

SEA TECHNOLOGY®

www.sea-technology.com

MAY 2022

**COMMUNICATIONS
TELEMETRY
DATA PROCESSING**

FEATURING:

New Applications for Consumer Tech

Digital Toolbox for Data

IoT for Remote Monitoring

Teledyne Geospatial
Imaging Solutions for Land and Water



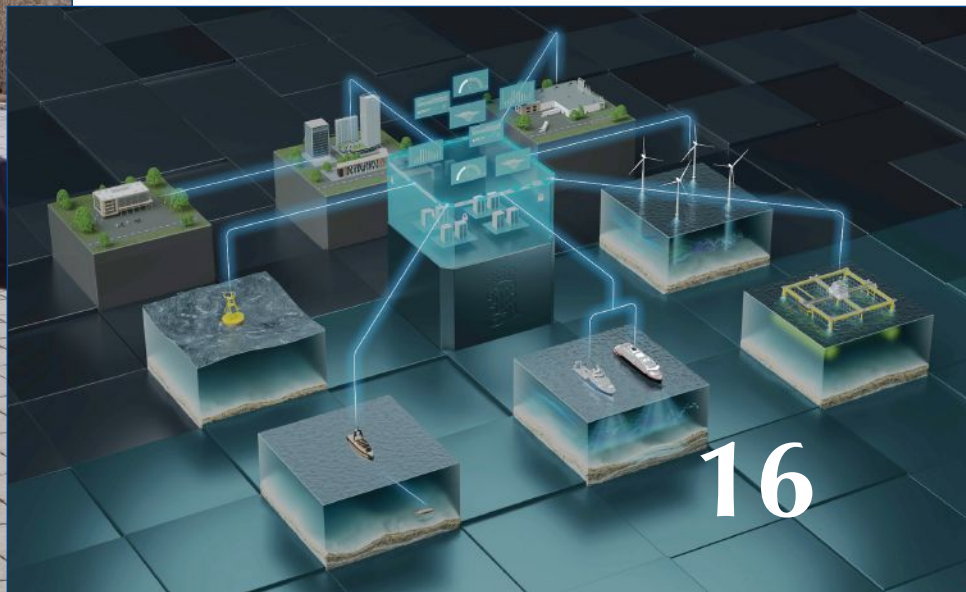
**FOR A LIMITED TIME GET A FREE
CARIS COLLECT SAAS LICENSE FOR
ONE-YEAR WITH THE PURCHASE
OF A NEW TLS-M3**

CARIS Collect offers a streamlined solution for the TLS-M3, including real-time display of georeferenced points and integrated controls for the TLS-M3 settings. The TLS-M3 is built with a weather-proof housing, internal heat system, and a long-range laser scanning capability that can reach up 2000 metres. CARIS Collect and the TLS-M3 can seamlessly integrate with existing multibeam systems to create a complete survey solution for the marine environment.

GET IN TOUCH WITH US TODAY AT
<https://www.teledynecaris.com/en/contact/contact-sales/>
TO SECURE THIS OFFER



© 2022 Teledyne Optech and Teledyne CARIS,
are both Teledyne Technologies companies. All rights
reserved. Specifications are subject to change.



CONTENTS

MAY 2022
Volume 63, No. 5

FEATURES

- 10** **A HELPING HAND FROM SPACE**
Gavan Murphy (*Globalstar*) reveals how satellite-based consumer tech supports ocean research.
- 16** **NEW DIGITAL TOOLS FOR OCEAN OBSERVING**
Leif Bildøy, Peer Fietzek and Tonny Algrøy (*Kongsberg Maritime*) introduce a cloud-based platform that supports science, industry and their collaboration.
- 21** **REVOLUTIONIZING COASTAL MONITORING**
Rachel Tracy (*In-Situ*) discusses a new era of buoy-based sensor technology and data management.
- 25** **GLOBAL CONNECTIVITY**
Wouter Deknopper and Dan Rooney (*Iridium*) show how Iridium Certus offers high-speed satcom for autonomous vessels.
- 28** **INCREASING ACCESS TO eDNA SAMPLING**
Nate Formel (*NOAA*) introduces new open-source technology now available to the public.

DEPARTMENTS

- | | |
|--|---|
| 6 Soundings | 39 Navy Currents |
| 7 Editorial | 40 Environmental Monitoring |
| 30 International | 41 Contracts/Meetings |
| 32 Offshore Oil & Ocean Engineering | 42 Professional Services Directory |
| 34 Marine Electronics | 43 Soapbox |
| 36 Product Development | 44 Advertiser Index |
| 38 Capital Report | |

COVER IMAGE

In January 2022, a New Zealand team deployed a telemetered hydrographic mooring of primarily RBR instruments beneath the Ross Ice Shelf through 600 m of ice into a 250-m-deep water column. (Credit: Craig Stevens, NIWA)

NEXT MONTH

AI data processing, hydroacoustics and sub-bottom profiling ... APACHE6 USV for 3D bathymetric surveys ... Instrument calibration at sea for ships ... USVs for offshore data collection ... Scientific unknowns in seabed mining.

Copyright 2022 by Compass Publications, Inc. *Sea Technology* (ISSN 0093-3651) is published monthly by Compass Publications, Inc., 4600 N. Fairfax Dr., Suite 304, Arlington, VA 22203; (703) 524-3136. All rights reserved. Neither this publication nor any part of it may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior permission of Compass Publications Inc. Periodicals postage paid at Arlington, Virginia, and additional mailing offices. Due to the COVID pandemic, printed issues will not be available in 2021. Digital subscriptions may be purchased for US 40 for one year. Printed back copies, where available, are US 6.00 each plus shipping and handling.



Sea & Sun
Technology

- » CTD PROBES
- » MSS PROBES
- » SENSORS
- » EQUIPMENT
- » CALIBRATION
- » SERVICE



up to 11.000 m



- » conductivity
- » temperature
- » pressure
- » oxygen
- » turbidity
- » pH, Redox
- » fluorometers
- » and much more



sales@sea-sun-tech.com
+49 4323 910 913

)) SEC Proposes Public Companies Disclose Climate Risks. The U.S. Securities and Exchange Commission is considering a proposal to mandate climate risk disclosures by public companies. The proposed rules would require disclosures about a company's governance, risk management and strategy with respect to climate-related risks. Moreover, the proposal would require disclosure of any targets or commitments made by a company, as well as its plan to achieve those targets and its transition plan, if it has them. The proposal would provide investors with consistent, comparable information for making their investment decisions and would provide consistent and clear reporting obligations for issuers. The proposal would help issuers more efficiently and effectively disclose these risks and meet investor demand, as many issuers already seek to do. One report found that nearly two-thirds of companies in the Russell 1000 Index, and 90 percent of the 500 largest companies in that index, published sustainability reports in 2019 using various third-party standards, which include information about climate risks. SEC staff, in reviewing nearly 7,000 annual reports submitted in 2019 and 2020, found that a third included some disclosure related to climate change.

)) New Equity Fund for Blue Economy. InvestEU Blue Economy, the scaled-up equity initiative that builds on the BlueInvest Fund pilot under the European fund for strategic investments, brings together the European Maritime, Fisheries and Aquaculture Fund, the European Investment Bank (EIB) Group and InvestEU finance, thereby mobilizing an additional €500 million of EU funds for financial intermediaries investing in this sector. The InvestEU Fund aims to mobilize more than €372 billion of public and private investment through an EU budget guarantee of €26.2 billion that backs the investment of implementing partners, such as the EIB Group and other financial institutions. BlueInvest is a platform and accelerator to foster innovation and investment in sustainable technologies for the blue economy. It provides investment readiness support and access to finance for early-stage businesses, SMEs (small and medium-size enterprises) and scale-ups. BlueInvest is enabled by the European Maritime and Fisheries Fund.

)) NOAA Launches New Chart Display Service. The new NOAA Chart Display Service (NCDS) renders NOAA electronic navigational chart (NOAA ENC) data with "traditional paper chart" symbology in online and offline applications for which a basemap of nautical chart data is desired, including GIS, web-based and mobile mapping applications. The new service uses symbols, labels and color schemes familiar to those who have used NOAA paper nautical charts or the NOAA Custom Chart application. NCDS is available as Esri REST Map Service, OGC Web Map Service and MBTiles formats. NOAA is developing its own online NCDS viewer that will enable users to easily pan and zoom through U.S. ENC data rendered by the NCDS. The NCDS replaces the Raster Navigational Chart (RNC) Tile Service and the Seamless RNC Service. These services were shut down in March as part of NOAA's continuing transition away from traditional paper and raster nautical charts in order to focus on improving and modernizing ENC coverage. Production of all traditional paper and raster charts will end by January 2025.

)) Approval for Fully Autonomous Ship Framework Concept. ClassNK has granted the approval in principle (AiP) for a fully autonomous ship framework (development code "APEXS-auto") jointly developed by Nippon Yusen Kabushiki Kaisha (NYK), MTI Co. Ltd. (MTI) and Japan Marine Science Inc. APEXS-auto is a framework of the concept for realizing a fully autonomous ship by automating a series of processes required for ship operation, including information gathering, analysis, planning, approval and execution. ClassNK has been involved in various demonstration projects to support the development and implementation of automated and autonomous ship operation technologies from a safety perspective and has worked to establish the necessary safety standards. In 2020, ClassNK issued the AiP for a crewed autonomous ship framework (development code "APEXS") developed by NYK and MTI.

)) Project NEMO to Map Most Remote, Inaccessible Ocean Areas. The Nippon Foundation-GEBCO Seabed 2030 Project (*Sea Technology*, January 2022) and Seatrec have launched Project NEMO (Novel Echosounder to Map the Ocean) as part of a new memorandum of understanding. The project will aid ocean mapping in some of the world's most remote and inaccessible areas. Seatrec has brought together an interdisciplinary team of scientists and engineers to develop an autonomous profiling float with an echosounder to map the seafloor. The novel thermally recharging echosounder float, called NEMO, is the integration of three technology breakthroughs over recent years: autonomous profiling floats as demonstrated by the Argo program; the innovative echosounder designed by Airmar Technologies in collaboration with Innomar Technologies; and the transformative ocean thermal energy harvesting technology developed by Seatrec. Project NEMO will start with a pilot demonstration deploying a cluster of NEMO floats to cover an area around Point Nemo in the South Pacific, the most remote location in the ocean. Upon a successful pilot demonstration, the NEMO float clusters can be deployed at selected locations to map the gaps in seafloor bathymetry. Seabed 2030 is a collaborative project between The Nippon Foundation and GEBCO to inspire the complete mapping of the world's ocean by 2030 and to compile all bathymetric data into the freely available GEBCO Ocean Map. **ST**

publisher
managing editor
production manager
assistant design/
website manager
advertising
service manager

C. Amos Bussmann
Aileen Torres-Bennett
Russell S. Conward
Joshua Ortega

Susan M. Ingle Owen

ADVERTISING REPRESENTATIVES:

HEADQUARTERS

C. Amos Bussmann
4600 N. Fairfax Dr., Suite 304
Arlington, VA 22203-1553
Tel: (703) 524-3136
seatechads@sea-technology.com

EASTERN U.S.A. & CANADA/G.O.M.

Ray Mahr, Jr.
KRK Consultants Ltd.
17476 Slipper Shell Way, Ste. 6
Lewes, DE 19958
Tel: (302) 569-0019 (M)
rmahrjr@gmail.com

WESTERN U.S.A. & CANADA

John Sabo
Barbara Sabo
Gregory Sabo
John Sabo Associates
447 Herondo St. #305
Hermosa Beach, CA 90254
Tel: (310) 374-2301
bsabo@jsaboassoc.com

EUROPE

John Gold
John F. Gold & Associates
"Highview"
18a Aultone Way
Sutton, Surrey, SM1 3LE, England
Phone/FAX Nat'l: 020-8641-7717
Int'l: +44-20-8641-7717
johnfgold@gmail.com



Sea Technology back issues available on microform.

Contact: NA Publishing, Inc.
P.O. Box 998, Ann Arbor, MI 48106-0998
1-800-420-6272

COMPASS PUBLICATIONS, INC.

4600 N. Fairfax Dr., Suite 304
Arlington, VA 22203-1553
Tel: (703) 524-3136
oceanbiz@sea-technology.com
www.sea-technology.com

publishers of:
Sea Technology
Commercial Fisheries News
Fish Farming News
Commercial Marine Directory
Fish Farmers Phone Book/Directory
Sea Technology Buyers Guide/Directory
Sea Tech e-News

*Celebrating more than 58 years
of serving the global ocean community
- Since 1963 -*

Inspiring Innovation by Immersing Youth in STEM

Founded in 1973, the National Inventors Hall of Fame (NIHF) exists to honor Our Nation's Greatest Innovators and to inspire and empower the next generation of inventors through hands-on STEM education programs. Our organization takes great pride in infusing insights from NIHF Inductees—visionary inventors with diverse cultural and professional backgrounds—into our programs. Their stories and video messages with invention challenges and seeds of invention wisdom are seamlessly integrated into each year's brand-new curriculum for Camp Invention, our nationwide STEM summer camp for children in kindergarten through sixth grade.

According to Opportunity Insights, a nonprofit research organization based at Harvard University, exposure to innovation from an early age greatly increases the potential for children to become inventors. By introducing children to great innovators, we give them direct exposure to key tenets of the Innovation Mindset: confidence, creative problem solving and persistence.

For this year's Camp Invention program, for example, we've crafted an experience called Robotic Aquatics featuring three NIHF Inductees you might know very well: Jacques-Yves Cousteau, Emile Gagnan and Harold Froehlich.

Inducted for co-inventing the modern demand regulator used in diving, the team of Cousteau and Gagnan enabled the development of the Aqualung, which enabled safer and deeper dives. In many ways, this technology made the underwater world accessible to the everyday person. Cousteau's wealth of underwater exploration experience combined with Gagnan's engineering expertise made for a powerful combination, and their invention was made possible because of their teamwork and collaboration.

While participating in Robotic Aquatics, Camp Invention participants are primed for teamwork through a video that highlights Gagnan and Cousteau's collaboration. The co-inventors also are featured in each camper's Inventor Log, a tool that encourages children to write and sketch their ideas for the invention prototypes they develop throughout the week.

The Inventor Log also introduces campers to Froehlich's deep-sea submersible, Alvin. Developed while Froehlich was working at General Mills, which had begun operating a number of aeronautical research labs in 1946, Alvin's design included a novel and buoyant material called syntactic foam, a mechanical arm, and propulsion units enabling forward, horizontal and vertical movement. The design included Plexiglas windows, a detachable steel cockpit and landing skids to rest on the ocean floor. Since its first dive in 1964, Alvin has helped scientists map the Mid-Atlantic Ridge, discover hundreds of new species, locate the missing RMS *Titanic* and conduct environmental waste studies. Thanks to its revolutionary design and continuous modifications, Alvin, the longest operating deep-sea submersible, is still in use today.

In Robotic Aquatics, Alvin offers inspiration to children as they create their own "aqua innovations"—prototypes of devices that operate on or in the water. Campers get customized stickers with portholes and other features and mechanics they can add to their creations for a more realistic design of a submersible or other underwater equipment.

