, and environmental monitoring.

Its recent additions is the YellowScan Navigator, bringing bathymetric LiDAR to UAV platforms, enabling high-resolution mapping of shallow waters. Using a green laser to penetrate water and full-waveform technology, it pro-

duces detailed 3D models of riverbeds, harbors, and coastal ecosystems, supporting hydrographic surveys, dredging, and coral reef monitoring.

Beyond technology, YellowScan offers software, training, and global support, while its annual LiDAR Convention fosters community and knowledge-sharing. YellowScan also aims to make its technologies more accessible; once limited to government agencies, bathymetric LiDAR is now available to universities, NGOs, and survey firms.

In Sweden, VisionAir Production used YellowScan's Navigator to support Ystad Municipality's coastal erosion program — the first UAV-based bathymetric LiDAR survey in the country. Mounted on a Hexadrone Tundra 2, the Navigator mapped 8.7 km of coastline and 6 m below water, delivering seamless land-sea datasets over 550 hectares. This revealed erosion hotspots and unexpected sediment shifts, insights traditional boat surveys missed.

YellowScan's headquarters house all R&D, production, and support activities. The site includes labs for optics and electronics, UAV integration areas, and in-house manufacturing with strict quality control. Training rooms and demo spaces host customer sessions, while nearby coastlines, rivers, and forests provide real-world test environments.

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LANDER LAB

COST EFFICIENCY OF BAITED OCEAN LANDERS

By Kevin Hardy, MTR Columnist, President, Global Ocean Design

Image above: Vessels fitted with a swinging davit arm and winch are ideal for deploying and retrieving Baited Remote Undersea Video (BRUV) systems. In this photo, a Stereo-BRUV system, developed by the Australian Institute of Marine Science (AIMS), is lowered to the seafloor. BRUVs have minimal impact on seafloor communities or the seabed.

Photo by Marine Ecology Group - Fish Research, The University of Western Australia

Operational costs of lander operations are seldom incorporated into scientific articles. This Lander Lab article was inspired by a well-considered academic paper, “Cost-effort analysis of Baited Remote Underwater Video (BRUV) and environmental DNA (eDNA) in monitoring marine ecological communities,” by Alice J. Clark, Research Student, University of Sussex, Brighton, UK, et al. The authors’ estimations of cost effectiveness of two non-invasive sampling methods were tested in the field, a near shore MPA recovering from years of trawling and severe storms. The methods fit the area and time duration of the study. Additional material has been added to this article to supplement the original paper. Readers are encouraged to read the original full text on-line, especially for details of the scientific methods, analysis, and conclusions. Citation below. Dr. Zachary Graff, Research Scientist at the NGO “Beneath the Waves” beneaththewaves.org suggested the subject of BRUVs described in this article.

Determining the diversity and distribution of species in an ecosystem is essential to creating a baseline for monitoring studies or to assess the success of conservation and restoration strategies. The methods for sampling marine and aquatic ecosystems can be inefficient and biased, such as diver operated video, or harmful to the environment and biodiversity, such as bottom trawls and seine nets. Both are time-consuming and expensive. Choosing an efficient and cost-effective sampling method to establish baselines and monitor biodiversity is an important consideration in an ecological study.

Two non-invasive techniques for monitoring the sea life in the full water column of a chosen site were considered: baited camera systems, and metabarcoding of environmental DNA (eDNA). Cost comparisons, strengths, weaknesses, and measures of effectiveness are determined.

“While the area of study was localized,” writes Clark in her paper, “the findings presented herein are applicable to global aquatic biodiversity and conservation monitoring programs.”

Baited Cameras

Automatic time lapse cameras for benthic studies have been in use since the 1950’s by researchers such as Prof. John D. Isaacs, Scripps Institution of Oceanography/UCSD, and Dr. Harold E. Edgerton, Woods Hole Oceanographic Institution.

Baited Remote Underwater Video (BRUV) is an increasingly common, effective, non-invasive and non-destructive method for sampling marine biodiversity. Shallow depths may be explored using a camera system that is lowered to the seafloor like a crab pot and marked with a surface float. Images are often limited to daylight hours, so lights and batteries are not needed. These simple systems are known as “Baited Remote Underwater Video” (BRUV) platforms.

