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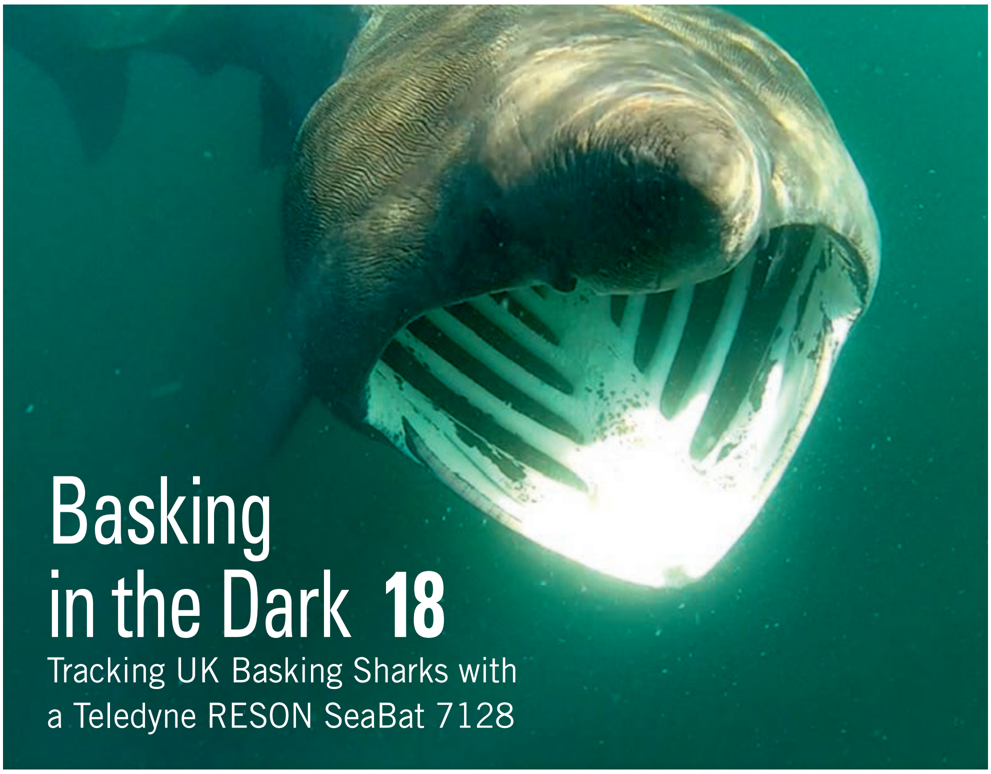
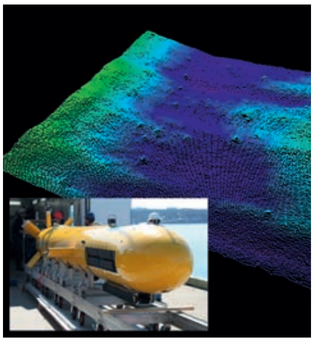
ROVs as Versatile Workhorses

Interview: Captain Nuhu Jidere Bala, Hydrographer of Nigeria

Basking in the Dark





March 2015 Volume 19 #2
An ADCP that lives underwater attracts marine vegetation. This example has been cleaned of its growth. (Image Courtesy: Russ Nelsion via Flickr).

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PHOTOGRAPHY: ARIE BRUINSMA (WWW.ARIEBRUINSMA.NL)

e-Navigation

It seems like the concept of e-Navigation is sailing onto the rocks of bureaucracy, unwilling flag states within IMO and the economic crisis. If so, I dare to challenge that there is a chance for hydrography to save e-Navigation from its fate. e-Navigation, as a concept of integral electronic navigation, originated with the International Maritime Organization, backed by many of the other maritime organisations around, such as the International Hydrographic Organization (IHO), the International Association of Lighthouse Authorities (IALA) and the Baltic and International Maritime Council (BIMCO). The strategy of e-Navigation, developed in 1985, has always aimed at more safety at sea and been carried mainly by IMO flag states including Norway, United States, the Netherlands, United Kingdom and Singapore. Better organisation and exchange of data, better communication between ships and ship and shore would increase the safety of navigation in commercial shipping and prevent ships from collisions and other accidents. While commercial shipping is growing and becoming more important in globalisation, and is one of the greenest forms of transport, the efforts to take e-Navigation to a higher plane are seemingly being halted.

Progress is not easy. This is partly due to the crisis diminishing margins of shipping companies, flag states being unwilling to implement new rules and regulations for their vessel fleet and bureaucracy on the one hand, and many manufacturers in the different fields of navigation that need to be linked on the other. It looks like the combination of these factors is currently slowing down the progress of e-Navigation. It is to a certain extent understandable; the challenge is huge. But the benefits would be even greater!

The way forward would be for an array of manufacturers in the field to take the lead – as they have already shown to be capable of – and convince shipping companies to make use of new bridge equipment, charts and ECDIS systems - even without this being mandatory - because the new e-Navigational tools make business more profitable, efficient, safe and resilient. I foresee a leading role for hydrography, manufacturers of hydrographic equipment, thus not just for the chart makers or ECDIS manufacturers, institutes and organisations. Safe navigation has been the core task of hydrography for centuries; in fact it was how it originated. If it means that safe, efficient and resilient navigation depends on more than just bathymetry nowadays, it's a logical step to incorporate the other factors and data that play a role on the bridge to ensure safe navigation into the products that hydrography delivers. The International Hydrographic Organization has done more than its fair share in the wider combination of institutes and should be capable of taking the leading role on the institutional side of development.