Camp Invention gives youth exposure to existing technology so that they can envision what might be next. When we help children discover more about what already is, we empower them to imagine what might be. As our quest to further explore, understand and protect our world continues, we must give tomorrow's innovators the access, skills, tools and hope they need to succeed. This mission is our real expedition. **ST**

SEA TECHNOLOGY® 2022

ADVERTISING CLOSES ON THE 15TH OF THE MONTH PRECEDING ISSUANCE

JANUARY

Annual Review & Forecast

**OCEANS 2022 Chennai, February 21-24, Chennai, India

FEBRUARY

Instrumentation: Measurement, Processing & Analysis

**Oceanology International, March 15-17, London, Excel, U.K.

MARCH

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

**AUVSI XPONENTIAL 2022, April 25-28, Orlando, FL

APRIL

Offshore Technology/Alternative Energy & Ocean Engineering

**Offshore Technology Conference, May 2-5, Houston, TX

MAY

Communications, Telemetry, Data Processing

**Undersea Defence Technology (UDT), June 7-9, Rotterdam, The Netherlands

**EUROMARITIME, June 28-30, Marseille, France

JUNE

Seafloor Mapping/Sonar Systems/Vessels

**Sea Technology supports these shows via media partnerships.

BONUS INFORMATION TO KEEP OUR READERS UP-TO-DATE

- | | | |
|----------------------------|---------------------|-----------------------|
| • Capital Report | • Marine Renewables | • Ocean Engineering |
| • Company Profiles | • Marine Resources | • Ocean Research |
| • Contracts | • Meetings | • People |
| • Environmental Monitoring | • Navy Currents | • Product Development |
| • International | • Ocean Business | • Soapbox |

EDITORIAL CONTACT: Aileen Torres-Bennett, oceanbiz@sea-technology.com

Compass Publications, Inc., 4600 N. Fairfax Dr., Suite 304, Arlington, VA 22204

1963 – 2022 Celebrating More Than 58 Years

22

Editorial Calendar

UE DATE

JULY

Deck Gear, Cable, Connectors, Power Systems & Salvage

****CLEAN PACIFIC 2022**, August 23-24, Renton, Washington

AUGUST

Geophysical Exploration/Seafloor Engineering

****IMAGE '22**, August 28-September 2, Houston, TX

SEPTEMBER

Ocean Resources Development & Coastal Zone Management

****OCEANS 2022 Hampton Roads**, October 17-21, Virginia Beach, VA

****EURONAVAL**, October 18-22, Paris, France

OCTOBER

Environmental Monitoring, Remote Sensing & Pollution Control

****CLEAN GULF 2022**, November 8-10, New Orleans, Louisiana

****Offshore Energy 2022**, November 29-30, Amsterdam, The Netherlands

NOVEMBER

Undersea Defense/Antisubmarine Warfare

DECEMBER

Diving, Underwater Vehicles & Imaging

Follow Us On:



OTHER OPPORTUNITIES

- Advertorials
- Sea Technology Buyers Guide/Directory
- Sea Tech e-News
- Commercial Fisheries News
- Fish Farming News

- Fish Farmers Phone Book/Directory
- Commercial Marine Directory
- Direct mail list rentals
- Article reprints/PDFs
- Banner and skyscraper Web ads
- Sponsored e-blasts

• **ADVERTISING CONTACT:** Sue Ingle Owen, seatechads@sea-technology.com

ngton, VA 22203-1553 • Tel: 703.524.3136 • sea-technology.com

ars of Serving the Global Oc ty

A Helping Hand from Space

Satellite-Based Consumer Tech Supports Ocean Research

By Gavan Murphy

Researchers worldwide are feverishly studying Earth's oceans to understand their health and how climate change is affecting biodiversity. In doing so, they're taking advantage of advanced technologies in innovative, highly creative ways.

As scientists seek to stretch their budgets, low-cost consumer devices based on satellite tech and originally conceived to keep cars and motorbikes from being stolen are now being deployed worldwide to enhance oceanographic knowledge. A winning combination of affordable state-of-the-art satellite tech and the Internet of Things (IoT) is helping researchers around the world.

Ocean Drifters Monitor Currents, Biodiversity

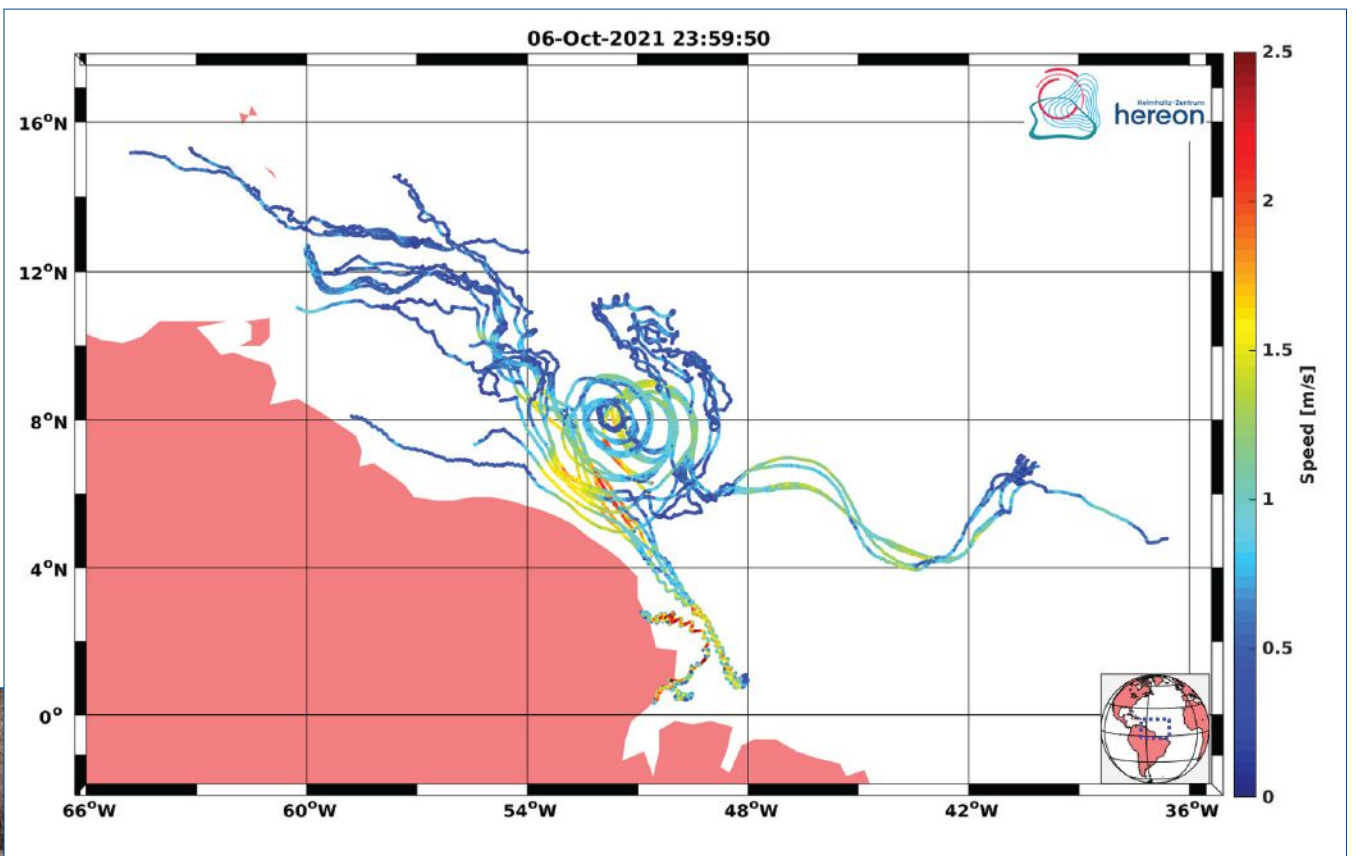
Scientists at the Helmholtz Center Hereon, a non-profit research institution in Germany, have designed and engineered innovative ocean drifter devices, or surface floats, built around a low-cost consumer satellite tracker. The drifters are fitted with an underwater sail suspended at half-a-meter depth, and they report their position every 5 min. This enables monitoring of ocean surface currents and reveals how biodiversity varies in the world's rivers and seas.

"Our purpose is to understand in greater detail the surface flow of water and organisms around the globe," explained Dr. Jochen Horstmann, a scientist at Hereon.

U.S.-headquartered Globalstar is a leading provider of satellite technology with a fleet of satellites traversing the globe in low Earth orbit at 1,400 km high. Globalstar's customers operate in industries such as oil and gas, transportation and maritime, as well as in governments and NGOs. The company provides commercial-grade, satellite-enabled asset tracking and worker safety solutions.

At the heart of Globalstar's heritage is low-cost consumer devices. In addition to its popular hand-held tracking products featuring SOS and emergency rescue services (gadgets for people involved in dangerous sports and wilderness-based hobbies), it created SPOT Trace,





(Left) Hereon drifter with SPOT Trace embedded to monitor ocean currents and biodiversity. (Above) Hereon drifter tracking, October 2021.

a small anti-theft device that can be discreetly mounted on a valuable item, such as a car or motorbike. This unassuming little device is playing a pivotal role in ocean science.

"We already have a reasonable idea of how currents work from satellite imagery and numerical models. However, we need reliable measurements of surface currents to better understand their processes and to improve our models," Horstmann said.

"As researchers, we always strive to get best possible value for money in the equipment we use, not only for us but for those governments, institutions and private individuals who fund our work. We needed drifters that were economical, but when we looked at the devices already available in the market, they were typically very expensive, so we decided to build our own."

Horstmann and his colleagues knew they needed to build drifters capable of capturing and transmitting data even in extreme ocean conditions. "Our drifter has to be robust enough to endure the elements, in particular severe winds and waves," explained Horstmann.

The drifters' position information is transmitted via Globalstar's satellites. "By looking at the data

transmitted by the SPOT Trace-equipped drifters, we see where water and the organisms being carried flow and how biodiversity is affected," Horstmann said. Because SPOT Trace uses 100 percent satellite technology, it can communicate waypoints from even the most remote locations.

Hereon is also collaborating with the EU-funded AtlantECO project. The focus of AtlantECO is the Microbiomes experiment. Marine microorganisms play an essential role in the ocean ecosystem, representing more than two-thirds of marine biomass. They are the first link in an immense food chain, feeding a good part of humanity; they also capture atmospheric CO₂ and deliver half of the oxygen we breathe every day.

"Over a billion microorganisms live in every liter of seawater, and thanks to plankton, the ocean absorbs 25 percent of the CO₂ emitted by humans," explained Dr. Paulo Calil, a Hereon scientist. "But while an essential cog in the great climate machine, the functioning of this microbial world remains largely unknown."

"Our oceans are changing: They are becoming hotter on the surface because of climate change, and they are becoming more stratified," Calil said. Changes in ocean currents affect transport and connectivity patterns. Satellite-based studies are helping researchers understand the role of currents in ocean biodiversity. "Currents transport nutrients, they mix the ocean, bringing phytoplankton to the surface and redistributing the nutrients horizontally, igniting surface phytoplankton blooms," Calil explained.

DNA analyses of water samples from various depths reveal genetic composition in different locations and current sections. By tracking how the organisms travel,

scientists can see how oceans and currents are connected, and how currents help connect different species.

“There are widespread consequences of changes in currents for marine productivity, which in turn affects carbon levels and the whole ‘machinery’ of the ocean, as well as weather patterns,” Calil added. Additionally, many areas can be impacted economically, such as those related to fisheries.

Hereon’s drifters have shown that organisms travel extremely far due to intensifying currents. For example, in the South Atlantic, swirling eddies that form on the southern tip of Africa are seen to spread species all the way to eastern South America. Physical oceanographers, microbiologists, biologists, geneticists and biological oceanographers are all benefiting from this research.

SPOT Trace’s energy efficiency is playing a crucial role here: “Even after 150 days in the ocean, the drifters continue to send data, despite being subject to very rough conditions. We’re really impressed with this technology,” Horstmann said.

Tracking Plastic Pollutants in the North Sea

A team from Germany’s University of Oldenburg Institute for Chemistry and Biology of the Marine Environment has been studying the movement of plastics in the North Sea using the SPOT device.

“We embed low-cost satellite trackers into floating buoys, and these provide a wealth of information on the movement of plastics on the sea’s surface. This helps us understand how debris moves and how it’s affected by complex interactions of wind, current and tides,” said postdoctoral researcher Jens Meyerjürgens.

The SPOT device is fitted inside the buoy’s housing, directly below the cap. As in other studies, the cap stays above water so the device retains a stable connection with Globalstar’s spacecraft. The other component in the buoy is a long-life battery pack that provides up to five months of power.

SPOT Trace includes an integrated GPS receiver, simplex transponder and motion sensor. It is an IoT solution: Data gathered from the movement of the buoys across the water are transmitted to Globalstar satellites, then to Globalstar’s land-based Earth stations and then to SPOT’s website. The team exports data from the website, refines the data using numerical computing software, and plots the data on maps. The resultant analysis not only shows where the plastic is traveling but also how fast.

Sophisticated modeling tools simulate complex ocean currents at the surface to reflect movement of waste. For



Compact rugged SPOT Trace from Globalstar.

a truly comprehensive picture, the simulation is in 3D, examining depth and wave height, too.

“It is important that we look at how debris travels in the water column and on the sea-floor,” Meyerjürgens said. The resulting data set adds valuable granular detail to projections of surface drift behavior. “We aim to make reliable predictions based on multiple algorithms and mathematical analysis.”

The University of Oldenburg team measures wave height with a wave radar array on the island of Spiekeroog to understand the wave field structure in the coastal zone of the southern North Sea. Modeling specialists compare established models for North Sea current behavior with an existing wave model. These data are combined with wind data to capture the effects of atmospheric forcing as well. The team interprets data from the drifters to analyze and record velocity, tide metrics, wave movement and wind.

Other partners in the project, funded by Lower Saxony’s Ministry for Science and Culture, are tasked with analyzing the composition of ocean pollutants, measuring the relative amounts of plastic bags, bottles and non-plastic pollutants, such as metal, while others take care of removal.

“Seventy-five percent of the debris that washes ashore on our islands is plastic, mostly from fishing activity,” said Mathias Heckroth, managing director of Mellumrat e.V., an NGO dedicated to conservation and scientific research of the uninhabited island of Mellum, one of the 32 Frisian Islands in the North Sea being studied by the University of Oldenburg team. Mellum is situated in the intertidal Wadden Sea, a UNESCO World Heritage Site protecting more than 10,000 species of plants and animals, from microscopic organisms to fish, birds and mammals. Up to 12 million migrating birds spend time on Mellum each year.

One of the most revealing discoveries has been how quickly some buoys washed ashore, some beaching only one month after traveling up to 700 mi. “It was clear that the influence of the wind on the movement of debris is greater than anticipated,” said Meyerjürgens.

Heckroth cited the study as playing an important role in helping identify the sources of plastic litter. It also reveals unexpected drift movement: “For example, we usually have a west-to-east drift, but sometimes tracking reveals drift in the opposite direction, and we’re studying why,” Heckroth added.

Responsibility for cleaning beaches resides with local governments, which always face tightening spending budgets. Having a clearer understanding of the plas-

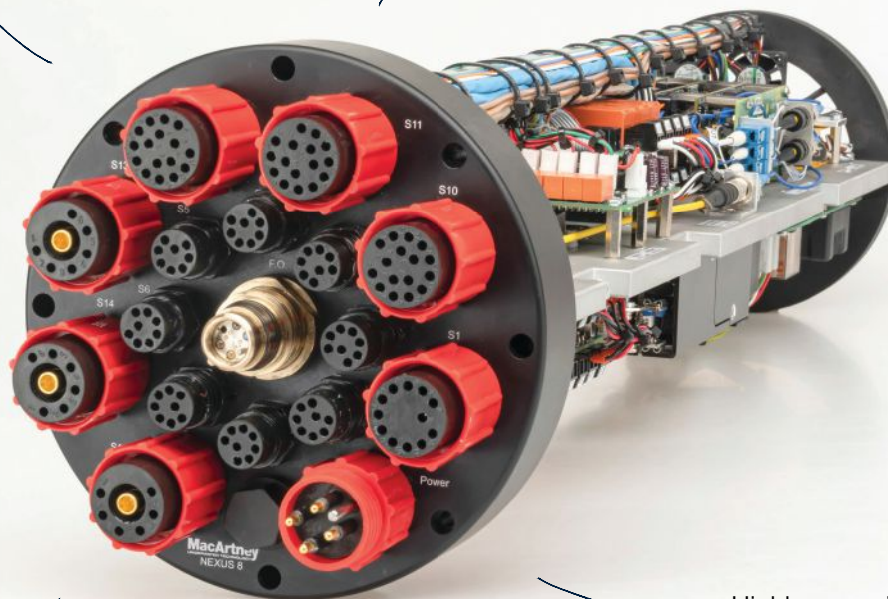


NEXUS

Compact and highly versatile multiplexer

Developed with support from customers and end-users

Ultra-high bandwidth



Highly versatile and future proof

Intelligent programmable eFuses

Depth rating up to 6,000 metres

MacArtney global solutions

Denmark | Norway | Sweden | United Kingdom
France | Italy | Germany | Netherlands | USA
Canada | Brazil | India | Singapore | China | Australia





(Above) A team from Germany's University of Oldenburg Institute for Chemistry and Biology of the Marine Environment has been studying the movement of plastics in the North Sea using SPOT Trace. (Left) Beached plastic debris on the German island of Mellum.

tics' movement patterns will help improve efficiency of cleanup initiatives. Another hoped-for benefit from these studies is more robust pollution legislation and impactful decontamination programs.

Tagging Trash in Lake Ontario

The University of Toronto's "Trash Team" is also engaged in an innovative study of plastic pollution. Another low-cost Globalstar satellite tracker, SmartOne C, is being used to understand sources of plastic litter and reveal the pathways of plastics in Toronto Harbour on Lake Ontario.