The use of BRUV systems is favored over extractive sampling methods such as trawling, as many species escape the nets, or are destroyed by capture. Because they are quiet and offer bait, the BRUVs provide a 40% more efficient approach to recording species counts than diver video transects. Additionally, BRUV offers a permanent sampling record that can be reviewed to reduce interobserver variability, provides data on habitat types and can be deployed in deep or heavily structured ecosystems.

BRUVs can provide relative measures of species richness and abundance in a diverse range of conditions and habitats. Stereo-BRUV systems can determine the body size of fish and also produce a digital depth-of-field map, where features and creatures can stand out from their surrounding environment. Fish size can be used as a proxy for biomass, an essential metric for fisheries management reporting. More complex surveys might include a sensor suite to measure and record the effect of fluctuating oxygen minimum zones, and other physical oceanographic events on local populations of animals. Multiple BRUV/ocean lander systems can be deployed at one time, making it a time-efficient survey method of a large area.

Multi-camera digital imaging systems with overlapping fields of view can provide 360° panorama views of the seafloor around a lander. Thermal cameras are finding relevance in marine studies.

As Isaacs showed, deeper waters can be accessed by an autonomous ocean lander in the same manner as a BRUV, relying on the lander’s ability to release a drop weight to float up to the surface. The anchor may be released by a timer or acoustic command. The cost of the anchor and environmental impact can be mitigated by use of ferrocement. (See Marine Technology Reporter, November/December 2024, pp. 40, Lander Lab #12, “Ferrocement Anchors.”)

Like BRUVs, ocean landers provide long duration, quiet, non-invasive platforms to observe marine life, or monitor changing ocean conditions. A second timer can close a small Niskin bottle using a burnwire, capturing a near-bottom water sample for eDNA analysis, as discussed below. The sample of water only adds weight to the vehicle when it is pulled out of the sea and on to the boat.

Other studies have highlighted the limitations of BRUV/Landers. Species ID can be challenging in turbid water environments due to low visibility and there can be overrepresentation of apex predators due to species behavior associated with scavenging. In addition, the scent of the bait will draw species from other areas that may not necessarily be local to the sites sampled, thus the true sampling area is largely unknown. Fish higher in the water column, and cryptic (camouflage) and sedentary species are also likely to be under-represented when using BRUV. Finally, footage analysis can be labor-intensive, time-consuming and costly.



Fig. 2. WHOI'S Harold E. Edgerton (left) assists in deploying a tethered deep-sea camera system onboard Jacques-Yves Cousteau's Research Vessel CALYPSO during Mediterranean fieldwork in 1953.

Photo © 2010 MIT. Courtesy of MIT Museum

show species not seen in short duration imaging during daylight hours. Scant DNA can be amplified using polymerase chain reaction (PCR) techniques.

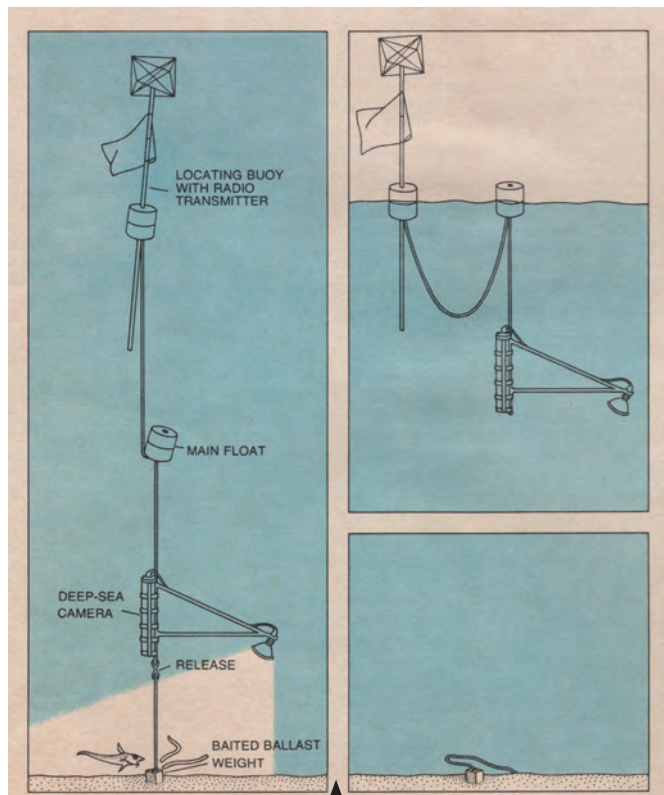
The eDNA method allows for the rapid assessment of diverse ecosystems, the detection of invasive species, and estimates of community composition, painting a portrait of the biodiversity and biomass in a given ecosystem. While DNA will degrade over time, it remains in the environment long enough for the presence of the organisms to be detected without being directly observed or caught. The filtering process is simple, requiring very little training, expertise and time in the field. The technique removes the need for extensive taxonomic expertise to identify species typically required by photographic methods.