I started by saying that the concept of e-Navigation is sailing onto the rocks. Of course, that is just a figure of speech. e-Navigation will go on; technological progress has never been stopped by an institute, bureaucracy or economic crisis and it will be a major step forward. e-Navigation will grow and hydrography will play a major and increasing role in this!

Durk Haarsma durk.haarsma@geomares.nl

Hydrography for **Riverine Navigation**

Riverine transportation has been a feature of many regions around the world for many years, but very little has been seriously attempted in South East Africa and it is apparent that not only is it the physical attributes of a waterway that will determine the viability of transportation but also the impact that such an operation might have for the countries concerned.

Technology has advanced the opportunities for the use of, and the requirement for, bathymetry. Accurate bathymetry from aircraft has been available for many years and in recent time bathymetry from satellites is becoming more readily available. These methods, however, may not be practical on rivers. Recently, consideration has been given to the use of the Shire and Zambezi Rivers to transport personnel and goods both to and from the inland States to the coastal ports.

Most commercially used waterways, such as the Rhine River, are well surveyed, controlled and administered. An enormous amount of freight and passenger traffic is conveyed on the Rhine safely and to the benefit of all concerned.

▲ *Neil Guy.*

While general activities in or around a waterway could perhaps be controlled or regulated, some technical considerations, not normally required in the maritime hydrographic sphere, need serious consideration. This would include the chart datum that would be suitable, bearing in mind the natural fall in the level of the river water over the extent of it's passage from source to sea. In addition, unlike the maritime counterpart, the level of the water could be seriously affected by floods, droughts, releases from dams and the usage of the water from the river for other normal activities. It may be necessary to introduce locks to ensure a required water depth at all times.

A recent feasibility study of the Shire and Zambezi Rivers for their use as commercial waterway from Lake Malawi to the sea has highlighted major requirements for accurate up-to-date information that will be required for navigation. The normal sources of information available to a marine cartographer and information needed by the navigator would come from different sources and would require well-established procedures to ensure safe river passage. While this may not be of immediate concern it will have to be considered early in any project of this nature.

As there are many other authorities involved in the region, an independent Waterways Authority, similar to that in operation on the Rhine River, would be vital. The responsibilities and methods used by a charting service supporting such waterway traffic could be vastly different to that normally undertaken by a National Hydrographic Service and may require additional training and experience, different equipment and different information supply methods.

While much has still to be done to establish a waterway in a developing region it is apparent that this could soon be a reality. And although the development might take time, the provision of the appropriate navigational services should be considered by the relevant authorities and steps possibly taken to ensure that such a service could be introduced when required.

G4 Satellite Positioning Augmentation Service

Fugro has further extended its technology leadership in the field of GNSS augmentation systems for offshore positioning applications with the launch of its G4 service. The satellite correction service is the first to take advantage of all four GNSS (Global Navigation Satellite Systems): GPS, GLONASS, BeiDou and Galileo. GNSS augmentation services improve position accuracy compared to unaided GNSS receivers. By using all available GNSS satellites, Fugro's G4 service is designed to improve availability and reliability of offshore positioning and will thus enhance the safety and productivity of a wide range of survey and other activities offshore. G4 represents an advancement compared to augmentation systems that are based on GPS only or GPS combined with its Russian equivalent, GLONASS.

▸ ***http://bit.ly/1DBnJut***

IMCA Appoints Marine Technical Adviser

Andy Goldsmith has joined the International Marine Contractors Association as technical adviser Marine, with particular responsibilities for DP (dynamic positioning). According to IMCA's chief executive, Chris Charman, Andy has 17 years of experience on a range of DP vessels under his belt and is a long-time user of IMCA guidance.

▸ ***http://bit.ly/1DBnShA***

Andy Goldsmith.

VideoRay Pro 4 during testing at Dunbar Harbour.

Software Upgrades to Sonar CoPilot System

SeeByte, UK, in collaboration with VideoRay, USA, has successfully developed and tested improvements to the Sonar CoPilot system. These software upgrades include improvements to the user interfaces and target tracking features. The system provides a comprehensive tool to allow for 1-click automated target inspections using a man-portable ROV.

▸ ***http://bit.ly/1DBozYi***

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Hypack to Embrace HUDDL – bit.ly/1DBqHzd
Mark 2 Tritex Multigauge 3000 Underwater Thickness Gauge – bit.ly/1DBD2Di
d'ROP Survey Platform Launched – bit.ly/1vBqe9C

Sonardyne 6G Order from Seatronics for West Africa Project

The presentation of the contract for Sonardyne.

Seatronics, UK, is to take delivery of GBP1million worth of its 6G acoustic positioning technology. The contract was placed on the second day of the Subsea Expo 2015 exhibition and conference in Aberdeen, UK. The multi-functional Compatt 6 transponders and Ranger 2 USBL (Ultra-Short BaseLine) positioning systems that make up the order will be utilised for a wide variety of subsea operations including structure installation, pipeline metrology, ROV tracking and touchdown monitoring.

▸ ***http://bit.ly/1DBo94b***

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Teledyne RDI Citadel CTD-NV	ow.ly/JbqGC
Teledyne RDI Citadel CT-EK	ow.ly/JbqI0
Valeport Midas CTD+	ow.ly/JbqJg

EMODnet Bathymetry New Release

A new version of the EMODnet Digital Bathymetry (DTM) has recently been published, which now covers all of Europe's seas. The resolution of the EMODnet DTM has been increased from 1/4 x 1/4 arc minutes to a grid with 1/8 x 1/8 arc minutes (circa 230 metres). The new DTM is based upon approx. 6,000 gathered survey datasets and composite DTMs as provided by 29 data providers from 16 countries.