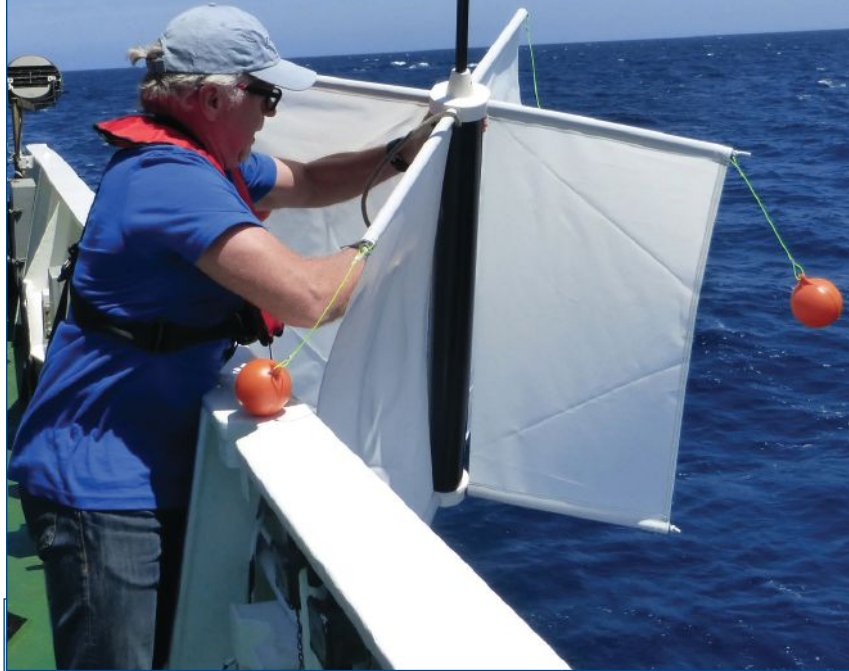
In spring 2021, the University of Toronto team deployed several "blender bottles" at strategic locations around the harbor. The GPS-tagged bottles were designed to represent floating plastic litter. The team uses

the data captured to discover movement patterns and litter accumulation zones.

Trackers are embedded in airtight, bright orange bottles, housed on a small platform and secured so the trackers constantly face the sky and the satellites. Cloud-based mapping provides location data captured at scheduled tracking intervals. This provides the team with waypoints marking the location of each bottle every hour. Automated reporting from Globalstar's user interface enables the team to look at historical reports, taking weather, wind and other environmental factors into consideration. The SmartOne C has a motion sensor, comparative GPS positions and custom-configured sensors to gather and transmit asset status information from the bottles.

"It's evident that Toronto Harbour has a trash problem," said Cassandra Sherlock, a Trash Team member.

SPOT Trace helps NATO oceanography researchers. (Below) SPOT Trace deployed in Sargassum research. (Credit: E. Zettler, NIOZ)



nology Organization - Centre for Maritime Research and Experimentation (STO-CMRE), based in La Spezia, Italy, (*Sea Technology*, January 2022) embed SPOT Traces in buoys and set them afloat in Mediterranean and Arctic waters. The data help STO-CMRE to understand currents and the changing sea environment, and inform NATO's operational planning.

The research examines the seas' horizontal motion and how surface properties are transported deeper into the water column, leading to greater understanding of maritime characteristics: temperature, acoustic propagation, and the movement of phytoplankton and pollutants.

NATO STO-CMRE has conducted several studies in parallel. One, sponsored by the U.S. Office of Naval Research, deployed SPOT Trace-equipped drifters to study the Alboran Sea, between the Iberian Peninsula and North Africa. STO-CMRE also uses buoys in the Barents Sea for research fundamental to safe Arctic traffic routes.

Elsewhere, the Royal Netherlands Institute for Sea Research (NIOZ), University of Amsterdam and Utrecht University use SPOT Trace to understand how climate change has led Sargassum seaweed to bloom dramatically, killing coral, impacting fishing and forcing beach closures (e.g., in the Caribbean and U.S.).

All life depends on the health of our seas, and these studies show how new applications for low-cost consumer devices can support research on ocean health. Fortunately, technological innovation, enabled by satellite communications, is leading to new scientific discoveries and enhanced understanding of maritime ecosystems. **ST**

"The data we're collecting is helping inform placement of trash capture devices, such as Seabins, to divert litter away from Lake Ontario. The data also help us understand where litter enters the water, how it moves from point A to B, and areas where it eventually accumulates."

Other Projects

In another example of SPOT technology supporting ocean research, teams from NATO's Science and Tech-

Gavan Murphy is the director of marketing for Europe, the Middle East, Africa and Asia-Pacific at Globalstar. Based at Globalstar's European headquarters in Dublin, he spearheads marketing strategy for SPOT tracking solutions and IoT solutions for vertical sectors, including maritime, energy, safety and security, transport, and heavy industry. Prior to joining Globalstar in 2008, Murphy was channel development and category manager at Vodafone.



New Digital Tools for Ocean Observing

Cloud-Based Platform Supports Science, Industry and Collaboration

By Leif Bildøy • Peer Fietzek • Tonny Algrøy

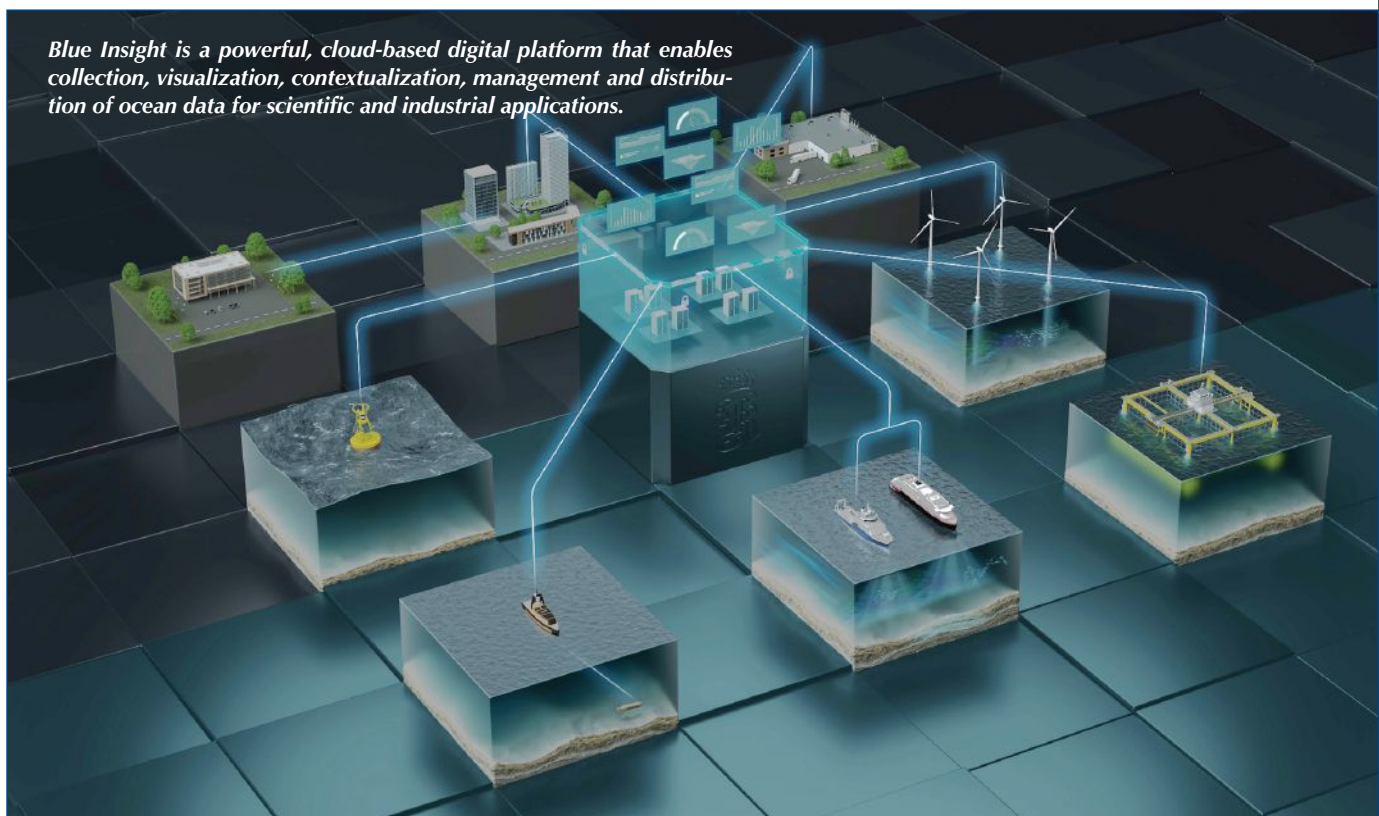
Kongsberg Maritime (KM) has launched a powerful, cloud-based digital platform called Blue Insight to enable state-of-the-art collection, visualization, contextualization, management and distribution of ocean data. Focusing on marine and meteorological information, Blue Insight is of key value to both scientific and industrial users of the maritime environment. It is an open, modular platform. The core module contains the cloud framework, built to the highest cybersecurity standard, and application-specific dashboards, teamed with data

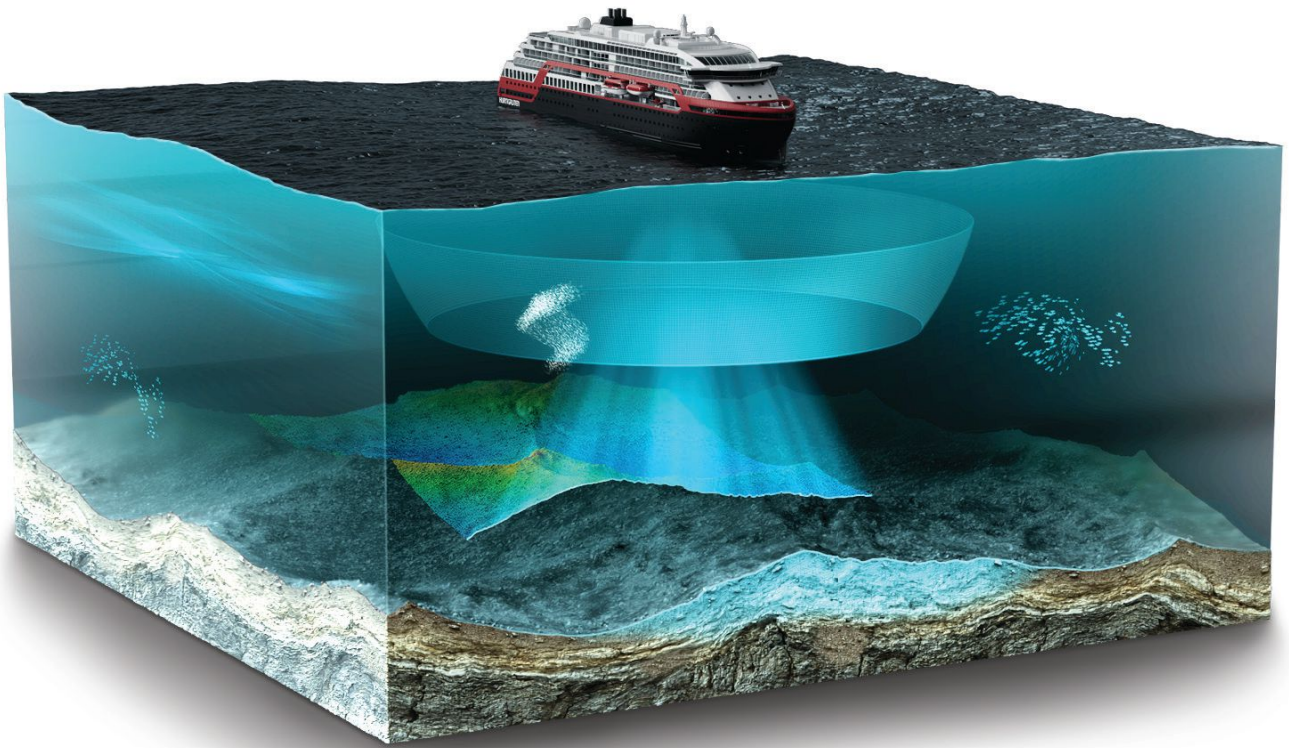
storage and management functionalities. Modules can be added to this framework to tailor Blue Insight's functionality to suit and digitally enhance various projects, however large or small. Blue Insight targets typical users of KM gear, such as underwater acoustics, and it interfaces with and smoothly handles data from other third-party sensor types based on customer requirements.

Design

Blue Insight's development began as part of the One

Blue Insight is a powerful, cloud-based digital platform that enables collection, visualization, contextualization, management and distribution of ocean data for scientific and industrial applications.





Ocean Expedition, an activity endorsed by the UN Decade of Ocean Science for Sustainable Development. The expedition is a circumnavigation by the Norwegian tall ship *Statsraad Lehmkuhl*, which serves as a sail training ship and state-of-the-art research vessel (*Sea Technology*, December 2020), with the purpose of creating attention for and sharing knowledge about the crucial role of the ocean in a global sustainability context. In this expedition, Blue Insight enables data collection and efficient data sharing in real time, including livestreaming.

Data can be collected from any platform, ranging from crewed to autonomous surface vessels to underwater vehicles, such as AUVs or gliders. Through ongoing delivery projects, several modules already exist to assist customers in obtaining the best efficiency gains and results from Blue Insight.

Key to Blue Insight's data-streaming functionality is the concept of onboard sensor fusion (which exists as a module in the platform), by which data are streamlined from various onboard sensors and local databases for seamless transmission to the cloud. The Sensor Remote module enables Blue Insight to link with KM onboard sensors, such as echosounders, via a web interface enabling remote control and checking their status and health.

The Ocean View module is a powerful and comprehensive web-based visualization tool for historic and real-time sensor or database graphs, 2D map projections and 3D visualizations.

The Data Forwarder module enables data conversion into any common format and automated data forwarding to external cloud systems or databases.

Science Analytics is another module, and it supplies an infrastructure for more in-depth data-handling capabilities, such as the implementation of machine learning and AI-enhanced data analysis on board or in the cloud. As

A vessel of opportunity collects environmental data by means of active acoustic sensors. Blue Insight facilitates data collection and processing, as well as remote instrument control.

an example, one of the first delivery projects has seen the module providing a framework on Norway's Institute of Marine Research USVs for the automated onboard classification of fish "on the fly," facilitating the transition from reliance on research ships to being able to use robots to collect data for biomass studies. This specific application example further benefits from the Sensor Remote module for the remote control of the robots' main acoustic instruments (www.kongsberg.com/maritime/the-full-picture-magazine/2021/5/digital-future-for-ocean-research).

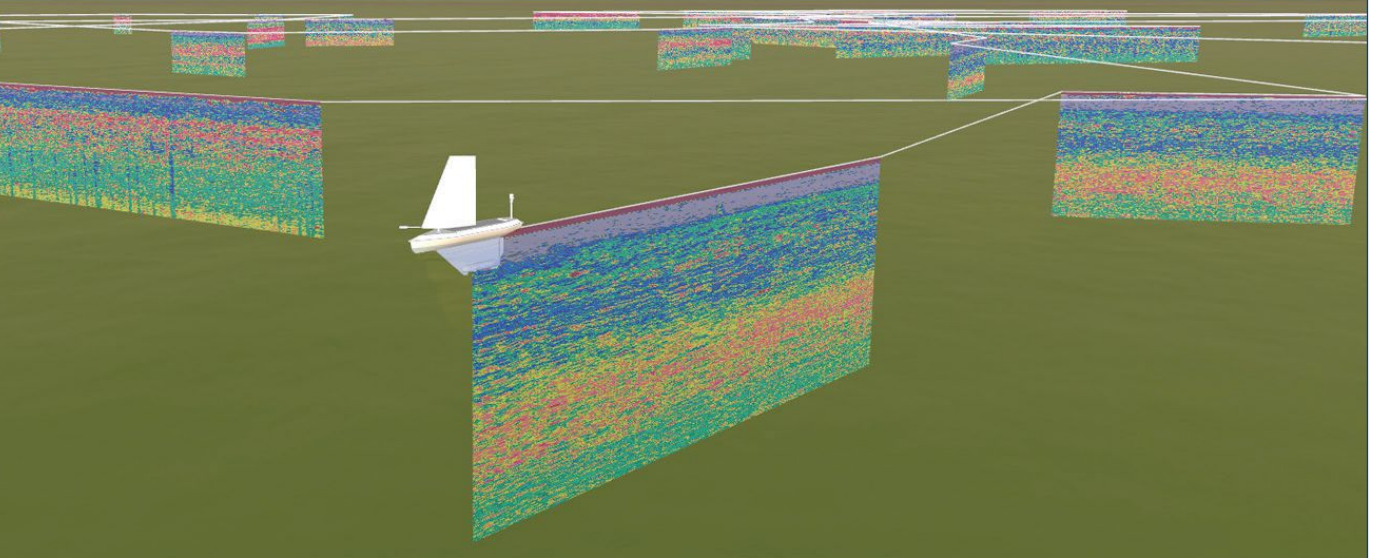
The portfolio of modules and support for specific instruments will be continuously expanded, consistent with KM's aim to provide customers with unprecedented swift access to data, even in heterogeneous environments.