Despite the many advantages of eDNA-based monitoring, it also has limitations. Several factors can influence the detectability of eDNA in the environment, leading to either false negatives (failed detection of species present in the area) or false positives (detection of species not present in sampled area). The probability of detection can be influenced by biotic and abiotic factors, including species-specific eDNA genera-

Metabarcoding of environmental DNA (eDNA) is a high-throughput DNA sequencing technique that has become increasingly popular in surveying marine ecosystems. An important advantage of using eDNA is the simplicity of sample collection: a relatively small volume of water, 2L, is needed. Unlike traditional DNA barcoding which identifies a single individual, metabarcoding simultaneously identifies multiple species, providing a broad overview of biodiversity. Genetic material shed by organisms in the ocean such as skin cells, scales, feces, gametes, and other organic material are found in sediments and near bottom (demersal) seawater. These are deposited over a time scale longer than a video clip, and may

Fig. 3. Scripps Institution's John D. Isaacs' baited camera free falls into the deep sea to reveal unknown fish species and other scavengers that are attracted to bait attached to the anchor in 1968. Isaacs' work showed that still images identified sea life, while film clips revealed behaviors. At a predefined time, the anchor is released and the camera system floats back to the surface where it is recovered.

Image courtesy of Scripps Institution of Oceanography/UCSD



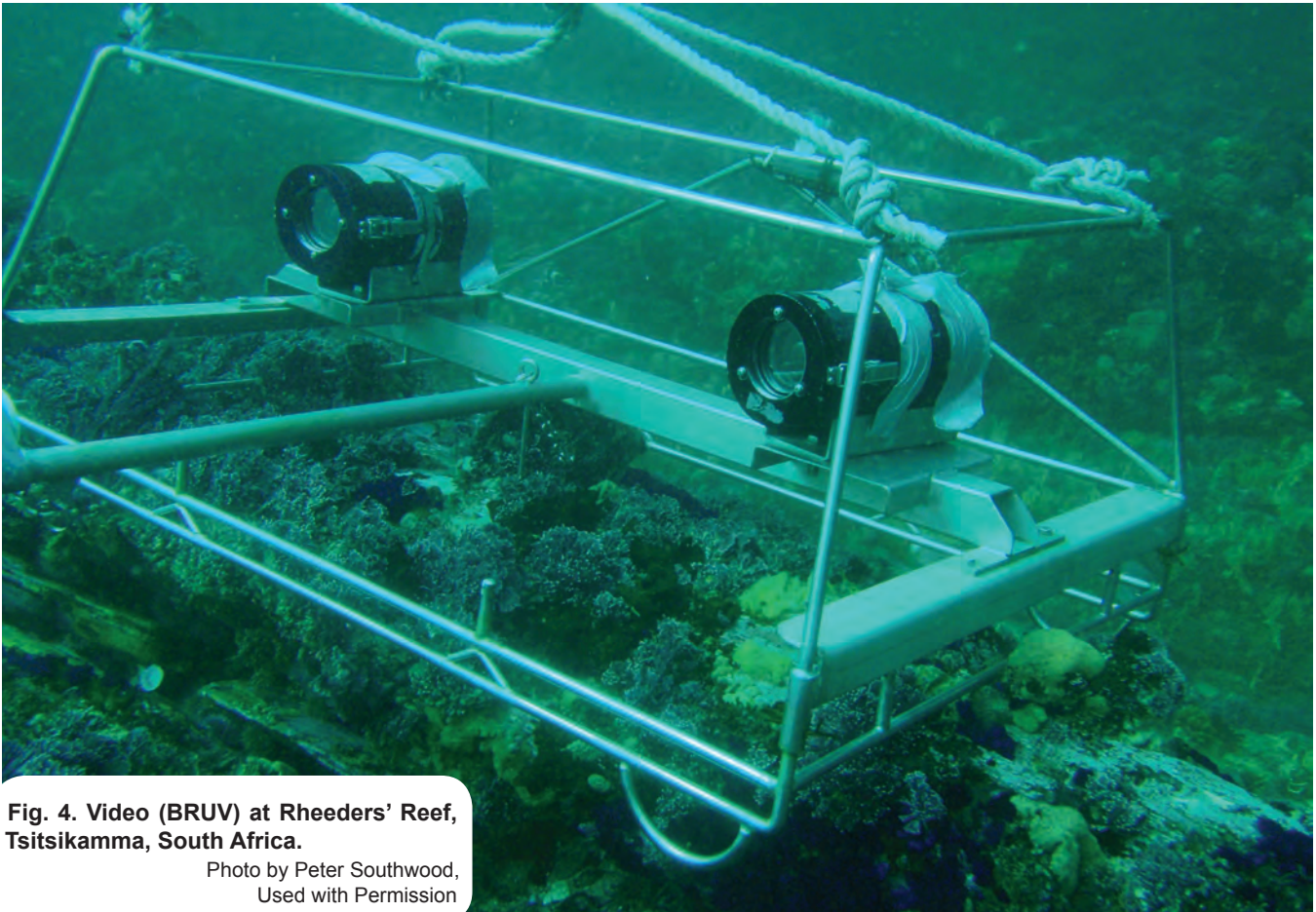


Fig. 4. Video (BRUV) at Rheeders' Reef, Tsitsikamma, South Africa.

Photo by Peter Southwood,
Used with Permission