▸ ***http://bit.ly/1DBp3xA***

Launch of d'ROP Survey Platform

Developed by UK-based Osiris Projects, the dynamic Remotely Operated Survey Platform (d'ROP) has the potential to revolutionise survey productivity in shallow-water tracking and inspection applications. In recent years, with the expansion of offshore wind and cable interconnectors, there has been a significant increase in the requirements for cable depth of burial surveying in coastal areas, where compact ROVs struggle with the environmental conditions and where work class ROVs add significant expense.

▸ ***http://bit.ly/1vBqe9C***

The d'ROP Survey system installed on the Bibby Athena.

Tritech Successful with Swedish Navy

UK-based Tritech has been selected as the preferred supplier for sonar and acoustic positioning onboard SAAB Seaeye Falcon remotely operated vehicles (ROVs) for Försvarets Materielverk (FMV), the Swedish Defence Materiel Administration. The ten ROV systems will be deployed for seabed surveys, inspections, light underwater work and recovery of objects and encompass a full suite of Tritech sonars including Gemini multibeam imager, Micron mechanical scanning sonar, PA500 altimeter and MicronNav USBL.

▸ ***http://bit.ly/1DBpc3Y***

New Managing Director for MMT Norway

MMT has appointed Audun Brandtzæg as managing director of MMT Norway and has opened a new office in Haugesund, Norway. Mr Brandtzæg will be responsible for developing MMT´s operations in Norway, from market and business development to the implementation of projects. He will also contribute to MMT's cooperation with REACH Subsea.

▸ ***http://bit.ly/1DBpBmW***

Deep Trekker Vectored Thrust ROV Model

Modelled on the Deep Trekker DTG-2 Mini ROV, the Deep Trekker DTX2 is a subsea vehicle to combine the patented pitch mechanism that Deep Trekker is known for with 4 powerful, vectored thrusters for manoeuvrability unmatched in this vehicle class. Rated for depths of up to 300m and with speeds approaching 3.5 knots and 13kgs of thrust, the DTX2 is as powerful and strong as it is nimble and easy to use.

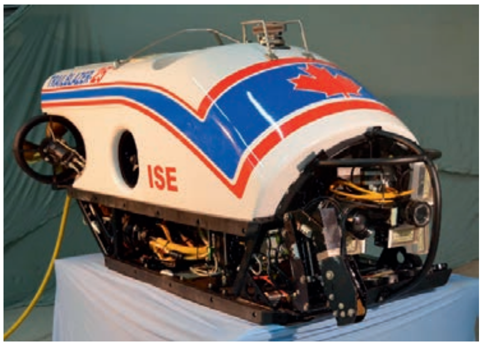
▸ ***http://bit.ly/1DBoIQJ***

The new DeepTrekker DTX2 for deeper water and higher performance.

Refit for Canadian Navy's Trailblazer

The Canadian Navy's mine-countermeasures (MCM) remotely operated vehicle (ROV) is ready to be returned to the customer after its recent refit by International Submarine Engineering Ltd. For ISE project manager Andrew Ronan, TrailBlazer 25 was his first refit of a vehicle. He concluded that, even at 20 years old, Trailblazer puts newer systems in the shadow on the mine range.

▸ *http://bit.ly/1DBpqbr*

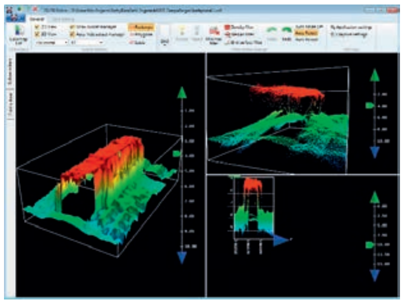


The Trailblazer ROV.

Chesapeake Bathy Processor Engine

Chesapeake Technology (CTI, USA) has released its new processor engine specifically designed for high-volume interferometric side-scan sonar and shallow-water multibeam data. CTI has also enhanced import options for side-scan sonar and magnetometer data and made more than 30 customer- and manufacturer-driven enhancements throughout the product.

▸ *http://bit.ly/1DBqWdz*



Screen of the new Bathy processor engine.

Hypack to Embrace HUDDL

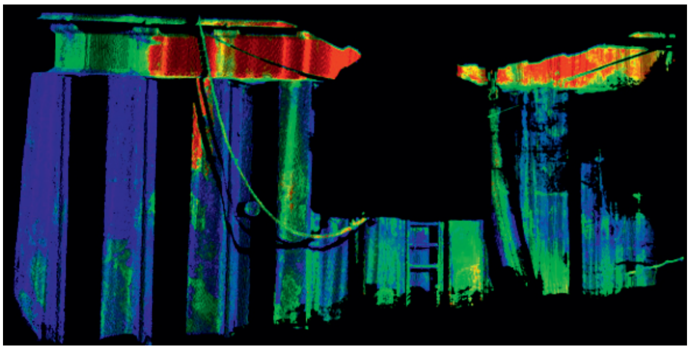
One of the problems software developer Hypack saw hydrographers face is that they might have to use two or three different software packages in order to get the exact final products their project requires. CCOM-UNH's project HUDDL aims to develop a routine that automatically generates source code in different languages to parse differently formatted files and allow the user to read their data files into any application.