Collaboration Using Gliders

A collaboration between KM and Akvaplan-niva, a nonprofit Norwegian research institute headquartered in Tromsø, is using Blue Insight for gathering meteorological, oceanographic, biological and chemical data from unmanned autonomous glider vehicles. The project has been underway for several years, and recent funding from the oil and gas company ConocoPhillips Norway has focused efforts toward understanding the impact of offshore oil and gas facilities on selected marine species in the North Sea.

The project is continuing to evolve the glider concept into an operational system for research and industry while advancing the digital environment to introduce new, cutting-edge management and analysis features.

3D visualization of echograms (“colored curtains”) measured by and shown together with the cruise track of a Sailbuoy USV. The sea surface is shown as semitransparent, and the greenish bottom color represents the bathymetry at the site.



“Blue Insight has been an invaluable aid for managing the vast amount of data we collect at sea with our fleet of gliders, often for months at a time,” said Lionel Camus, manager for digital solutions at Akvaplan-niva. “This innovative digital platform has enabled Akvaplan-niva to deliver professional solutions and to share an unprecedented common experience via the cloud with our customers during each survey.”

KM and Akvaplan-niva have expanded Blue Insight’s capabilities to better serve requirements for ecosystem monitoring by industrial users of the ocean space with real-time visualizations of ocean data in the dedicated Ocean View module. During 2021, the work on the digital infrastructure focused on setting up the Blue Insight environment and advancing the multiplatform operation and data visualizations. The latter were realized in 2D map projections, as well as 3D environments that also show relevant offshore assets together with external information-bearing background layers. Vehicle tracks can be displayed with measurement data and additional features, such as AIS-supported positions of vessels in the vicinity, all tremendously supporting contextualization within monitoring endeavors.

The current long-term focus is on efficient data management to optimize Blue Insight as a more holistic tool for Akvaplan-niva to secure economic value and safe environmental operations for businesses and authorities in all water-related issues. While further enhancing the visualization capabilities (i.e., the Ocean View module) remains a priority during the project, clear emphasis is put on data management in the broadest sense, comprising the elements of data flow, sharing, quality control

and analysis. Due to the intensification of joint efforts during the project period until 2023, the dedicated team of programmers could be enlarged.

The visualization work will progress several aspects related to comprehensive and seamless 4D data and vehicle track display, as well as cover application-specific dashboards. The work on data flow will introduce an advanced data indexing and cataloging environment for improved searchability of the growing amount of data. Furthermore, the realization of automated data pushes to selected stakeholders via the Data Forwarder module will demonstrate efficient data sharing. For example, conductivity and temperature data from the gliders will be shared in real time with the Norwegian Meteorological Institute for automated consideration within physical ocean modeling.

For an advanced digital environment to optimize the handling of ocean data, automated data quality control and analysis are important. A central element will be the realization of a customized, cloud-based processing environment with sandboxing capabilities usable with various programming languages. Data analysis will be further addressed through the implementation of an in-cloud classifying framework used for the processing of echosounder data.

The deep domain knowledge and close collaboration of the project partners, together with clear focus and dedication, steadily enhances the efficiency of complex monitoring missions in the interest of customers and all stakeholders. As part of this process, Akvaplan-niva has already been using Blue Insight successfully for additional environmental monitoring projects at the polar front

UDT 2022

Undersea Defence Technology

7-9 June
Rotterdam, the Netherlands

REGISTER AT [UDT-GLOBAL.COM](https://www.udt-global.com)



SEE YOU IN ROTTERDAM

We are excited to announce the theme for the 34th edition of the show will be 'The Grey Zone: Undersea Technologies to Protect Maritime Trade, Operations & Infrastructure'. Join us in Rotterdam from 7-9 June 2022 to explore this increasingly important aspect of underwater defence and security.

WHO IS EXHIBITING?

babcock[™]

BAE SYSTEMS

 **L3HARRIS**[™]

NAVAL
GROUP

 **RHEINMETALL**

 **SAAB**

INTERESTED IN EXHIBITING?

If you would like to become a sponsor or exhibitor for UDT 2022, please contact Group Event Manager James Condley.

 James.Condley@clarionevents.com

Gold Sponsor

 **L3HARRIS**

Bronze Sponsor

 **SUBSEA CRAFT**

Organised by

 **CLARION**
EVENTS

***“Data can be collected from any platform,
ranging from crewed to autonomous surface vessels to underwater vehicles,
such as AUVs or gliders.”***

around Svalbard and within a floating wind park, both on behalf of energy majors, as well as for international research projects (www.bioglider.eu).

Empowering Global Bathymetry Collaboration

In another science and industry collaboration, Kongsberg Maritime has partnered with The Nippon Foundation-GEBCO Seabed 2030 Project to develop and deliver the SeaKoMaP solution to optimize the processing of bathymetric data. SeaKoMaP, an acronym that stands for “Seabed 2030 Kongsberg Maritime Cloud Processing,” will allow Seabed 2030 to use Blue Insight to leverage its extensive alumni network as a means of simplifying some of the many processes necessary for the project. SeaKoMaP supports Seabed 2030’s mandate to map the entirety of the world’s ocean floor by the end of this decade (so far, only about 20 percent of the seafloor has been adequately mapped).

KM will provide Seabed 2030 users with remote login privileges for Blue Insight, thus enabling them to work

on tasks ranging from data collection to the publishing of seafloor maps in the cloud. Blue Insight breaks boundaries and empowers the Seabed 2030 Project to bring various users together on the same platform, resulting in an efficient workflow for accelerated progress.

Conclusion

KM’s primary focus in developing this powerful, cloud-based framework for data collection, sharing and analysis has been to increase our knowledge of the ocean environment and act as a digital enabler for sustainability. This vision is now becoming a reality through collaborations with, for example, the Seabed 2030 project and the glider project with Akvaplan-niva and ConocoPhillips, demonstrating how research institutions and industry can work together to benefit from contextualized data. Such collaborations help to make conservation and business go hand in hand.

The projects discussed in this article are just a few early examples of how Blue Insight can be used for both scientific and industrial applications. The goal is for it to grow continuously over time and enable future capabilities. KM has already expanded its customer base for Blue Insight, indicating that we have found a need waiting to be explored further. **ST**

NEW

**Improved Electronics
Low Power Consumption**

Mini Rosette®/CTD Water Sampler 1018 M with Model 316 or 320 Idronaut CTD

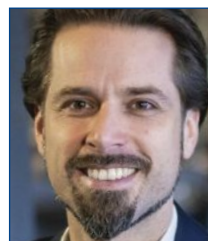
- Lightweight, small, compact
- Allows operation from a small boat
- Conducting cable or battery-powered
- Programmable timed operations
- Pressure-activated bottle closing (optional)
- Deep & shallow water models available
- Optional Teflon®-coated Water Sampler
- CTD compatible
- Flag Pulse to CTD A/D input



General Oceanics Inc.

1295 N.W. 163 St., Miami, FL 33169
Tel: (305) 621-2882, Fax: (305) 621-1710
E-mail: Sales@GeneralOceanics.com
<http://www.GeneralOceanics.com>

Leif Bildøy, Peer Fietzek and Tonny Algrøy are part of the Ocean Science group at Kongsberg Maritime, with product management, business development and sales responsibilities, respectively.



Revolutionizing Coastal Monitoring

A New Era of Buoy-Based Sensor Technology, Data Management

By Rachel Tracy

Sensor-equipped buoys have long been used to address challenges ranging from shellfish farming safety to urban runoff contamination, environmental impact studies and more. In the past, buoy-based monitoring systems were complex and costly to deploy and manage, requiring significant resources to collect data from even a handful of sites.

Today, the combination of Internet of Things (IoT) technology and remote data management is changing that dynamic. Faster, cheaper data collection has opened up monitoring capabilities for organizations of all sizes, while delivering more detailed and accurate insights into coastal ecosystems than ever before.

Getting the most from your buoy-based monitoring deployment, however, isn't necessarily straightforward. The specific application, monitoring parameters and site characteristics all affect platform setup, while the instruments themselves must be carefully selected to ensure reliability and minimize costs. Finally, organizations must decide how they will remotely collect and manage their data, affecting the insights generated from that data, as well as the timeliness of event response.

Application-Specific Monitoring Buoys

Buoys are used to monitor marine processes in a number of applications useful for researchers, consultants and government agencies. Drifting weather buoys are a classic example, providing a network of data points

Vulink cellular telemetry and the Aqua TROLL multiparameter sonde fit securely in the lightweight Basic Observation Buoy from Shore-Science for an easy-to-deploy remote monitoring system.



used in climate change research and monitoring. Today, the advent of smaller, more advanced and more cost-effective sensors is driving growth in application-specific monitoring buoys. One example is buoys carrying a suite of sensors that provide advance warning of harmful algal blooms (HABs) in nearshore waters. Sensors required for this application include chlorophyll a, blue-green algae (BGA) and dissolved oxygen (DO). In this scenario, a daytime increase in oxygen and chlorophyll alone might



Flexible, compact instrumentation makes remote data collection easier and more affordable.

not be cause for concern, whereas a spike in all three parameters would indicate a HAB.

Another emerging application for buoy-based coastal monitoring centers on monitoring environmental impacts related to crude oil leaks. Buoys equipped with crude oil sensors can help detect very low concentrations of crude oil in waters near storage and pumping facilities, providing early detection and faster response to leaks.

For estuarine studies, buoys equipped with fluorescent dissolved organic matter (FDOM) sensors are helping researchers and municipalities track the influence of freshwater on coastal systems. Monitoring networks equipped with FDOM sensors can help define the spatial extent of the freshwater interface, as well as identify terrestrial pollution sources.

Coastal municipalities in particular are working to address water quality issues related to stormwater pollution with buoy-based monitoring. In this context, FDOM sensors are helping agencies track water quality, current movements and the influence of different river inputs on overall water quality.

In addition to use on smaller buoys for nearshore applications, sensor-equipped sondes, such as In-Situ's Aqua TROLL 500 and Aqua TROLL 600, are also used on larger buoy platforms for open-ocean deployments.

This type of buoy-based monitoring is also becoming an important tool for ensuring food safety in mussel and oyster farming. By measuring salinity as a proxy for runoff-related contamination, companies can get precise data on when and how long to pause farming operations, helping mitigate the cost of closures.

Adroit is a company that uses the Aqua TROLL 500 in an IoT data buoy for monitoring salinity at a New Zealand mussel farm to limit the duration of harvesting closures after precipitation events. Compared with closures

driven by onshore precipitation data, harvesting doesn't have to stop as early or for as long when farmers have timely, location-specific salinity data. Ships can harvest up until the point of closure, giving them more time to gather product.

Larger buoys are also useful for environmental impact monitoring in challenging conditions. Aridea Solutions, for instance, used the Aqua TROLL 600 sonde on a buoy monitoring a natural gas leak in Cook Inlet, Alaska, which is a breeding ground for beluga whales. The company chose the Aqua TROLL 600 because of its self-cleaning function and the fact that it is rugged enough to withstand harsh estuarine conditions.

As technology evolves, the list of buoy-based monitoring applications continues to grow. IoT in particular is opening up new avenues in coastal research, making data more accessible while reducing the cost of monitoring.

IoT: The Next Chapter in Buoy-Based Monitoring

The growth of IoT technology combined with remote data management has transformed how researchers, consultants and government agencies monitor coastal ecosystems. The primary impact has been an explosion in the amount of data coming in, not just in terms of monitoring environmental parameters but also for remotely managing equipment. These advances, combined with smaller and more cost-effective sensors, have significantly reduced the cost of buoy deployments, unlocking deeper insights and ushering in a new era of coastal monitoring.

IoT technology enables instruments to be connected and controlled by remote monitoring systems. Similar to how people can manage their home thermostats remotely, smart sensors in the maritime space now enable users



only those with big budgets could afford that level of data collection. The result for a wider range of users is a more accurate, detailed view of an entire water system, compared with only being able to monitor a limited number of sites.

Overall, far more measurements can now be collected at lower cost, increasing data resolution and insights while helping detect events that spot sampling may not catch. And the more data generated, the better understanding we have of how these ecosystems behave and respond to environmental pressures—and how best to protect them.

Why Instrument Quality Matters

The ultimate success or failure of buoy-based monitoring deployments depends heavily on the instruments used in a given platform. Sensor reliability and stability are key considerations, as are setup, maintenance requirements and anti-fouling capabilities.

Fluorometer design is a prime example, where multiparameter water

quality sondes are equipped with chlorophyll a and BGA sensors used in HAB monitoring. In-Situ fluorometers are designed with integrated optical compensation to adjust for LED brightness and provide stable measurements even at low detection limits. Without this capability, measurements can drift over time, leading users to misinterpret drift as an actual change in the ecosystem.

Using chlorophyll a, BGA and DO sensors on the same sonde can also introduce interference that impacts data reliability. In-Situ fluorometers, however, use isolated optical frequencies and low-interference spectral bands to minimize this interference and improve data accuracy. For users, this means being able to put as many optical sensors on a sonde as needed without having to worry about interference.

Sensor stability is an additional concern when equipping buoys with pH and DO sensors. In-Situ's pH sensor, for example, has a stable reference design that reduces measurement drift compared with traditional glass-bulb sensors. In-Situ's rugged dissolved oxygen (RDO) sensor, too, is more stable than traditional DO probes, with a fast response that makes it ideal for dynamic conditions and vertical profiling. Its snap-on calibration cap doesn't need replacement for months, compared with instruments that require trips to the field for calibration every few weeks.

Finally, anti-fouling should be a factor in instrument selection for buoy deployments. While wipers and copper guards reduce biofouling, instrument design has evolved in recent years to provide even better protection. The Aqua TROLL 500 and Aqua TROLL 600 multiparameter sondes, for instance, have flat-faced interlocking

to manage instruments and gather data anywhere they have an internet connection.

For instance, remote monitoring now makes it possible to evaluate sensor health, update monitoring frequency or change calculated parameters—all without having to physically visit buoys. This is a huge advancement considering the steep cost of coastal fieldwork, which requires equipping, fueling and hiring a captain to transport a research boat to buoy locations.

Smaller Tech Improves Portability, Affordability

Sensor technology getting smaller also means monitoring platforms are shrinking, making them not only more cost effective but also simpler to deploy and manage.

Smaller platforms are easier to access and set up, making sensor calibration and maintenance more efficient during trips to monitoring locations.

The ShoreScience Basic Observation Buoy (BOB), for example, is a low-cost tool for monitoring protected waterways and inshore areas. The buoy, which measures roughly 18 in. in diameter and extends to 50 in., can be launched from a center-console boat. When users do visit the field, they can use In-Situ's VuLink paired with the VuSitu app to communicate with sensors without having to haul the entire buoy into the boat.

The combined result of these technological advances is that multiple buoys can now be deployed for a price comparable to what a single system once cost. Today, even smaller organizations can develop and maintain large networks of monitoring buoys, whereas, in the past,

sensors and a tight-fitting sonde guard that minimizes space for biofouling compared with traditional sondes.

These advancements support more reliable data combined with less maintenance, which can mean just a few site visits a year, rather than monthly visits to troubleshoot or maintain equipment. Considering the high cost of accessing remote coastal sites, choosing stable, high-quality instruments with minimal maintenance needs is key to minimizing the total cost of buoy-based monitoring.

Making Your Data Work for You

Choosing the right instruments is only half of the equation when it comes to a successful buoy-based monitoring deployment. Telemetry and data management are also vital to any project, playing an integral role in the insights gained from the monitoring system.

Ease of use should be top of mind when it comes to selecting a telemetry solution that ensures seamless data collection and streamlines fieldwork. In-Situ's VuLink telemetry system is one of the easiest on the market to set up. With more than two years of battery life at 15-min. reporting intervals and expanded coverage through the use of M1/NB-IoT technology, VuLink significantly decreases the cost and complexity of remote data collection and transmission.

VuLink displays instrument connection, battery life, network connection and connection to the cloud with one button press, and it's designed to mount on a 2-in.

"Faster, cheaper data collection has opened up monitoring capabilities for organizations of all sizes, while delivering more detailed and accurate insights into coastal ecosystems than ever before."

pipe or well, so it doesn't require conspicuous installations or solar panels. It can also power the instruments it's connected to and includes a built-in desiccant-less venting system for vented water level sensors, plus barometric pressure compensation.

VuLink can be paired with the Bluetooth-enabled VuSitu mobile app available on Android and iOS devices for data access, and a cellular connection to HydroVu, In-Situ's cloud-based data management platform, simplifies the process even further. The HydroVu portal allows users to analyze, process and visualize data via custom dashboards, also enabling alerts for when specific parameter thresholds are exceeded.

One example is setting alarms for when chlorophyll a, BGA and DO concentrations change by a specified amount, enabling faster response in the event of a HAB. Users can view data from all sites at once for on-the-spot comparison among sites, or visualize a specific parameter across sites to analyze trends or identify anomalous measurements.