tion and degradation, linked to body size, life history stage, diet and migration. The transport of eDNA by high tidal ranges or ocean currents and its rate of decay due to UV strength, pH and water temperature can also affect detection probability. Additionally, contamination of the sample is possible from sample collection through to processing.

Another limitation of eDNA is reference databases used to translate the operational taxonomic units (OTUs) are still incomplete, especially for species found in parts of the world where less research has been carried out.

The Sussex Bay, UK, Study, 2021

The objectives of this study were to: (1) compare species assemblage metrics obtained using BRUV and eDNA; (2) compare the sensitivity of two eDNA metabarcoding primers; (3) investigate the importance of eDNA replication and (4) compare the cost and effort required of both survey techniques for detecting the presence of marine vertebrate species.

Sussex Bay, on the south coast of the UK, was the site selected to test these biomonitoring methods. The presence of marine vertebrate biodiversity was examined at 29 different sites chosen by previous towed video transects. The samples

were collected between the 5th and 21st of July 2021, between 8 am and 5 pm.

In their study, a BRUV platform with three cameras was utilized, two looking in one direction, a third looking rearward. The video images were analyzed using footage from the right-hand camera only, using the left-hand camera in case the right camera failed or was obstructed by seaweed. As images were taken during daylight hours, no lights were used.

Three BRUV systems were deployed in succession by boat at each of the 29 sites, 150 m apart and left to film on the seafloor for up to 75 min. Fish and marine vertebrates were observed and identified to the lowest taxonomic level possible.