▸ *http://bit.ly/1DBqHzd*

Corrugated Wall Scan with Underwater Laser Scanning

Locating and investigating retaining wall deterioration in its early stages is critical for ensuring the protection of the coastline and for avoiding extensive repairs or costly replacement. ADUS DeepOcean recently deployed the 2G Robotics ULS 500 in profile mode to continuously scan and generate a high-resolution 3D model of a corrugated wall. The high resolution of the scans provided a detailed understanding of the wall's condition and enabled signs of corrosion and wear to be easily detected.

▸ http://bit.ly/1DBpFTI



A sample of the capabilities of the 2G Robotics ULS500.

Dutch Waterways Authority Charters UK Research Vessel

The RV *Cefas Endeavour* has commenced an 18 day charter to the Dutch government organisations Rijkswaterstaat (RWS) and the Institute for Marine Resources & Ecosystem Studies (IMARES), with local mobilisation in Scheveningen (the Netherlands). The 74-metre multi-disciplinary research vessel will participate in International Bottom Trawl Survey (IBTS) operations in the North Sea, in collaboration with vessels from other European agencies, under the auspices of the International Council for the Exploration of the Sea (ICES). The objective of the survey is to collect data for the assessment of fish stocks (e.g. cod and plaice) and to investigate changes in the ecosystem.

Dutch charter of RV Cefas Endeavour.

▸ ***http://bit.ly/1DBpV5e***

Tri-frequency Side-scan Sonar System

EdgeTech, USA, has released an AUV-based sonar system that provides three side-scan sonar frequencies as well as sub-bottom profiling capabilities in one compact and integrated system. One of the recently delivered EdgeTech 2205 tri-frequency systems was configured to operate at 230kHz, 540kHz and 1,600kHz. This configuration provides more flexibility for AUV operators and allows them to collect different sets of data for different missions without reconfiguration.

▸ ***http://bit.ly/1DBq0pp***

The EdgeTEch 2205 side-scan sonar system including three frequencies.

Future Hydrographers Trained in Japan

Kongsberg Maritime has contributed to an extensive hydrography training course in Japan. The course was run by the Japanese Coast Guard and successful participants are accredited with the IHO Cat B survey category certification. The company's underwater mapping group supported the international cooperation effort by supplying training on Kongsberg Maritime shallow-water multibeam survey equipment.

▸ ***http://bit.ly/1DBqAn8***

PLA Inks Deal on Survey Vessel

The Port of London Authority (PLA, UK) has sealed a deal to put a new purpose-built survey catamaran on the River Thames to replace its existing survey vessel *Yantlet*. The CTruk MPC19, designed to be fuel-efficient, is to be delivered later this year.

▸ ***http://bit.ly/1DBrmAy***

An artist's impression of the new survey vessel.

Valeport Software with Bonus Utilities

Valeport's latest operating software, Datalog X2, has been released and is now available for online download at no cost. This software is designed to interface, configure and download data from both legacy and new products and also includes bonus utilities. Datalog X2 ensures Valeport products will work across new software platforms, and an embedded Terminal X2 programme offers wider functionality to those not able to use other Terminal packages such as Hyperterminal.

▸ ***http://bit.ly/1DBqs72***

Tidal Testing at Fish Research Centre

The Marine Renewable Energy Collaborative (MRECo, USA) has entered into an agreement with the Conte Fish Research Center to manage tidal testing in its large flumes in Turners Falls, Massachusetts, USA. A standard two-week test for in-stream or tidal turbines will be scheduled, lowering the risk and costs of testing new technologies.

▸ ***http://bit.ly/1DBqNqx***

Hydro International Interviews Captain Nuhu Jidere Bala, Hydrographer of the Nigerian Navy

Government and Private Surveying **Working Together**

Nigeria is a country that plays an important role for the African continent, even though this is not at all times apparent. It has quite a lot of offshore activity and its ports handled 22,324,223 million metric tonnes of cargo in the first nine months of 2014. Improving the waterways is one of the goals the management has set itself. Add to this all the inland waterways that have an economic significance as well. This makes it interesting to talk to Captain Nuhu Jidere Bala, Hydrographer of Nigeria.

Nigeria has almost one thousand kilometres of coastline and eight thousand kilometres of internal waterways. Can you describe how the Hydrographic service plans to survey and chart this large area?

As the lead agency for hydrography in Nigeria, the Nigerian Navy Hydrographic Office works with other related agencies and maritime stakeholders to develop a prioritised hydrographic survey programme for Nigeria. An analysis and assessment methodology has been developed to assess the adequacy of hydrographic surveying and nautical charting coverage. Indications of chart adequacy and completeness as depicted on current charts covering Nigerian waters are spatially correlated with vessel traffic data and significant maritime sites/areas associated with social, environmental and economic factors to prioritise the Nigerian waters for survey. Based on the survey priority assessment, critical navigation areas would be surveyed first before moving on to less navigation significant areas.

Nigeria has been an active member of the International Hydrographic Organization (IHO) since 1976. What is your opinion about this Organization and about the Regional Hydrographic Commission of Eastern Atlantic?