Many groups require more advanced data analysis, making it important to use a platform that simplifies data integration with other applications. HydroVu's application programming interface (API), for instance, lets organizations import data to their own database for processing in R or MATLAB. This is an important consideration for those who already have a historical database and need monitoring data automatically imported.

The Future of Buoy-Based Monitoring

As sensors become smaller, more cost effective and more connected, it's clear that data from buoy-based monitoring applications will continue to proliferate. It doesn't change the fact, however, that coastal monitoring sites tend to be harder to access, making them more costly and resource intensive than groundwater or surface water monitoring.

Technology that makes remote data collection simpler, more reliable and more affordable will help researchers, consultants and government agencies expand their understanding of coastal ecosystems, generating more detailed insights while improving the efficiency of deployments.

The end goal is to make coastal monitoring more accessible for organizations of all sizes in order to enhance our knowledge of the environment and how to protect it for future generations. **ST**

Rachel Tracy is a freelance writer for In-Situ Inc.

Li-Ion Ocean Power

AUV, ROV

Vehicle Batteries

Li-Ion Batteries

API17F certified

Energy Storage System

All-Electric

Li-Ion PowerPack™ - Underwater Power Solutions

Highly reliable, efficient and safe Li-Ion batteries AC+DC
Made for harsh offshore and subsea conditions
such as offshore energy, scientific and
AUV or ROV equipment

[Learn more](#)

SubCtech GmbH
www.subtech.com
info@subtech.com

ISO 9001

SubCtech

Global Connectivity

Iridium Certus Offers High-Speed Satcom for Autonomous Vessels

By Wouter Deknopper • Dan Rooney

USVs, ASVs, AUVs, UUVs and maritime autonomous surface ships (MASS) are making waves in the maritime industry. USVs and ASVs in particular offer significant advantages: They are small, light and offer longer mission times since no crew is on board and, therefore, support facilities are not required. USVs are also able to operate in high-risk environments with remote operators, removing personnel from potentially hazardous situations.

To accomplish their missions, autonomous vessels of all types rely on the Iridium Certus service to serve as a

safe and efficient means of truly global command and control (C2) and to create an array of previously unthinkable capabilities.

Flexible Satcom

Introduced in 2019, Iridium Certus has increasingly become the preferred satellite communications (satcom) choice for USVs, drones and autonomous maritime vessels. Iridium Certus terminals are powered by the Iridium satellite network of low Earth orbit (LEO) cross-linked satellites, which provide a web of coverage to the entire

The Iridium-connected Thales VesseLINK 700 aboard XOCEAN's XO-450 USV, X-16. (Credit: XOCEAN)





Ocius Technology Bluebottle USV. (Credit: Ocious Technology)

planet. In addition to delivering truly global coverage, these terminals deliver low-latency satellite connectivity through small form factor equipment. The Iridium network's L-band spectrum allocation also offers a weather-resilient and highly reliable signal, cementing it as the new standard for dependable satellite communications for the maritime industry. The small form factor equipment and modules built for the service means USV engineers are not as constricted by size, weight and power (SWaP) requirements and have multiple options to integrate the best over-the-horizon (OTH) solution for their needs.

As a flexible and evolving platform, Iridium Certus provides not only a combination of devices to match customer needs but also various service speeds. Current service classes include: Iridium Certus 100, Iridium Certus 200 and Iridium Certus 700, all of which are delivered through a variety of Iridium Connected terminals. Whether it's command and control, mission data transfer, location tracking, sensor feedback, performance monitoring, or video and image transfer, USV fleets can extend their OTH capabilities with Iridium Certus.

Iridium Certus 100 "midband" terminals are optimized for affordability, with SWaP advantages, including smaller antenna options. The service provides a unique blend of capabilities for satellite connectivity, enabling low-profile antennas and battery-powered devices designed for maximum mobility. Despite the small size, Iridium Certus 100 terminals provide IP connectivity up to 22 Kbps up and 88 Kbps down that efficiently support sending pictures, emails and other vital information from anywhere at sea. One product is the Blue Sky Network

Skylink 6100, which is a versatile dual-mode solution (Iridium Certus/LTE) that provides maritime data, telemetry and monitoring operations. Its lightweight, low-SWaP design is particularly valuable since it allows for easy installation for unmanned vessels.

High-Speed Communications

Iridium Certus 200 builds upon the foundation of Iridium Certus 100 but with data transfer speeds up to 176 Kbps up and down. The higher speeds permit a wider range of USV applications, including higher resolution image and video transfer. The small form factor, lightweight equipment has no moving parts, ensuring easy installation, low maintenance and reliability. This gives mariners affordability of both service and equipment. The Iridium-connected Thales VesseLINK 200 terminal supports a wide range of communications applications and easily integrates with existing equipment, including LTE routers to provide maximum flexibility for USVs.

Regardless of the theater of operation, Iridium Certus 700 delivers the highest speed L-band communications globally. USVs benefit from Iridium Certus capabilities including tracking, command and control, performance reporting, sensor feedback, high-resolution image and video transfer, and video stream. With IP data speeds up to 352 Kbps transmit and 704 Kbps receive, Iridium Certus 700 is delivered through a number of products, including the Cobham SAILOR 4300, Intellian C700 and Thales VesseLINK 700.

Certus in the Field

As the only satellite network that offers global line

“As a flexible and evolving platform, Iridium Certus provides not only a combination of devices to match customer needs but also various service speeds.”

of sight, Iridium technology is deployed on a variety of small, medium and large USVs for OTH satellite communication. There are several examples showcasing Iridium’s role as a leader at the forefront of connectivity for autonomous vessels.

The MARTAC MANTAS and Devil Ray utilize the Skylink 6100, powered by Iridium Certus 100 service, from Iridium partner Blue Sky Network. The leading edge, low-SWaP, multi-carrier satellite and internal LTE/4G network terminal for USVs supports position reporting, video streaming, payload sensor reporting and more. With Iridium connectivity, the Devil Ray and MANTAS vessels can operate beyond human capability with reliable, robust, low-latency communications.

The XOCEAN USV platform offers a safe, economic and carbon-neutral solution to collecting ocean data. Individual uses can range from fish stock analysis, seabed mapping, transmission of relevant data back to shore, environmental monitoring and more. The Iridium Certus-connected Thales VesseLINK 700 provides the shore-

based mission team with critical data no matter where the USV operates.

The Ocius Technology Bluebottle USVs operate on missions around the coast of Australia and use “solar sails,” plus wind and waves, to generate power. The Iridium Certus-connected Thales VesseLINK 700 coupled with a 4G/LTE router delivers mission data to the team ashore, regardless of the Bluebottle USVs’ location.

“Iridium Certus has been a pivotal part of the capability that we have been delivering,” Peter Włodarczyk, lead engineer at Ocius Technology, said.

There are countless other companies and organizations taking advantage of Iridium’s reliable, weather-resilient and truly global connectivity. To learn more, visit: www.iridium.com/markets/autonomous-vessels. **ST**

Wouter Deknopper is the vice president and general manager of maritime at Iridium.

Dan Rooney is the maritime director at Iridium.



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.

ogulus

blueprint subsea

www.blueprintsubsea.com
enquiries@blueprintsubsea.com

Twitter Instagram LinkedIn Facebook YouTube

Increasing Access to eDNA Sampling

New Open-Source Technology Now Available to the Public

By Nate Formel



SASE set up on sandy bottom near sponge and coral reef habitat.

Sampling of environmental DNA (eDNA) in seawater enables scientists to noninvasively assess marine biodiversity, detect cryptic or invasive species, and monitor groups of organisms beyond the limitations of visual surveys. Scientists at NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) have engineered a new instrument that will provide valuable information about the biodiversity of aquatic ecosystems. A recently published paper in *HardwareX* (<https://doi.org/10.1016/j.ohx.2021.e00239>) describes the design and creation of a low-cost, open-source, subsurface, automated eDNA sampler, SASE, for sampling eDNA in the water column.

This novel technology resulted from a collaboration between scientists at AOML, the Cooperative Institute for Marine and Atmospheric Studies (CIMAS) at the University of Miami Rosenstiel School of Marine and Atmospheric Science, and the Northern Gulf Institute at Mississippi State University.

Building on the success of the subsurface automated sampler, the first of its kind created in 2015, scientists have retooled and expanded the original technology to be able to sample eDNA. The SASE filters the water to collect eDNA for lab analysis and preserves the sample at room temperature to keep the eDNA from degrading



SASE with a remote control to pre-program a set water volume for sampling.

before it's retrieved for study. The SASE enables scientists to collect and preserve a sample without physically being on site, thus reducing the time and resources spent gathering samples in the field. This is important for omics work in biological sciences because the SASE enables eDNA to be well preserved, which is essential in order to extract and identify the DNA present in a sample.

Design

The SASE is waterproof and submersible to 55-m depth (40 m deeper than the 2015 SAS model). It uses a peristaltic pump system to filter a pre-programmable volume of water, up to 2 L, and automatically preserves the eDNA sample. Replaceable filters and a low build cost of approximately \$280 (compared to other eDNA samplers that cost more than \$100,000) allow for repeated sampling and accessibility of the technology to smaller research and biomonitoring groups that may otherwise be financially burdened by more costly eDNA samplers.

The open-source code and design of the SASE make it an instrument that is adaptable for a range of future eDNA research applications, supporting NOAA's goal to innovate and leverage emerging environmental technology to observe and better understand the ocean and Earth systems.

Upcoming Work

The eDNA samples collected for the SASE validation tests have been sequenced, and the data show the SASE performs on par with traditional manual eDNA sampling for capturing fish diversity and richness from filtered water samples.

The next step for the SASE is to demonstrate its function in the field. NOAA AOML researchers Luke Thompson and Sean Anderson have submitted research proposals to test the SASE in Miami's urban waterway, taking

advantage of a livestream subsurface camera system (Coral City Camera) to both monitor the SASE on site and compare the results of the SASE eDNA samples with animals visible in the camera's field of view.

A Milestone in Tech

The SASE represents a milestone for AOML as one of the first pieces of technology to go through a rigorous transition process, from the desks of scientists in the laboratory through organizational approval channels to the wider scientific community.

An official SASE "transition plan" was developed and executed that documented the important steps of the transition process, including the project's purpose and research background, benefits and impacts, implementation, costs, and alignment with NOAA's goals and strategic plan. The transition plan served as a roadmap to ultimately shift the SASE to the public via open-source technology, allowing for a more affordable option for the automatic collection and preservation of eDNA at precise times, weeks or months in the future.

The SASE officially transitioned from research within NOAA's Office of Oceanic and Atmospheric Research, or "NOAA Research," to commercialization (open source) via NOAA's Technology Partnership Office, making the capability readily available to the eDNA community.

Anyone from the public can access the instructions to build and use the SASE at: <https://data.mendeley.com/datasets/y3dgh36zt9/2>. **ST**

Nate Formel is a marine biologist who focuses on conservation and restoration of coral reef ecosystems. He is a senior research associate at NOAA's Atlantic Oceanographic and Meteorological Lab, where he develops novel, low-cost and open-source sampling equipment to expand the suite of tools to study coral reefs.

international

SEA-KIT Expands Production Facility

SEA-KIT International is expanding its Tollesbury production facility in the U.K. to deliver on a growing USV orderbook.

The news comes as Fugro snaps up SEA-KIT's latest 12-m X-class build for its growing Blue Essence fleet. This build, SEA-KIT's sixth X-class, was originally planned as a fleet vessel for demonstration of the technology to new markets. It is set to be even more versatile and fuel efficient than its predecessors, which are now firmly established as safer, lower carbon solutions for offshore tasks on commercial operations around the world.

New Adventure Race for Seafarers

The Mission to Seafarers has launched the new Adventure Race Japan that will take place in May 2023. All sponsors and participants will support the Mission's Emerging Port Strategy 2022 to 2026, a five-year plan to develop existing operations in Asia, as well as globally.

The Adventure Race Japan will take place on the Izu Peninsula, regarded as a place of outstanding natural beauty and a designated UNESCO Global Geopark.

Companies are invited to enter teams of three to take on this endurance challenge, which includes trail running and water-based activities.

Participants will benefit from team building with colleagues, networking with local and international industry partners during the challenge and at the gala dinners, as well as raising money to help seafarers.

40-by-30 Initiative

Nor-Shipping has signed up to the new 40-by-30 initiative from WISTA Norway that aims to increase female participation in maritime, with a goal of boosting the number of women in leading industry management positions in Norway from today's level of 15 percent to 40 percent by 2030.

Nor-Shipping has partnered with WISTA for over a decade, highlighting campaigns and hosting the Waves of Change conference every two years.

Navico Adds Production Space

Navico, a division of Brunswick Corp.'s Advanced Systems Group (ASG) and a global marine electronics company with brands including Lowrance, Simrad, B&G and C-MAP, plans to expand its Ensenada, Mexico, facility over the next 14 to 16 months by 35 percent. A new 50,500-sq.-ft. building will be constructed, with 47,200 sq. ft. dedicated to additional production space to increase vertical integration and production capacity.

This marks Navico's first major expansion since joining Brunswick in October 2021. It is expected to create more than 100 jobs in the Ensenada community.

ASA Encourages IMO Maritime Research Fund

The Asian Shipowners' Association (ASA) strongly supports industry efforts to reduce emissions from in-



SUBSALVE USA

UNDERWATER LIFT BAGS
ENGINEERED FROM THE BOTTOM UP!

The World's Best
Underwater Lift Bags
from 25 lbs. to 50 tons,
Water Load Test Bags to 50 tons.
IMCA Compliant.
ABS Approved.

INNOVATORS IN BUOYANCY AND ENGINEERED INFLATABLES.

MARK V/ORCA • RAPID RECOVERY SYSTEMS • AIRCRAFT LIFTING BAGS
WATER LOAD TEST BAGS • VEHICLE RECOVERY SYSTEMS • CABLE & PIPELINE FLOATS
LIFEBOAT DAVIT TEST KITS • FEND-AIR • INFLAT-A-TANK • PIPE PLUGGERS

P.O. Box 2030, North Kingstown, RI 02852, USA
Tel: +1 401 884 8801 Fax: +1 401 884 8868
www.subsalve.com richard@subsalve.com

Looking for more news
from the ocean world?

READ
SEA TECHNOLOGY'S
BLOG

Visit our blog site, where we cover
everything from marine
technologies to industry, academic
and NGO research development.

You can comment, like and share
posts, and subscribe to receive
email updates from the blog.

sea-technology.com/blog

ternational shipping. The ASA further maintains that the only way to achieve ambitious net-zero targets would be through the adoption of the IMO Maritime Research Fund (IMRF), which will guarantee funding for the R&D necessary to accelerate the development of zero-emission ships.

The IMRF would be funded by mandatory R&D contributions from shipowners globally via a levy on actual fuel consumed. It would provide stability to support R&D efforts in a way that would insulate those efforts from external shocks that may result in increased volatility in carbon markets.

BMA Moves into South Korea

The Bahamas Maritime Authority (BMA) has expanded its presence in Asia, home to the world's fastest-growth shipping industry, by getting representation in South Korea through an agreement with marine and logistics provider Ben Line Agencies to help drive The BMA's continued growth in the region.

"South Korea is a top-10 ship-owning nation and one of the largest shipbuilders in the world," Captain Jahangir Hussain, The BMA's regional director for Asia, said.

By establishing an agent in South Korea, The BMA can support clients in China, Japan and South Korea. The BMA plans to build operations in other strategic locations across the region.

Equinor Exits Russia

Equinor has been exiting its projects in Russia in response to Russia's invasion of Ukraine. The company will also stop trading in Russian oil. This means that Equinor will not enter any new trades or engage in transport of oil and oil products from Russia.

Merger of French Civil, Defense Companies

ECA Group and iXblue have entered an exclusive negotiations period to bring the two French companies together, with a focus on the fields of maritime, inertial navigation, space and photonics. The two companies combined will employ more than 1,500 people.

Chevron to Acquire Renewable Energy Group

Chevron Corp. and Renewable Energy Group Inc. (REG) have reached an agreement under which Chevron will acquire the outstanding shares of REG in an all-cash transaction valued at \$3.15 billion, or \$61.50 per share.

The acquisition combines REG's growing renewable fuels production and leading feedstock capabilities with Chevron's large manufacturing, distribution and commercial marketing position.

The transaction is expected to accelerate progress toward Chevron's goal to grow renewable fuels production capacity to 100,000 barrels per day by 2030 and brings additional feedstock supplies and pretreatment facilities.

Chevron's renewable fuels business, Renewable Fuels - REG, will be headquartered in Ames, Iowa.