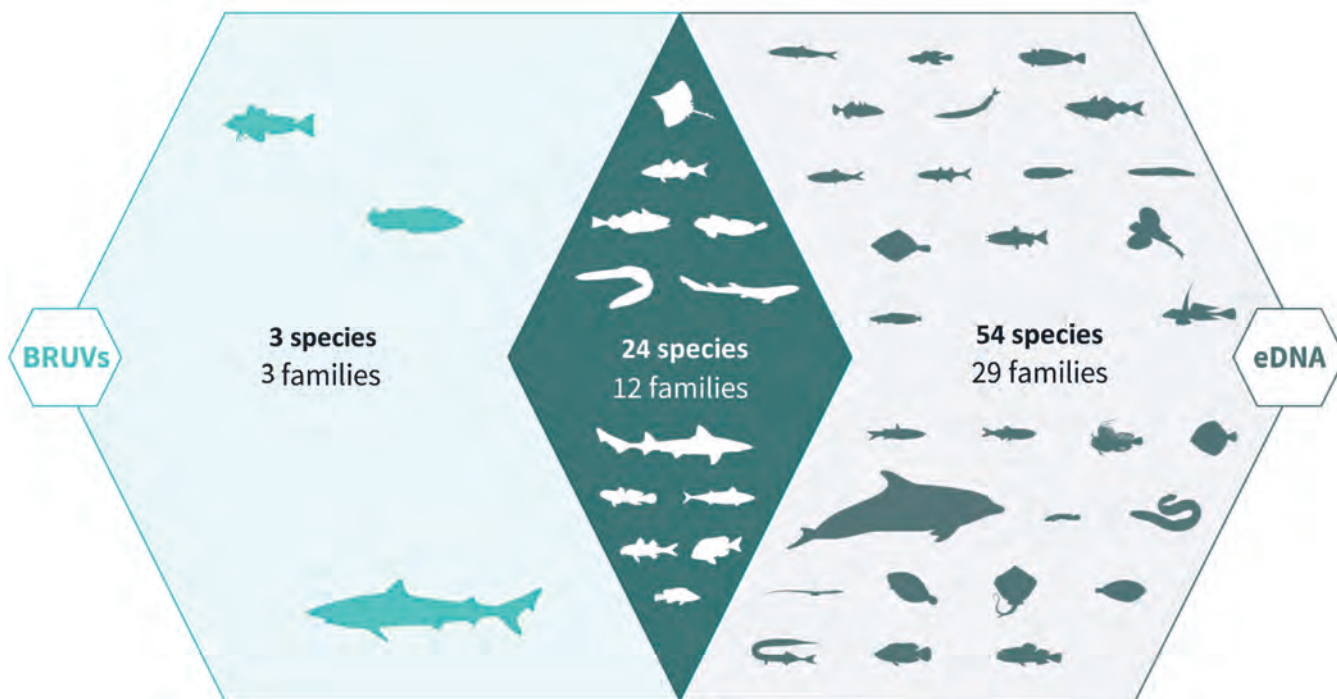
eDNA samples were collected at each of the 29 sites while the BRUV rigs were deployed. A Kemmerer sampler, triggered by a messenger weight, was used to collect water samples one meter above the seafloor. To minimize eDNA contamination and degradation, each sample was filtered immediately on the boat. In total, 87 BRUV deployments were carried out and 87 eDNA samples were collected in this study.

Results

Used together, eDNA Metabarcoding and video surveys

Fig. 5. Venn diagram of eDNA and BRUV species detections. Environmental DNA (eDNA) surveys captured the majority (78/81) of the species detected by both surveys, the center and right sections of the Venn diagram. BRUV surveys identified 27/81 species, the center and left sections of the Venn Diagram. Both methods identified the same 24 species belonging to 12 families.

Image used with permission. Infographic designed by Alice Clark in collaboration with NatureMetrics



offer strong potential to monitor ocean ecosystems at a variety of depths.

The Sussex Bay studies comparing eDNA and underwater videos found that BRUV surveys cost less overall, but that eDNA monitoring results in better value when accounting for the number of species detected. However, in contrast to BRUV surveys, the species detected by eDNA likely represent the species present within a larger geographical area than the specific site sampled, as noted above.

There may also be an inherent bias due to the time variation in the accumulation of eDNA material versus the time of day and length of the video sample. Also, bottom cameras are unlikely to see fish in the water column overhead.

Cost and Effort Comparison

The BRUV costs included building the camera rigs, the bait, the boat hire and the labor cost for video analysis. As the BRUV rigs were built the first year and plan to be reused the following four years, the first year is understandably more expensive than subsequent years.

The eDNA costs covered the Kemmerer sampler, the at-sea filtration system, the boat hire, and the eDNA kits, and the analysis by NatureMetrics. Again, the first year is more expensive than subsequent years as purchased equipment will

be reused year-to-year. The cost of carrying out the analysis in-house versus outsourcing the analysis was considered. Given a different level of expertise is required for BRUV video analysis than in-house eDNA analysis, the labor costs of each method were accounted for. The time taken to carry out the fieldwork was accounted for.