The establishment of the IHO is a great achievement for mankind. The work of the IHO in developing hydrographic and nautical charting standards has greatly helped in making the maritime environment a safe area. Nigeria has greatly benefited from being a member of the organisation, especially in the area of capacity building. The formation of Regional Hydrographic Commissions has acted as a forum for addressing common regional hydrographic matters and has served as a closer avenue for engaging governments on the need for adequately surveyed sea areas. The Eastern Atlantic Hydrographic Commission in particular has made tremendous progress in this regard. Consequently, more countries in the region have either indicated interest to join the organisation or have started the process of collecting and disseminating maritime safety information.

At the last Extraordinary International Hydrographic Conference (October 2014), Nigeria was represented by Navy Captain Daniel Atakpa and Mr. Okey Onowu, hydrographic surveyor of the Nigerian Maritime Administration and Safety Agency (NIMASA). Can you explain how the Navy and NIMASA cooperate in the tasks of surveying and charting?

Navy Captain Daniel Atakpa and Mr. Okey Onowu were part of the Nigerian contingent at the conference. I should have led the Nigerian contingent to the conference, but due to administrative problems in processing the visa, I asked Captain Atakpa to represent me. Nonetheless, the Nigerian Navy and the NIMASA have a memorandum of understanding, where the Navy provides certain key staff members to the NIMASA hydrographic department. This includes the head of NIMASA hydrographic department. Also, the two agencies collaborate in joint surveys and other capacity building programmes.

Moreover, I would like to remind you that in an interview in 2002, Commodore Joseph Abulu warned that the absence of new surveys will continue to push up the cost of cargo freight. Has the Nigerian Government been doing anything to remedy this situation?

The Nigerian Government recognises this and has entered into joint venture agreements since August 2005 for the maintenance of channels and waterways in some of the port complexes. These joint venture agreements executed through the Nigerian Ports Authority include the Lagos Channel Management, the Bonny channel company and recently the Calabar Channel Management. These companies are responsible for the planning and execution of maintenance and capital dredging works within the limits of the ports, the removal of wrecks and bathymetric surveys within these channels. The agreements have ensured that Lagos and Bonny channels have up-to-date charts. This work is expected to drive down the cost of freight coming to these ports. However, despite these notable achievements, much of the country's territorial waters remain unsurveyed or require survey to a modern standard. Consequently, shipping companies may still see the Nigerian waters as unsafe and base their insurance risk assessment on this factor.

How is the Nigerian Government filling in the need of providing adequate charts and nautical information of its sea area?
As a maritime nation, the Federal Government of Nigeria is serious about the safety of seafarers and the maritime environment. It has ratified and domesticated the SOLAS Convention since 1978. In recognition of its responsibility as a contracting government under Chapter V, regulation 9, of the SOLAS Convention, a proposed bill for the establishment of a National Hydrographic Agency under the Ministry of Defence is presently underway for consideration on the Minster's table awaiting the President's consent. The passage of this bill when finally considered would ensure that Hydrographic policies and requirements of the country are properly articulated and Hydrographic operations properly funded to provide adequate charts and nautical information of the nation's sea areas.

In the above-mentioned interview the Chief of the Naval Staff mentioned that a new survey vessel would be acquired. Can you describe its characteristics and its probable use?
Drawing from the transformation agenda of the Federal Government of Nigeria and indeed the ongoing transformation process in the Armed forces of Nigeria, the Chief of Naval Staff instituted a transformation plan for the Nigeria Navy. Part of the plan's strategic objective is the medium term goal of renewing the fleet with the acquisition of four survey boats and four survey launches. The launches would be used to survey the back waters and coastal areas of the Nigerian maritime environment, enabling naval patrol crafts to manoeuvre freely to combat criminal and illegal activities in our territorial waters. The survey boats would be used for hydrographic surveys and oceanographic research from the territorial waters up to the limits of the exclusive economic zone.

The IHO yearbook states that the nautical charts of Nigeria are provided by the Hydrographic Office of the United Kingdom of Great Britain and Northern Ireland (UKHO). Are there plans to set up an independent organisation for nautical chart production?
Yes, the nautical charts for Nigerian waters are produced by the UKHO. However, there are plans to develop an independent capacity for nautical chart production, which is the third phase of the IHO capacity building initiative. This plan is a long term goal of the Chief of Naval Staff's transformation agenda of establishing a productive and efficient organisation consistent with the Nigerian Navy Statutory roles.

Nigeria has six main ports. In what has cooperation been established with the Port Authorities to collect and disseminate the nautical information?
The NNHO and the Nigerian Ports Authority cooperate in various ways to ensure a safe maritime environment for seafarers. All maritime safety information collected by the ports authority is forwarded to the MSI facility for dissemination to seafarers and the NAVAREA II Coordinator. In addition, all surveys and 'as built' survey of construction works within the port complexes are forwarded to the office to update the nation's hydrographic database and spread the notices to mariners.

Is the Hydrographic Office also responsible for surveying and charting the internal waterways? If not, what other authority has that task?
The National Inland Waterways (NIWA) is the agency responsible for the management of the nation's vast inland water way resources. It is also responsible for the maintenance, dredging and surveying of the waterways.

▲ *Captain Nuhu Jidere Bala.*

However, all surveys carried out by NIWA are forwarded to the NNHO to update the nation's hydrography database. In addition, the NNHO may carry out the surveying of any inland waterway for defence and security needs of the nation.

How is the staff of the Hydrographic Office trained?