TDI-Brooks Adds CPT Tool

In summer 2021, TDI-Brooks took delivery of a Nep-

tune 5000 (N5K) CPT System from Datem. TDI-Brooks conducted two projects with this tool on the East Coast of the U.S. last year.

The first program was conducted in October 2021 for an offshore wind farm project, involving the acquisition of approximately 90 PCPTs. The second program was conducted in November 2021 for a pipeline design installation, with over 60 N5K CPT soundings acquired.

New Maritime Hub in Florida

Woolpert has opened an office in St. Petersburg, Florida, that will focus on maritime, defense technology and geospatial intelligence.

The office is located in the St. Petersburg Innovation District (SPID) and is part of its new St. Petersburg Maritime and Defense Technology Hub. SPID is a public-private partnership that aims to foster job growth, economic development, learning and inspiration by bringing innovative people and organizations together.

In addition to Woolpert, Saildrone has also opened a new ocean mapping headquarters and operations center in SPID's Maritime and Defense Technology Hub. The new location will be a permanent deployment site for ocean mapping, ocean data and maritime security missions, significantly expanding Saildrone's presence in the U.S. Southeast.

Another maritime company, Pole Star Space Applications Ltd., is moving into SPID's Maritime and Defense Technology Hub with the establishment of the Pole Star Defense division to drive its mission-critical U.S. government operations program. Pole Star Defense will focus on turning complex high-fidelity geospatial data into accessible insight for critical government maritime surveillance, safety, regulatory conformance, and sanction and sustainability screening operations.

OFG to Acquire NCS SubSea

Ocean Floor Geophysics Inc (OFG), in partnership with PGS, OFG's largest shareholder, has signed an agreement to acquire NCS SubSea, which provides ultrahigh-resolution 3D seismic data to the oil and gas and new energy markets via the P-Cable system.

The addition of P-Cable technology broadens OFG's range of marine geophysical data technology and services for the offshore market.

Japan Approves SAILOR 4300

Iridium Communications Inc. partner Cobham SATCOM, a provider of radio and satellite communications solutions, has received regulatory approval from Japan's Ministry of Internal Affairs and Communications to allow for Japanese adoption of its Iridium-connected SAILOR 4300 terminal. With this approval, those operating Japanese-flagged vessels can now utilize the high-performing, truly global L-band connectivity that the SAILOR 4300 provides.

Powered by Iridium Certus 700, the SAILOR 4300 can serve as a primary ship communications solution or as a VSAT companion service, supporting reliable voice and data applications for mariners' everyday use. **ST**

offshore oil & ocean engineering

EXRAY Enables Subsea Visual Inspection in North Sea

Hydromea has successfully trialed EXRAY, its wireless underwater ROV system, within a full ballast water tank on one of TotalEnergies' North Sea floating production, storage and offloading (FPSO) vessels. EXRAY was deployed to collect visual inspection data, validating system performance, including wireless navigation and wireless communication.

The pilot was able to command and control the vehicle and receive real-time 1,080-p video feedback, using proprietary wireless optical communication technology that replaces a cabled connection. Without a tether attached, the risk of entanglement in complex confined spaces is greatly reduced.

This project was funded by the Net Zero Technology Centre based in Aberdeen, Scotland, and is part

of a larger development roadmap focused on enabling portable and affordable multi-robot inspections of the increasing number of submerged assets in the North Sea.

Geotechnical Work in Black Sea by TDI-Brooks

TDI-Brooks has completed two geotechnical support projects for DenAr Ocean Engineering Services SA for the TPAO Sakarya gas field pipeline route investigation and site survey. The work involved two cruises.

During the first cruise, TDI-Brooks acquired approximately 30 gravity CPTs (gCPTs) with its memory-standard 15 cm² CPT cones. TDI-Brooks' CPT cones were fitted onto DenAr's piston core (PC) rigs. On box cores, TDI-Brooks provided its cyclic T-Bar's using DenAr's provided box cores. This project was conducted on the *DENAR 2* vessel

over a period of 71 days in the Turkish portion of the Black Sea.

For the second cruise, TDI-Brooks mobilized its research vessel, the RV *Proteus*, to the Black Sea for heavy geotechnical coring/CPT acquisition. This geotechnical program acquired several dozen 20-m jumbo piston cores, 40-m CPT-Stingers and up to 40-m SB Shelby-tube Stinger Samplers.

Predictive Maintenance for Platform Supply Vessels

Steerprop has signed a five-year contract with Siem Offshore for the propulsion monitoring service Steerprop Care Premium for three of the Norway-based offshore vessel company's platform supply ships.

Steerprop Care is designed to enhance the availability of a vessel by continuously monitoring the health of the main propulsion system, revealing any changes in the behavior that could indicate upcoming maintenance needs.

The basic version of Steerprop



Ocean Sensor Systems

For Details Visit Us on the web or call 954-796-6583 USA

WWW.OCEANSENSORSYSTEMS.COM

SENSORS FOR:

Ocean, Harbors
Intracoastal
Lakes, Ponds
Wave Tanks

MEASURE:

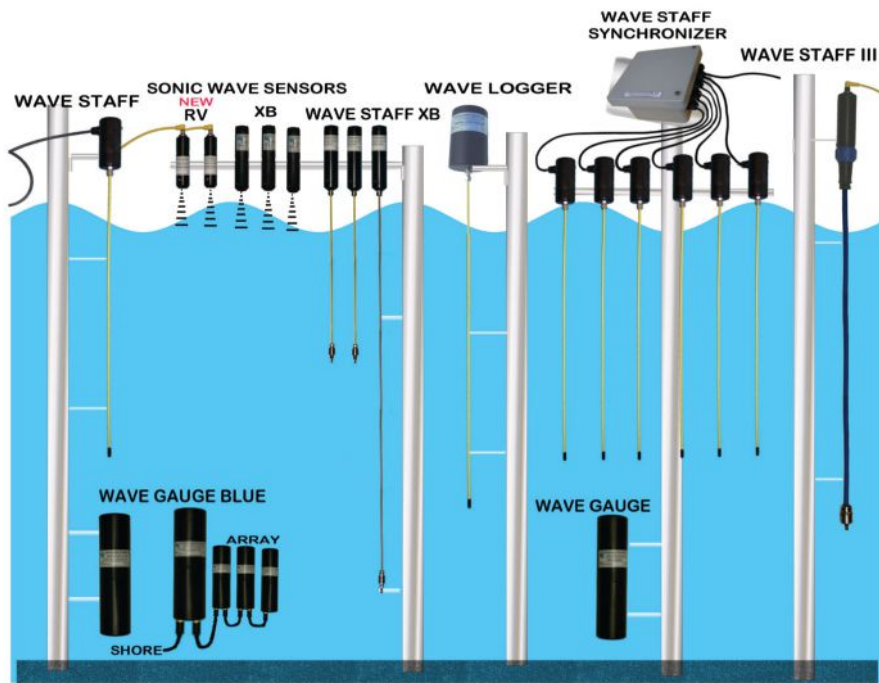
Waves
Tides
Levels

DATA VIA:

Cable
Logger
Wireless

WE SUPPLY:

Tech Support
Software
Accessories
Custom Work



Care is named Standalone, and it gives the onboard crew basic information about the propulsion system condition. It has been included in every propulsion unit delivery since 2019.

The online versions, Steerprop Care Plus and Premium, offer more advanced measurement capabilities, and if any development occurs that might cause future disturbances on a ship, Steerprop's predictive maintenance team will notify the crew and provide remote assistance if necessary. Steerprop Care Plus and Premium are also available as a retrofit installation.

Fugro to Provide Vision Tech For Installation, Decom

Fugro has signed a four-year global framework agreement with Heerema Marine Contractors for survey and positioning support services on board Heerema's heavy-lift crane vessels.

Fugro's worldwide reach and technology offers Heerema a solid support base for its global project portfolio, ensuring optimized offshore operations that minimize environmental impact.

Fugro will use its innovative vision technologies, such as Quick-Vision, 3Direct and InclinoCam, combined with remote services and expert teams to optimize Heerema's offshore installation and decommissioning campaigns across Europe, the Americas, the Middle East and Asia-Pacific.

Fugro's survey geodata and positioning support will assist Heerema in identifying seabed structures and debris while providing centimeter-level precision for installation projects. Real-time touchless inspection and monitoring technology offers a much safer, more efficient and sustainable solution for offshore operations. Remote support will also enable Heerema to monitor operations in real time, leading to faster, more informed decision making as projects progress.

Fast MODU Unmooring For Lundin Energy

Unmooring a mobile offshore drilling unit (MODU) from eight

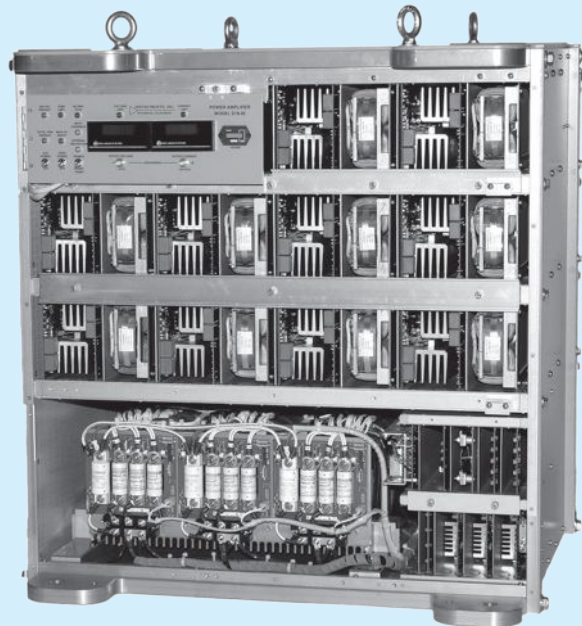
mooring lines in less than 2 hr. is quite an achievement, compared to conventional unmooring times that take up to 18 hr. in ideal weather. Earlier this year, Lundin Energy Norway AS accomplished this feat using Delmar Systems' RAR Plus releasable mooring system on the Deepsea Stavanger. This semisubmersible offshore drilling unit is one of the largest active MODU in the North Sea.

Buckle Mitigation Buoyancy

CRP Subsea has successfully delivered contracts providing more than 500 rotating buoyancy modules (RBMs). The RBMs will be attached to deepwater, high-temperature, high-pressure flowlines to mitigate pipeline buckling on the seabed. RBMs protect a pipeline by allowing it to roll on the seabed, reducing lateral friction and berm creation. **ST**

POWER AMPLIFIERS SWITCHING & LINEAR

**For more than 30 years we have been
building amplifiers to drive reactive loads.**



Model S16-20
20kVA continuous; 50kVA 20% duty
35 x 31.5 x 35.5 inches; 985 lbs.

Visit our Web site www.instrumentsinc.com



Instruments, Inc.

7263 Engineer Rd., San Diego, CA 92111-1493
(858) 571-1111 FAX (858) 571-0188 info@instrumentsinc.com
Copyright 2022

Imagery from *Endurance*

Earlier this year, the Falklands Heritage Maritime Trust's *Endurance22* Expedition located the wreck of the *Endurance*, the ship of polar explorer Sir Ernest Shackleton, which had not been seen since it was crushed by the ice and sank in the Weddell Sea in 1915.

One hundred years after Shackleton's death, the *Endurance* was found at a depth of 3,008 m within the search area defined by the expedition team before its departure from Cape Town, and approximately 4 mi. south of the position originally recorded by *Endurance* Captain Frank Worsley.

The team worked from the South African polar research and logistics vessel *S.A. Agulhas II*, owned by the Department of Forestry, Fisheries and Environment, and under Captain Knowledge Bengu, using Saab's Sabertooth hybrid underwa-

ter search vehicles. The wreck is protected as a historic site and monument under the Antarctic Treaty, ensuring that while the wreck is being surveyed and filmed it will not be touched or disturbed in any way.

Fleet Xpress from Inmarsat provided a high-speed connectivity solution to enable History Hit to broadcast the discovery of the ship from the Southern Ocean. Images captured from the shipwreck by AUVs launched from the South African icebreaker were shared online and with global media via Inmarsat's Fleet Xpress service. History Hit and Little Dot Studios were able to livestream the discovery with excellent picture quality.

Voyis is part of the expedition, and now that the wreck has been successfully located, its advanced underwater technology will be used to digitally recreate the *Endurance* and surrounding debris field using

highly accurate 3D models and extremely crisp photography generated by Voyis's Insight Pro laser scanner, Observer Pro stills cameras and Nova LED panels. Using the Insight Pro laser scanner, the survey team will be able to accurately map the *Endurance*. The system broadcasts the ultradense point cloud model in real time to the crew, digitally building up the shipwreck as they "fly" over the wreck with the Sabertooth vehicle.

Complementing the Insight Pro system is the Observer Pro imaging system, a long-range, highly sensitive digital stills camera, and two extremely high-output Nova LED panels to deliver crisp, evenly illuminated stills images. The Observer Pro imaging system works seamlessly with the Insight Pro laser scanner, providing gapless laser data with interlaced stills. Additionally, images taken by the Observer system are automatically color-corrected using Voyis's machine learning "true-color" correction, an onboard



August 23-24, 2022
Hyatt Regency Lake Washington

**Real-World Strategies & Solutions for Spill Prevention
& Response in the Pacific Northwest**

**Get \$100 off registration
with VIP code: SEATECH**

www.cleanpacific.org

improvement that replicates the exact color of the shipwreck if it were brought ashore, along with additional undistortion and light-leveling algorithms to improve the image quality in real time. Therefore, it will be possible to create photomosaics and photogrammetric models of the *Endurance* to further complement the 3D point cloud models generated by the Insight Pro.

BV Type Approval for Wireless Helm Control

Boston-based Sea Machines Robotics, a developer of autonomous command and advanced perception systems, has received type approval from Bureau Veritas (BV) for the company's commercial wireless remote-control helm system. Type approval from BV means that the wireless control technology embedded in Sea Machines' SM200 and SM300 systems has undergone rigorous third-party testing and certification to meet the stringent demands of classification and flag-state requirements for critical equipment on board marine vessels.

Sea Machines' wireless remote-control helm technology offers flexible control for mariners, eliminating the need for the vessel operator to be bound to a fixed control station. This system enables line-of-sight wireless helm and propulsion control with up to 1,000-m range, as well as remote control of auxiliaries and payload equipment via a wearable belt-pack device, freeing mariners from the wheelhouse to conduct operations from any location that offers the greatest advantage, visibility and safety.

Sea Machines' wireless helm control is currently in use on U.S.-flag tugboats in ATB sets, coastal construction tugs, search and rescue vessels, explosive ordnance removal craft, and survey vessels. Other applications include oil spill response vessels, yachts and tenders, offshore support vessels, seine skiffs, and daughter craft.

Partnership to Advance Marine E-Mobility

Aqua superPower and X Shore have created a strategic alliance to

drive infrastructure compatibility and technical standards for electrification across the marine world. Aqua superPower and X Shore will collaborate across Europe and North America to demonstrate the ecosystem and interoperability required to support marinas, boat builders and consumers in the transition to marine e-mobility.

X Shore's intelligent software combines seamlessly with Aqua su-

perPower's network and user management technology.

Boat charging infrastructure is already well developed, and this partnership will expand DC charging technology, primarily the speed of charge being delivered.

The fully sealed design of Aqua superPower's IP-65-rated DC rapid chargers provides robustness and ease of use in marine and freshwater environments. **ST**



WHERE WATER AND QUALITY MEET

Professionals stick with In-Situ water quality monitoring equipment because they trust it to work every time.

Redundant, on-board data storage, fully potted sensors, and integrated optical compensation on our fluorometers ensure reliable performance. So, you can focus on the data.

Learn more at in-situ.com/seatech



productdevelopment

Acoustic Underwater Comms



WhitePointer enables simultaneous communication between multiple surface and underwater platforms. The system complies with NATO standards and enables reliable voice and data communication between surface ships, submarines, and other underwater users, including divers and drones. It supports underwater acoustic networked communication with multiple users and can be fully integrated with any onboard communication system. DSIT Solutions Ltd.

Compact DVL

Pathfinder is now available in 300-kHz OEM configuration for up to 500 m of bottom tracking. The extended-range tracking option delivers up to 60% increase in bottom tracking range. The DVL has been dramatically reduced in size and weight for installation on board the smallest vehicles. Teledyne RD Instruments.

Sunlight-Readable Monitor

The 10.1-in. TFT monitor has capacitive multitouch developed specifically for marine applications, even under extreme conditions. The combination of a display brightness of 1,000 cd/m² and a contrast of 800:1 ensures superior readability with decreasing reflection under strong sunlight. The monitor has DVI-D/HDMI video interfaces and can operate in temperatures of -20° C to 70° C. SemsoTec GmbH.