In the context of a five-year timeframe, the BRUV surveys proved to have the lowest cost compared to both outsourced and in-house eDNA surveys. Nevertheless, eDNA analysis detected a higher species richness, resulting in a lower cost per species detected, with the caveat of earlier described limitations.

When estimating the future costs over five years of sampling the effect of inflation or the likely decrease in cost of eDNA sequencing was not considered.

Equally, video technology is also likely to make great advancements in the coming years. Previous studies estimate the time spent on video footage analysis to be double the length of the recorded video. However, with the rapid development of deep learning and associated AI tools used to automate or partially automate video analysis, the time and effort used for analysis of video footage is likely to be reduced considerably. Camera technology is also becoming more affordable and increasing in resolution quality, allowing more precise identification of population characteristics.



Fig. 6. Cost comparison of BRUV surveys, eDNA surveys with in-house sample analysis and eDNA surveys with external sample analysis. Costs were broken down into three categories: equipment, field work and analysis. Overall, the BRUV survey was the most affordable biomonitoring technique, and eDNA with external sample analysis was the most expensive. Infographic was designed by Alice Clark in collaboration with NatureMetrics

Future Thoughts

A BRUV or ocean lander capable of both video imaging over a minimum 24-hour cycle and water sampling for eDNA, including topside filtering and preservation techniques identified by the Sussex Bay researchers, provides a cost-effective monitoring tool that may be used continuously for several years.

Citations

Clark AJ, Atkinson SR, Scarponi V, Cane T, Geraldi NR, Hendy IW, Shipway JR, Peck M. 2024. Cost-effort analysis of Baited Remote Underwater Video (BRUV) and environmental DNA (eDNA) in monitoring marine ecological communities. *PeerJ* 12:e17091

Full paper with citations may be found at *PeerJ* <<https://peerj.com/articles/17091/>>

Published April 30, 2024

“Lander Lab” is a hands-on column of Ocean Lander technologies and strategies, a unique class of unmanned undersea vehicles, and the people who make them. It is meant to serve the global ocean lander community in the manner of *Make Magazine* and other DIY communities.

Comments on this article, or suggestions for stories of interest to other Landereans are welcome. Other ocean lander teams are encouraged to write in about their work. MTR invites you to contact Kevin Hardy: email: khardy@marinelink.com

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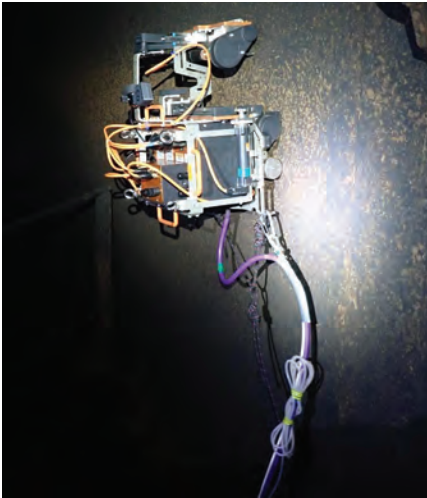
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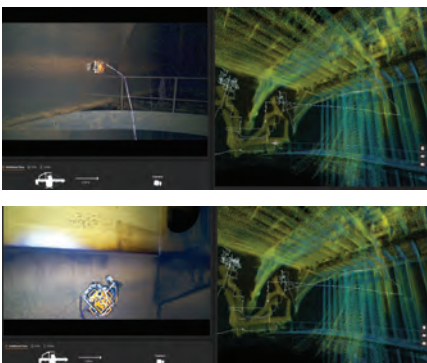


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SES is also launching the C-RECON 13-ES, a 4-meter, all-electric USV with integrated C-KONTROL payload backbone, C-Lock quick-mount system, and modular carbon-fiber hull.

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The Wilcoxon Sensing Technologies facility in Maryland supports sensitive and classified defense programs with strict quality and traceability standards. The Piezo Technologies facility in Indianapolis, Indiana, is dedicated to manufacturing high-performance piezoelectric ceramics and ultrasonic transducers.



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