The NN trains its officers and other staff at both local and foreign institutions. The Nigerian Navy Hydrographic School (NNHS) currently trains NN ratings in Survey Recorder (SR) courses. However, the NN has initiated efforts to commence a Pre Basic Hydrographic Course for officers at the school as a precursor to an IHO accredited Basic Hydrographic Course. The NNHO has also benefited from various capacity training schemes of the IHO. An officer of the department is taking a Master's degree in Hydrography at the University of Southern Mississippi sponsored by the Republic of Korea through the IHO. Other officers are currently undergoing both basic and longer hydrographic courses in India, Bangladesh and Pakistan.

How do you see the presence of the private industry in the hydrographic activities?

The presence of the private industry in hydrographic activities in Nigeria is good for the nation. Their work complements the efforts of the NNHO in the development of hydrography in Nigeria. However, the NNHO regulates their activities and approves all surveys. The companies are also mandated by law to submit all survey data collected to update the Hydrography database.

How do people see the hydrographic profession in Nigeria? Are young people interested?

The awareness for the hydrographic profession is still very low, especially for a maritime nation like Nigeria. This can be attributed to the fact that the majority of the population is unaware of the importance of hydrography. However, the office, in conjunction with other stakeholders in the industry under the auspices of the Nigeria Hydrographic society, is making efforts to enlighten the people about the importance of hydrography and the hydrographic profession. ◂

Captain NJ Bala

Captain NJ Bala (1966) attended the Nigerian Defence Academy and graduated with a BSc Physics in 1989. He attended both Basic Hydrographic Course CAT 'B' and Long Hydrographic Course CAT A at the National Institute of Hydrography in GOA, India. From 2009 to 2010, he was at the University of Plymouth for an MSc Hydrographic Surveying. He has held several appointments within the Nigerian Navy, both onshore and offshore. From 2010 to 2012, he was the Commanding Officer of Nigerian Navy Hydrographic School Port-Harcourt. Bala was the deputy director Hydrography at the Nigerian Navy Hydrographic Office before his appointment as Hydrographer of the Nigerian Navy as of 18 July 2014.

info@nnho.org.ng

Tracking UK Basking Sharks with a Teledyne RESON SeaBat 7128

Basking in the **Dark**

Recent hydrographic advances are revolutionising the way the marine environment can be accessed, scanned and quantified. With the emergence of sonar technology and, more recently, remotely or autonomous operating vehicles equipped with sonar, underwater cameras or photogrammetry, almost all aspects and species within our vast oceans can now be visualised. This is also becoming reality for even the most elusive marine animals. Here, we describe our quest to track basking sharks, Cetorhinus maximus, using multibeam sonar, thereby advancing the way we can observe and protect the UK's largest shark.

The application of hydroacoustic methods to study fish and, more recently, marine mammals or diving seabirds, has provided three-dimensional data in time and space for a more detailed understanding of subsurface movements. Both, single/multi-frequency echo sounders and multibeam sonar systems have been used increasingly in behavioural studies of marine animals. Producing a multidimensional acoustic image, multibeam visualisations of marine life can extend the view from animal surface observations deep into the water column. Multibeam sonar has not been used to study sharks to date, but could provide a major advantage to make observations of an elusive species that does not require to surface to breathe and spends most of its time at depths of 100s to 1000s of metres.

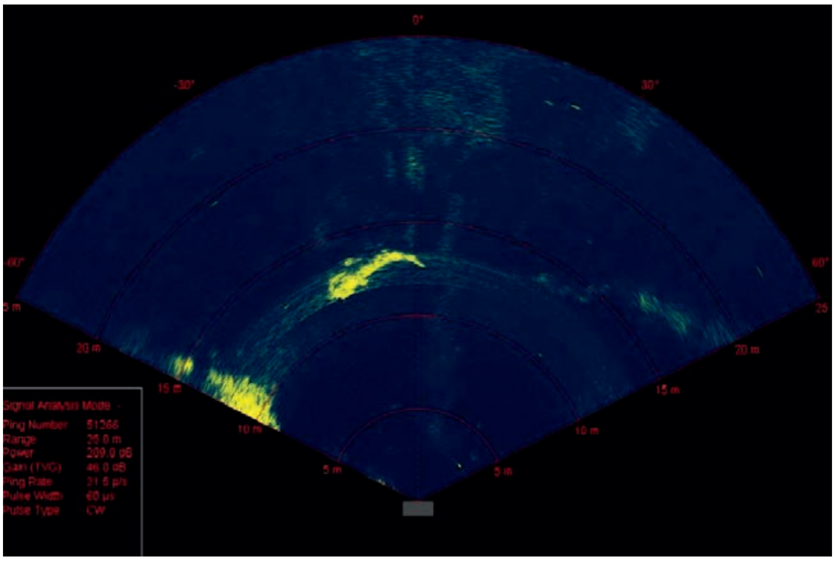
UK's Largest Shark

Reaching over 12m in length, the filter-feeding basking shark is the world's second largest fish just after the tropical whale shark. Every summer, basking sharks appear in their tens or even hundreds in UK coastal waters, showing persistent, seasonal aggregations. Little is known about their life history, and the only record of a birth was made by a Norwegian fisherman over 70 years ago: a captured female basking shark gave birth to five live young and one still-born. Until recently, basking sharks were fished for their liver oil, mainly around Norway, Scotland and Ireland and over 70,000 sharks were landed in a 40-year time period. The impacts of these fisheries remain uncertain, leading to their classification as 'Endangered' (IUCN Red List) in the Northeast Atlantic and inclusion on the MPA (Marine Protected Areas) search feature list for Scottish territorial waters.