Fast Autonomous Interceptor

UHSI32 can execute autonomous transit missions, pattern autonomy and dynamic collision avoidance while being operated via over-the-horizon network connectivity almost anywhere in the world. A Ray-

theon command and control system helps analyze, track and compile data. UHSI32 has a speed up to 45 kt. and an extended patrol period of three days. Missions include maritime security, search and rescue, insertion, surveillance, and protection of assets at sea. CMN NAVAL and Sea Machines Robotics Inc.

Noise-Reduced Propeller

Cavitation created by standard propellers is a huge source of noise for boaters. The Sharrow MX dramatically reduces traditional tip vortices and cavitation, providing a smooth and quiet ride. Sharrow Marine LLC.

Dynamic Positioning



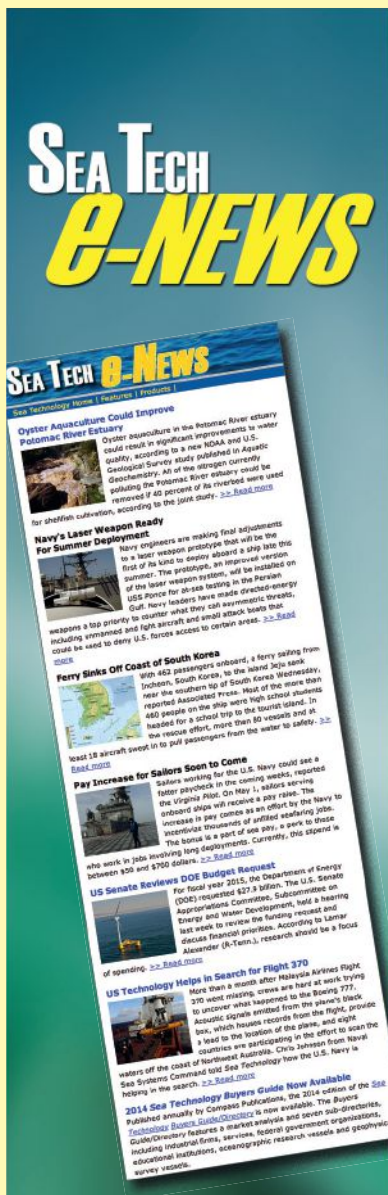
SPAN technology delivers a deeply coupled GNSS and inertial navigation system (INS) that provides robust, reliable and continuous centimeter-level positioning for operators to maintain safety and maximize uptime. With a GNSS+INS solution, DP vessels can bridge outages in GNSS tracking and through short periods of radio-frequency interference, jamming or spoofing. Hexagon | VERIPOS.

Electricity from Heat Sources

E-PowerPack converts waste heat directly into electrical power. It reduces fuel consumption and CO₂ emissions, serving as a simple, cost-saving tool for complying with new sustainability requirements. Alfa Laval Marine Division.

Enhanced Cyber Protection

CyberGuard Threat Detection's new version uses Deep Packet Inspection technology to retroactively explore whether any newly identified indicator of compromise might



Featuring the government and industry news you need to know, *Sea Tech e-News* delivers timely information straight to your inbox, with details on recent product releases, updates on new hires and promotion, and workshops. We send out the newsletter every other week, so you'll get a steady stream of news edited down to what matters most.

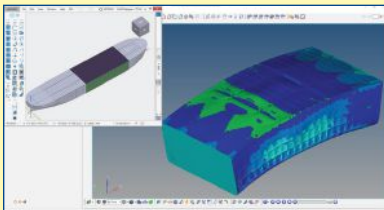
Sign up today at
www.sea-technology.com
to receive your **FREE** bi-weekly
electronic newsletter

have attacked a vessel. User-friendly “one-click” countermeasures via the CyberGuard dashboard can contain a cyber threat. DNS blacklisting blocks malicious web domains. Media access control addresses blacklisting and can quarantine an infected device. Marlink.

DSL Add-On Module

The new component enables Ethernet-powered sensors to run on standard, nonfiber-optic ROV tethers. Smaller than a travel mug, the new DSL module is an add-on component that plugs into the ROV and provides up to 100-megabit Ethernet for standard twisted-pair cables or copper tethers. This enables ROVs to run multibeam sonars, DVLs, IP cameras and other sophisticated Ethernet-enabled peripherals. SEAMOR Marine Ltd.

Enhanced Data Linkage



The latest upgrade of PrimeShip-HULL's system enables users to carry out prescriptive calculations and direct strength calculations on NAPA Designer seamlessly by utilizing NAPA's application programming interface (API) to the full extent. Dimension amendments following the calculations can be directly reflected in the 3D models of NAPA Designer. ClassNK and NAPA Group.

Biodegradable Oceanic Fluid

Oceanic Environmental Control Fluid (ECF) meets the world's most stringent environmental control standards. It can last 20 to 30 years inside a subsea system and will biodegrade completely within 28 to 60 days when discharged. MacDermid Offshore Solutions.

Subsea Wireless Optical Modem

LUMA X-UV can beam data at up to 10 Mbit/s in the presence of other light sources in the environ-

ment, enabling real-time streaming of HD-quality video and 4K images wirelessly through water. It is a tool that enables wireless control of underwater vehicles that have their lights on during missions or for deployments in shallow waters. Hydromea SA.

USV for Hydrographic Survey

EchoBoat-240 is a 2.5-m/8-ft. remote vessel that excels in confined or shallow bodies of water where traditional survey methods are not suitable. The USV allows for remote control or semiautonomous navigation of waterways and integrates high-resolution multibeam sonar equipment in a compact package. Its moonpool allows for flexible installation of multibeam systems. Seafloor Systems Inc.

Automatic Target Recognition

Spectral AI is available on Klein's side scan sonar systems. ATR capabilities are becoming increasingly important for operators of sensor

systems demanding faster operational tempo and more autonomous operation. Klein – A MIND Technology Business.

ROV Engineering Simulator

Tailored for subsea engineering, design reviews and accessibility checks of subsea installations with the use of ROVs, the simulator provides real-time simulation and visualization tools that allow users to set up a subsea scene, import CAD equipment and model various situations with ROVs. PaleBlue.

3D Asset Inspection

Vaarst's SubSLAM X2 creates millimeter-accurate 3D reconstructions in real time for asset inspection. Through company partnerships, Vaarst and Greensea's OPENSEA technology will autonomously control the VideoRay Defender ROV around an asset until it generates a robust point cloud model. Vaarst, Greensea Systems Inc. and VideoRay LLC. **ST**



US Multi-Agency Approach to Protect Endangered North Atlantic Right Whales

Building on existing initiatives to study and assess impacts of offshore wind energy development on the North Atlantic right whale, the U.S. Bureau of Ocean Energy Management (BOEM) is fostering multiple federal and state partnerships that will inform and strengthen protections for this endangered species.

For more than a decade, BOEM has funded independent research studies and formed partnerships to better assess potential offshore wind energy development impacts on protected species. These studies collect broad-scale baseline distribution, behavioral and ecological data on protected species in general, as well as on North Atlantic right whales.

As offshore wind energy development expands in the Atlantic, BOEM is engaging with NOAA to develop a science and management strategy to protect and promote the recovery of North Atlantic right whales while responsibly developing offshore wind energy. The strategy will identify existing and needed collaborative research, mitigation requirements and regional-scale monitoring to help minimize impacts to this critically endangered species. BOEM expects to provide a draft strategy later this year for stakeholder input.

BOEM and NOAA are also working with partners to develop a regional passive acoustic monitoring (PAM) network to identify the larger scale movements and distribution of marine mammals, including the North Atlantic right whale. In addition, real-time PAM systems will be deployed to detect animals in the vicinity of construction operations and prompt site-specific mitigation measures designed to reduce the impacts of offshore wind energy projects on marine species.

BOEM is also working with NOAA Fisheries on a federal survey mitigation implementation strategy that will describe steps to limit the impact of offshore wind energy development on NOAA Fisheries survey activities, including those for North Atlantic right whales.

These efforts align with the recent interagency memorandum between BOEM and NOAA that will leverage the responsibilities, expertise and relationships of both agencies in support of the Biden-Harris Administration's offshore wind energy goals while protecting biodiversity and promoting cooperative ocean use.

AAPA Endorses US Senate Ocean Shipping Bill

The American Association of Port Authorities (AAPA), representing 80 deep-draft U.S. ports, has endorsed the Klobuchar-Thune bill on ocean shipping in the U.S. Senate (S.3586). The bill would increase the Federal Maritime Commission's (FMC) enforcement in ocean shipping while preserving "fluidity charges" that prompt cargo owners to keep their goods from piling up on severely limited terminal space.

Signs continue to seem positive for an untangling of international supply chains, especially for American

retail and American agriculture. Ports, terminal operators, carriers and longshore workers have been working around the clock to keep clearing cargo, including through the use of expanded gate hours and emergency "sweeper ships."

In the longer term, U.S. trade infrastructure will need sustained investments greater than those in the Bipartisan Infrastructure Law—hundreds of billions of dollars for maritime infrastructure alone—to keep up with the growth in trade that drives American prosperity, AAPA said.

Latest US Sea Level Rise Technical Report

The Sea Level Rise Technical Report provides the most up-to-date sea level rise projections available for all U.S. states and territories to inform decision makers. This multi-agency effort, representing the first update since 2017, offers projections out to the year 2150 and information to help communities assess potential changes in average tide heights and height-specific threshold frequencies as they strive to adapt to sea level rise.

Sea level along the U.S. coastline is projected to rise, on average, 10 to 12 in. (0.25 to 0.30 m) in the next 30 years (2020 to 2050), which will be as much as the rise measured over the last 100 years (1920 to 2020). Sea level rise will vary regionally along U.S. coasts because of changes in both land and ocean height.

Sea level rise will create a profound shift in coastal flooding over the next 30 years by causing tide and storm surge heights to increase and reach further inland. By 2050, "moderate" (typically damaging) flooding is expected to occur, on average, more than 10 times as often as it does today, and can be intensified by local factors.

Current and future emissions matter. About 2 ft. (0.6 m) of sea level rise along the U.S. coastline is increasingly likely between 2020 and 2100 because of emissions to date. Failing to curb future emissions could cause an additional 1.5 to 5 ft. (0.5 to 1.5 m) of rise for a total of 3.5 to 7 ft. (1.1 to 2.1 m) by the end of this century.

Continuously tracking how and why sea level is changing is key to informing plans for adaptation. The ability to monitor and understand the individual factors that contribute to sea level rise enables tracking of sea level changes in a way that has never before been possible (e.g., using satellites to track global ocean levels and ice sheet thickness). Ongoing and expanded monitoring will be critical as sea levels continue to rise.

Web Dashboard for OCS Safety

A new web-based dashboard for advancing safety in oil and gas operations on the Outer Continental Shelf (OCS) is now available to industry and the public as part of the U.S. Bureau of Safety and Environmental Enforcement and Bureau of Transportation Statistics SafeOCS Reporting System: www.safeocs.gov/sdp/dashboard/isd.

The dashboard increases transparency and improves the ability to follow trends, improve inspection planning, understand common factors and see meaningful relationships in process safety, personal safety and environmental stewardship on the OCS. **ST**

Albatross CMS for MCM

Elbit Systems Ltd.'s Swedish subsidiary, Elbit Systems Sweden AB, was awarded a contract from the Swedish Defence Material Administration (FMV) to supply the Albatross combat management systems (CMS) for the Royal Swedish Navy. The contract will be performed over a period of 34 months.

Elbit Systems Sweden will supply the Albatross CMS for the *Spårö*-class mine countermeasures (MCM) vessels of the Royal Swedish Navy. Albatross is a scalable, open-architecture CMS that is based on the company's E-CIX platform. Albatross CMS enables commanders and operators to receive a common operational picture correlating underwater detection and surface tracks, based on real-time data, live video streaming and imagery data, thereby expanding the operational envelop, increasing flexibility and enabling effective decision making during MCM missions.

Automation Solutions for German Frigates

Rolls-Royce business unit Power Systems, headquartered in Friedrichshafen, Germany, will deliver the automation solutions (in German, FüSAS – Führungssystem Automation Schiffstechnik) for the four new F126 frigates for the German Navy. The main contractor is Damen Naval. The scope consists of an integrated platform management system (IPMS) and a condition monitoring system (CMS). For this solution, Rolls-Royce will deliver its mtu NautIQ Master and mtu NautIQ Foresight products. The fire alarm, personnel locator and CCTV systems are also part of the contract.

This is the first naval order for mtu NautIQ products since Rolls-Royce launched its extended automation solutions portfolio, which now combines mtu and Servowatch technologies under one brand. Rolls-Royce acquired Servowatch, a supplier of integrated marine automation solutions, in 2020.

Tug Delivered to Indian Navy

The Indian Register of Shipping-classed vessel *Balbir* has been delivered by Hindustan Shipyard Ltd. to the

Indian Navy. This is the 200th vessel delivered by HSL to the Indian Navy. The 50-tonne bollard pull tug can achieve a speed of up to 12 kt. The ship performed beyond the contractual requirements during sea trials.

Drass Diving System Installed on Korean Ship

The installation of the Drass Diving System on board the Korean Navy ASR II ship has been completed.

In 2018, DRASS was awarded the Korean Navy contract to supply an advanced diving system for the new submarine rescue ship ASR-II. The project includes the design, manufacture and installation of the complete deep-diving system and is being implemented in collaboration with local partner Dongil Shipyard.

The 120-m-long ASR-II ship, named "*Ganghwado*," is being constructed by Daewoo Shipbuilding & Marine Engineering (DSME). From March 2022, DRASS has been involved in the commissioning and start-up of the system with a team of specialized engineers at the shipyard on Geoje Island. The ship is expected to be delivered to the Korean Navy around mid-2023, following a series of trials and evaluations.

Lightweight AUVs Delivered to Danish Navy

Three LAUV (lightweight autonomous underwater vehicle) units have been delivered to the Danish Navy as part of the recently signed framework agreement between OCEANSCAN-MST, a Portuguese manufacturer of lightweight AUVs, and the Danish Ministry of Defence Acquisition and Logistics Organisation.

These three LAUVs will be part of a larger fleet for mine-hunting applications. The LAUV units were configured for this type of operations and include a dual-frequency, high-resolution side scan sonar from Klein; an inertial navigation system from iXblue; a Doppler velocity log from Nortek; and multiple communication capabilities at surface and underwater.

An upcoming delivery will also include an LAUV equipped with a Voyis imaging system that will be used for mine identification and bottom photogrammetry.

The LAUV is an autonomous surveying tool that can cover large areas, down to 200-m depth, and operate for more than 10 hr. with high position accuracy.

The three LAUVs have undergone sea trials, successfully gathering side scan sonar data from the seabed. **ST**



environmental monitoring

Partnership for Tsunami Early-Warning System

MSM Ocean and Sonardyne have agreed to team up to supply a complete solution for early warning for coastal communities of a tsunami. The agreement combines MSM Ocean's expertise in oceanographic measurement buoys, onboard data processing and telecommunications with Sonardyne's precise deepwater pressure measurement and acoustic through-water telemetry capabilities. Together, these allow detection of minute changes in deepwater pressure at the seafloor that indicate a tsunami, triggering a direct alert to national emergency organizations via acoustic and satellite communications, all within seconds.

The tsunami early-warning system is fully compliant with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and can be deployed in areas of up to 7,000-m water depth.

MSM Ocean and Sonardyne have also agreed to explore further possibilities for combining their technologies in support of remotely connecting ocean scientists to their instruments on the seafloor via buoys.

Sonardyne has been supplying integrated bottom pressure recorders (BPRs) configured for deepwater tsunami detection to organizations around the world since 2007. They were developed following the devastating 2004 Indian Ocean tsunami. For the past decade, these have been integrated into MSM Ocean's buoy-based tsunami early-warning systems, which have been successfully installed along the Pacific coast of South America, including two systems deployed off Ecuador that detected the January 2022 tsunami caused by the Hunga-Tonga submarine volcano eruption 10,000 km away in the South Pacific. Alerts were raised by MSM Ocean's buoys with the National Tsunami Warning Center of Ecuador just 35 sec. after the wave was detected by Sonardyne's BPR.

Climate Change Disturbs Coastal Ecologies

An international team of environmental scientists has found that, as of 2013, only 15.5 percent of the Earth's coastal areas remain ecologically intact. This finding is the result of a study that, for the first time, merges both terrestrial and marine human impact maps in a global assessment of the anthropogenic pressures affecting coastal regions.

"We found that intact coastal areas have already become relatively rare, based on the most current data available from 10 years ago," said Benjamin Halpern, executive director of UC Santa Barbara's National Center for Ecological Analysis & Synthesis and a co-author of the new paper, which appears in the journal *Conservation Biology*. "Pressures to these coastal areas are not subsiding, so the amount of intact coastal area today is almost certainly less."

The findings are a stark reminder of both the heavy reliance humans have on the coast and the dwindling amount of coastal resources.