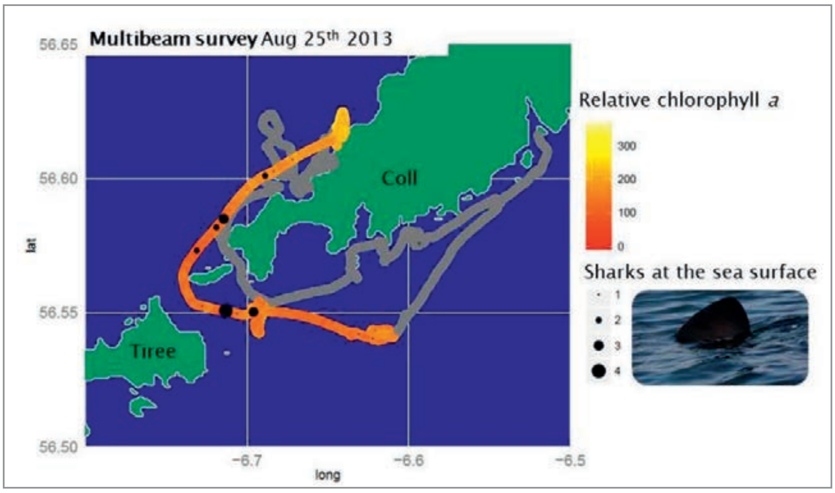
Monitoring Renewables

In coastal waters, basking sharks often spend a considerable amount of time at the sea surface, and as their name suggests, early fisherman believed they were 'basking' in the sun. Feeding in these waters is now evident, but it has yet to be determined if basking sharks use these areas for socialising, breeding or mating – vital information for their conservation. Hence, there is an urgent need to find novel approaches to study basking shark subsurface movements. Despite the rapid expansion of marine renewable energy (MRE: offshore wind, tidal and wave energy) installations, there remains a high level of uncertainty surrounding potential environmental and ecological interactions with marine life. Detailed behavioural response

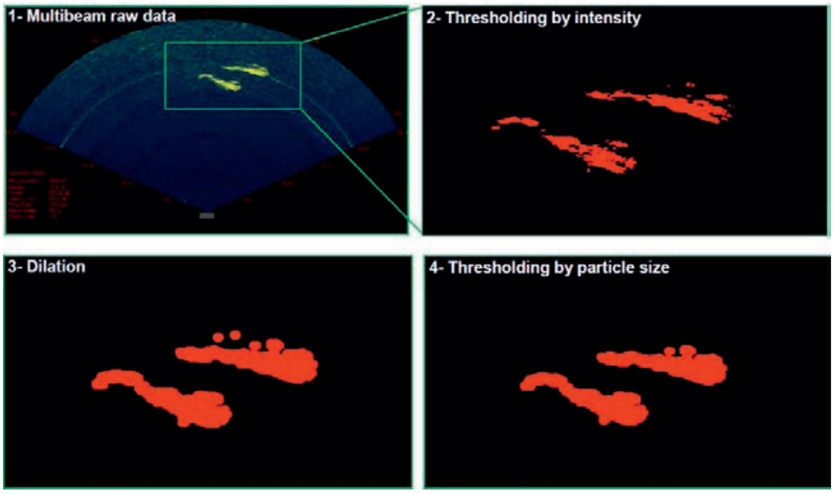
▲ *Figure 1: A basking shark filter-feeding on zooplankton.*



▲ *Figure 2: A close-up of a basking shark.*



▲ *Figure 3: Multibeam survey showing shark encounters and relative* chlorophyll a.



▲ *Figure 4: Multibeam image processing for detection and tracking.*

studies investigating potential impacts in the field are currently limited, thereby posing a challenge to provide robust information for successful Marine Spatial Planning.

Subsurface Behaviour?

Quantifying interactions remains a major challenge due to the difficulty of observing diving animals in highly productive waters,

Observing and protecting the UK's largest shark

where visibility is often poor. Therefore, the choice of observation platform for tracking multiple individuals needed thorough evaluation. While animal-borne instrumentation such as satellite or archival tags provides a vast amount of information on individual horizontal and vertical movements, it is impractical as a tool to quantify behavioural/social interactions. Remote sensing further relies on either frequent surfacing to obtain exact geolocations in near real-time, or subsequent tag recovery, which is not always possible when working with highly migratory animals. The use of underwater video can be advantageous in waters with excellent visibility, yet its uses are extremely limited in temperate, turbid waters. Only recent advances in the application of acoustic receiver-transmitter systems have improved the extent to which interactions of free-ranging sharks can be quantified, however it relies on prior tagging of all individuals within the group.

The Solution

As no traditional methods seemed ideal for quantifying basking shark interactions, hydroacoustic approaches were considered as a potential way forward. A major criterion for selecting the type of hydroacoustic instrument was the ability to capture subsurface movement in real-time, at high resolution (sub-metre) and at long ranges (tens to hundreds of metres). Therefore, we tested the efficacy of a high-resolution imaging multibeam sonar, the Teledyne RESON SeaBat 7128 (200/400kHz), to detect and track basking sharks in the shallow, temperate Sea of the Hebrides. It offers a wide horizontal beamwidth (128°) and a vertical received beamwidth of 28.5°, allowing visualisation of multiple sharks at a resolution that permits tracking of individual shark behaviour and interactions at ranges from 200-400m. The overall aims of this pilot-scale project were two-fold. Firstly, to explore the suitability of a state of the art hydroacoustic instrument for basking shark tracking that could be further developed for MRE monitoring. Secondly, to test the multibeam sonar and its efficacy in gathering more detailed natural behavioural data on basking shark aggregations. Fine-scale behavioural observations in combination with oceanographic data will ultimately enhance our understanding of the drivers of aggregations and habitat selection in times of large-scale marine habitat modification.