"Coastal regions contain high levels of biodiversity and are relied upon by millions of people for ecosystem services such as food and storm protection," said the study's lead author, Brooke Williams, from the University of Queensland. "Our results show that urgent action is needed to conserve those coastal regions that do remain intact and restore those that are degraded, especially to help mitigate climate change."

Current, Wave Monitoring At Polish Port

Miros has installed a tailored environmental monitoring system to support a three-year research project at the Port of Gdynia in Poland. The bespoke system provides accurate current and wave measurements and oil spill monitoring from a strategic location in the Bay of Gdansk. The results will be used to create recommendations for the operation of unmanned units in ports

and will be made available to government organizations.

The sea state data will be combined with a hydrodynamic model to calculate and forecast hydrometeorological conditions in the Port of Gdynia area.

A major project milestone was achieved in February 2022 when data first became available via Miros Cloud.

The research project is investigating the benefits of using mobile unmanned platforms to perform observations and surveillance work in ports. This is the result of an international consortium comprising five entities: Port of Gdynia Authority S.A., Gdansk University of Technology, Gdynia Maritime University, Norwegian Institute of Water Research and Miros AS.

The system is a combination of a Miros Wavex radar with oil spill detection capability and Wave-Weather, the company's remote, dry sensors for the measurement of directional waves, meteorological parameters, water level and surface currents.

The research project's findings will determine the degree of reliability of bathymetric surveys and automatic water sampling conducted by unmanned vehicles. Based on the data obtained during the project, 3D models will be created to predict the movement of specific substances, such as oil spills. This will be supplemented by tests at the port to provide practical insights and enable faster improvement of previously implemented solutions.

Seaglider Fleet in Europe

Cyprus Subsea Consulting Services Ltd. has established a fleet of four Seaglider AUVs to unlock new long-duration subsea survey and monitoring capabilities for research and commercial organizations. Featuring four M1 Seagliders acquired in February 2022, the new privately owned fleet is one of the largest of its kind in Europe.

The 1,000-m-rated M1 Seagliders of the fleet provide real-time environmental monitoring services in the open seas for diverse applications. **ST**

contracts

Seaber.io, Helsinki, Finland, has entered a partnership with its innovative technology that will enable the digitalization of bulk and breakbulk shipment planning and communications, optimizing cargo flows globally. Stora Enso.

Telesat, Ottawa, Canada, has awarded a contract for the design and supply of reference enterprise user terminals for the Telesat Light-speed Low Earth Orbit (LEO) satellite network. Intellian.

Columbia Shipmanagement, Limassol, Cyprus, will expand its operations and services in the French, Italian and Monégasque markets by signing a joint venture agreement. The new JV company, Columbia Seaworld Management (CSM Monaco), will provide CSM's full integrated maritime services platform to clients in the region. Sea World Management.

Norsepower Oy Ltd., Helsinki, Finland, will install two tilting Rotor Sails on board a Ro-Ro vessel built in 2018. The installation is scheduled for completion by December 2022. CLdN.

James Fisher, Barrow-in-Furness, U.K., has signed a charter agreement for the exclusive use of the multipurpose service vessel *Go Electra*, to be used throughout the remainder of 2022 by James Fisher Renewables and James Fisher Subtech. Go Marine Group.

ClassNK, Tokyo, Japan, has signed a memorandum of understanding to collaborate on the development of the power transfer vessel Power ARK. The first model of the Power ARK series is designed for transferring renewable energy in Japan's coastal waters. Full-scale operation is expected in 2025. PowerX Inc.

Bordelon Marine LLC, Lockport, Louisiana, has signed a one-year firm charter agreement for the MV *Shelia Bordelon*, a 260-ft. DP2 Jones

Act-compliant ultralight intervention vessel. Helix Robotics Solutions.

Tidewater, Houston, Texas, has contracted for best practice consultancy services and the fleet-wide implementation of the TM Master fleet management software suite. Tero Marine. **ST**

meetings

Note: The coronavirus (COVID-19) pandemic could affect event dates. Check event websites for the latest updates.

JUNE

June 1-2—Navigate, Turku, Finland. info@navigate.fi or www.navigate.fi.

June 1-3—MegaRust, San Diego, California. 703-836-6727, asne.hq@navalengineers.org or www.navalengineers.org/Symposia/MR2022.

June 6-9—Canadian Hydrographic Conference (CHC), Gatineau, Canada. chc2022.org.

June 7-9—Capitol Hill Ocean Week, Washington, D.C. capitol.hilloceanweek.org.

June 7-9—Floating Energy Systems Asia, Virtual. www.floatingenergy.conference.com.

June 7-9—Undersea Defence Technology (UDT), Rotterdam, Netherlands. www.udt-global.com.

June 9—NOIA/OOC Offshore CCUS Symposium, Woodlands, Texas. aparkins@noia.org or www.noia.org/event/noia-ooc-offshore-ccus-symposium.

June 19-24—Frontiers in Hydrology Meeting, San Juan, Puerto Rico, and Virtual. www.agu.org/FIHM.

June 21-23—Interspill, Amsterdam, Netherlands. +0333 444 1890, info@interspill.org or www.interspill.org.

June 27-July 1—UN Ocean Conference, Lisbon, Portugal. https://www.un.org/en/conferences/ocean2022.

June 28-30—Euromaritime, Marseille, France. www.euromaritime.fr.

JULY

July 3-8—International Coral Reef Symposium, Bremen, Germany. www.icrs2022.de.

July 20-21—Advanced Machinery Technology Symposium, Philadelphia, Pennsylvania. www.navalengineers.org/AMTS2022.

AUGUST

August 23-24—CLEAN PACIFIC, Renton, Washington. www.cleanpacific.org.

SEPTEMBER

September 6-9—SMM, Hamburg, Germany. www.smm-hamburg.com/en.

September 18-23—International Marine Debris Conference, Busan, South Korea. www.7imdc.org.

September 19-22—Moored Systems for the Future Buoy Workshop, Wilmington, North Carolina. https://mtsociety.memberclicks.net/buoy-workshop.

September 20-22—Fleet Maintenance & Modernization Symposium, Virginia Beach, Virginia. 703-836-6727 or www.navalengineers.org/Symposia/FMMS2022.

OCTOBER

October 16-19—AAPA Annual Convention & Expo, Orlando, Florida. https://my.aapa-ports.org/AC2022/Home/AC2022/Home.aspx.

October 17-21—OCEANS 2022 Hampton Roads, Hampton Roads, Virginia. hamptonroads22.oceans.conference.org.

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

professional services directory

An effective medium reserved for listing professional and consulting services. Size: 3-3/16" wide x 1" deep, to a maximum depth of 3". Rates: \$95 per one-inch insertion for 1-6 times; \$90 each for 7-12 consecutive times. Payment terms: net 30 days. Discounts: 10% for advance payment for 6 or more insertions without copy change; no agency commissions. No charge for typesetting. Send your electronic file or text and images (300 dpi) to seatechads@sea-technology.com by the 10th of the month preceding insertion month.

Relax.
We can take the pressure.



Subsea Instrumentation Housings and Junction Boxes
Contact us for a FREE Brochure

10,000 N. Technology Drive, Fountain Hills, AZ 85268
877-3PREVCO [Toll-Free] 480-837-0100 480-718-7723 [Fax]
noleaks@prevco.com www.prevco.com

SONOTRONICS
MARK YOUR EQUIPMENT



Mark your underwater equipment for later recovery in case of loss. With *close to 50 years* of experience in the manufacture of sonic pingers, hydrophones, and receivers, SONOTRONICS can provide equipment for your underwater tracking needs.

www.sonotronics.com
(520)746-3322



SEA CATCH
TOGGLE RELEASE

McMillan DESIGN, INC.
9816 JACOBSEN LANE
GIG HARBOR, WA 98132
USA

Tel: 253-858-1985 Fax: 253-858-1986
Email: jmcmillan@seacatch.com

WWW.SEACATCH.COM

GALVANIC TIMED RELEASES

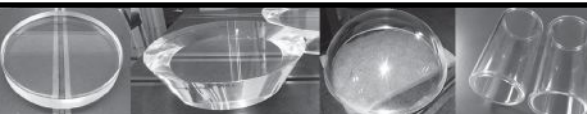
Cost-effective electrochemically degraded links available in durations ranging from one minute to 100 days. Trigger closure mechanisms, open escape panels, release cable support buoys or subsurface instrument locator floats. Stock and custom-designed releases available from:

International Fishing Devices, Inc.
935 Town Hall Ave., Unit 1, Jupiter, FL 33458
Ph: (954) 574-9517

André LaBonté
P.O. Box 60, Waipū, New Zealand 0545
Ph/Fax: 011-64-9-432-0645

underseareleases.com

HYDROSPACE Group
PVHO Windows and Acrylic Pressure Vessels



**Fabrication – Certification – Engineering – Repair
Replacement – Hydrostatic Testing – Custom Design**

Contact: Michael Azer Tel + (909) 989-7773 - pvho@HydrospaceGroup.com
www.HydrospaceGroup.com



Sea Technology magazine
Since 1963, *Sea Technology* has been the industry's recognized authority in providing information in design, engineering and application of equipment and services in the global ocean community.

Let *Sea Technology* work for you by providing published editorial content to validate your marketing initiatives.

Electronic Reprints
Digital versions of ST articles in high-resolution PDF format can be posted directly on your company's website.

For additional information, please contact:
Compass Publications, Inc.
T 703.524.3136 • F 703.841.0852 • seatechads@sea-technology.com • sea-technology.com

Unlocking Carbon Sequestration in the Gulf of Mexico—Erik Milito

Erik Milito is the president of the National Ocean Industries Association (NOIA), representing the interests of the offshore oil and gas and wind industries. He has successfully modernized and revamped the organization to achieve long-term success, including establishing a new mission, vision and objectives; creating an ESG program; and establishing proactive climate change policy and principles.



Carbon capture and storage (CCS) has become broadly recognized as a vital tool in addressing climate change. The U.S. Gulf of Mexico may soon be home to the deployment of technologies for this method of deep and durable emissions reductions.

There is growing momentum for offshore CCS in and along the Gulf of Mexico. If all goes as planned, onshore emissions from industrial centers along the Gulf Coast could soon be captured and stored deep below the seafloor, helping to meet climate change ambitions.

As its name suggests, CCS involves the capture of CO₂ from large-point sources, such as power generation and industrial facilities. The captured CO₂ is compressed and transported to be injected into deep geological formations that permanently trap the CO₂.

The International Energy Agency says that CCS provides an “important opportunity to achieve deep carbon dioxide (CO₂) emissions reductions. Similarly, the National Petroleum Council called carbon capture, utilization, and storage ‘an essential element in the portfolio of solutions needed to change the emissions trajectory of the global energy system.’”

Carbon dioxide is the most common greenhouse gas, and it is emitted through various industrial processes and the transportation

sector. Industrial processes include emissions from power plants, industrial furnaces and stoves, steel blast furnaces, cement plants and others.

The U.S. Gulf of Mexico offers tremendous advantages that can accelerate the emerging U.S. CCS sector. The Gulf Coast is uniquely situated for capturing emissions from industrial facilities onshore in Texas and Louisiana and transporting them for storage offshore. Along with its proximity to onshore emissions areas, Gulf of Mexico geology provides vast prospects for CO₂ storage.

Thanks to the 75-year-old offshore oil and gas industry, there is extensive and established energy infrastructure along the Gulf Coast and throughout the Outer Continental Shelf that can be leveraged to scale and deploy offshore CCS projects. The offshore energy expertise in the Gulf of Mexico also means that there is an accessible engineering and energy knowledge base and workforce, along with associated research, development and deployment capabilities.

We’ve already seen the successful deployment of CCS technologies elsewhere in the world. In 1996, the first large-scale CO₂ capture and injection project with dedicated CO₂ monitoring and storage was commissioned offshore Norway. Today, the facility has stored more than 20 million tonnes of CO₂ more than 1 km under the North Sea. Another project, Northern Lights, offshore Norway, is expected to begin storing up to 1.5 million tons of CO₂ annually, beginning in 2024.

The U.S. is already a leader in onshore CCS. Ten of the 19 worldwide CCS projects are in the U.S., and offshore CCS is set to enhance American leadership. Early projections show that 50 million tons of CO₂ could be stored annually in the Gulf of Mexico by the end of the decade. The Gulf of Mexico’s storage capacity could double by 2040.

American CCS leadership will soon translate into the offshore space: More than a dozen companies have proposed building a CCS hub near Houston that would also double as an “Innovation Zone.” Emissions from Houston-area facilities would be captured and transported via pipeline into the Gulf of Mexico. Talos Energy is also developing a CCS site offshore Texas. This facility is expected to eventually sequester 225 to 275 million metric tons of CO₂.

The geology, workforce and infrastructure of the U.S. Gulf of Mexico makes CO₂ storage attractive, but, as with any capital-intensive industry, an American offshore CCS sector requires certainty and predictability in the regulatory system, both at the state and federal level. It is incumbent on federal and state regulators to promulgate regulations that establish clear lease terms, processes and regulations for offshore CO₂ storage.

Additionally, financing will be integral to help CCS first-movers get the early wave of CCS projects going. Congress can lend its hand in supporting CCS by amending Section 45Q tax credits for carbon sequestration to eliminate the deadline for starting construction, extend the duration of credits, lower the CO₂ volume threshold and increase the value of credit. Congress and the administration can also provide grant funding to help develop additional infrastructure needed for offshore CCS.

Progress toward addressing the climate challenge will depend upon increased innovation, conservation, efficiency, resiliency, mitigation and adaptation. CCS is an innovative approach to mitigating greenhouse gas emissions. The U.S. Gulf Coast region offers distinct advantages as an emerging global hub for CCS, and the right policies can enable the advancement of this remarkable emissions reduction opportunity. **ST**

may advertiser index

Blueprint Subsea.....	27
www.blueprintsubsea.com	
CLEAN PACIFIC 2022	34
https://cleanpacific.org	
EvoLogics GmbH.....	45
www.evologics.de	
General Oceanics, Inc.	20
www.generaloceanics.com	
In-Situ Inc.	35
www.in-situ.com/seatech	
*Instruments, Inc.	33
www.instrumentsinc.com	
MacArtney A/S.....	13
www.macartney.com	
Ocean Sensor Systems, Inc.	32
www.oceansensorsystems.com	
Saab Seaeye Limited.....	39
www.seaeye.com	
Sea & Sun Technology	5
www.sea-sun-tech.com	
SubCtech GmbH	24
www.subCtech.com	
*Subsalve USA Division	30
www.subsalve.com	
Teledyne Geospatial	3
https://www.teledynecaris.com/en/contact/contact-sales/	
UDT 2022	19
https://www.udt-global.com/sea-technology-registration	

*For more information, consult the digital 2022 *Sea Technology Buyers Guide/Directory*:
<https://lsc-pagepro.mydigitalpublication.com/publication/?i=736936>

MISSION STATEMENT

Sea Technology is the worldwide information leader for marine business, science & engineering. Our goal is to provide our global audience with current information on the various segments of the worldwide marine/ocean industry through state-of-the-art and application articles, news columns, and staff reports; and to provide our advertisers with a cost-effective, valuable, and useful vehicle by which to promote their products and services.

For permission to photocopy portions of *Sea Technology*, please contact the Copyright Clearance Center • 222 Rosewood Dr. • Danvers, MA 01923 • Phone (978) 750-8400 • FAX (978) 750-4470

Sea Technology news magazine, including Underwater Engineering, UnderSea Technology, Oceanology International Offshore Technology, and its website, is edited for executives, scientists, engineering and technical personnel in industry, government, and education engaged in the field of undersea defense, oceanography, anti-submarine warfare, marine sciences, underwater exploration, diving and construction, drilling, and mining. While effort is made to verify material published, opinions of authors are not necessarily those of the publisher, and the publication accepts no responsibility in connection with any liability that might occur as a result of published material.

SEA TECHNOLOGY

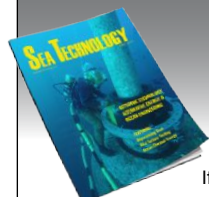
Available free of charge to qualified individuals (those involved in the marine industry) – in digital format.

www.sea-technology.com/subscribe-free

Also available, at no charge: our bi-weekly e-newsletter, *Sea Tech e-News*. Sign up here:

<https://sea-technology.com/enews>

If you prefer a more personal touch, please contact us at +703 524 3136 or seatechads@sea-technology.com.





Evo
Logics®

SMART SUBSEA SOLUTIONS

Delivering data in most adverse conditions: underwater acoustic modems with advanced communication technology and networking

Accurate USBL and LBL positioning of underwater assets

Modem emulator and other cost-saving developer tools

Autonomous surface vehicle for bathymetry, monitoring, search & rescue, and AUV support



New in 2022:

EvoLogics newsletter

stay up to date with our
latest developments:

evologics.de/newsletter