Finding Sharks

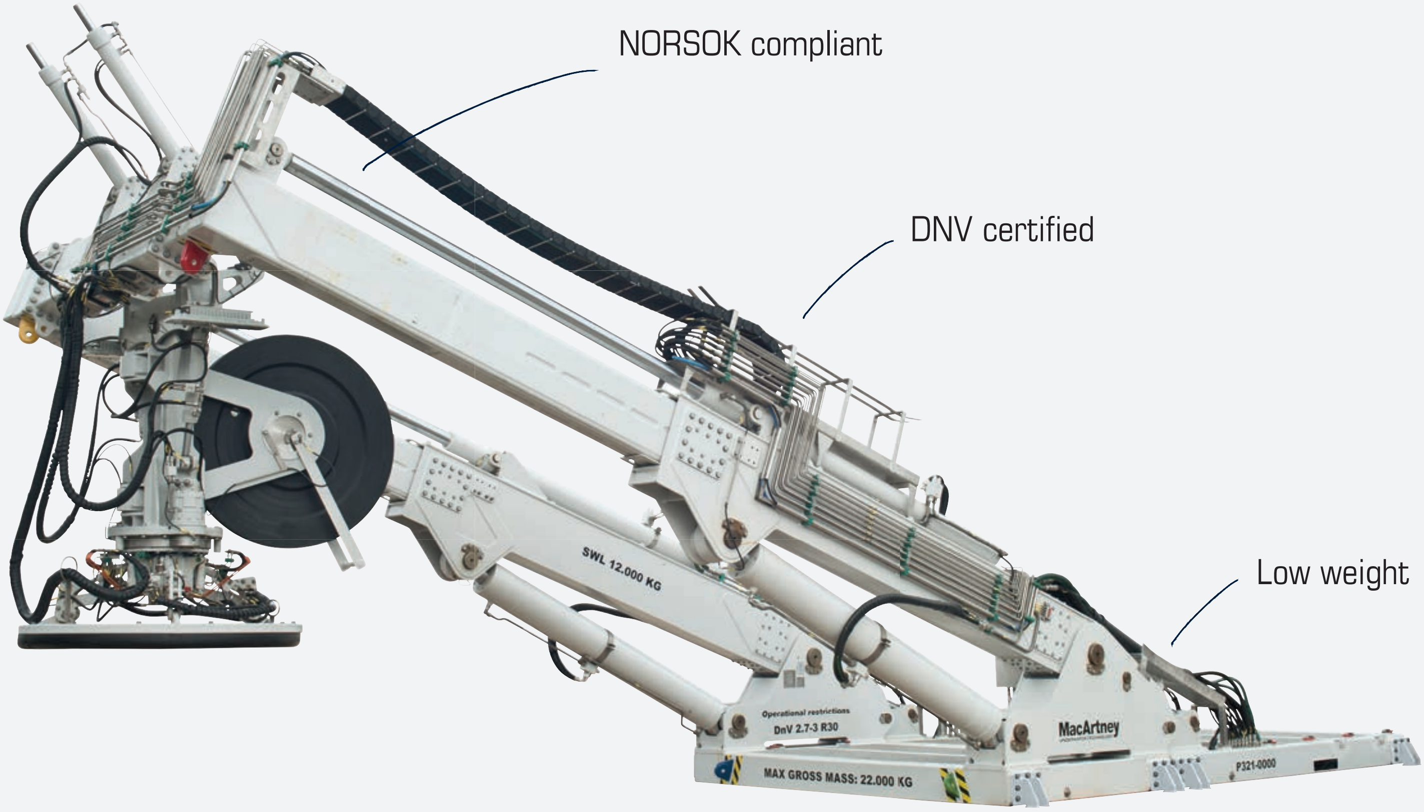
We chose a known aggregation site off the islands of Coll and Tiree (56.3°N, 6.3°W) on the West Coast of Scotland. Listed as an MPA search location, this site was also chosen due to its relevance for a planned offshore wind farm, the Argyll Array. A pilot study was conducted in August 2012. The multibeam was mounted on an aluminium ladder and submerged 0.5m onboard an 11.9m motorised vessel, the FV *Tarka*. The sonar head was directed perpendicular to the vessel on its port side. The angle of the sonar head was fixed to limit the survey area to the upper water column, where most sharks where expected. The dry end, displaying real-time recordings on a 19" LCD monitor was kept inside the vessel cabin. As basking sharks could be identified with confidence, a follow-up study was conducted in August 2013. The set-up was similar, however during this deployment, a flexible pan and tilt mechanism was applied allowing quantification of both surface as well as mid-water sharks, inaccessible to conventional echo sounders. Survey design consisted of either transects across visible thermal fronts (slicks at the surface) or active basking shark tracking of up to 20min at a time (Figure 3).

Oceanographic Measurements

To supplement subsurface observations, subsurface *chlorophyll a* (*chl a*), as an

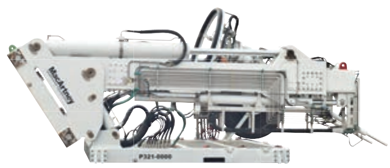
MERMAC A

Foldable launch and recovery system



Extensive telescopic reach

Fast and flexible deployment



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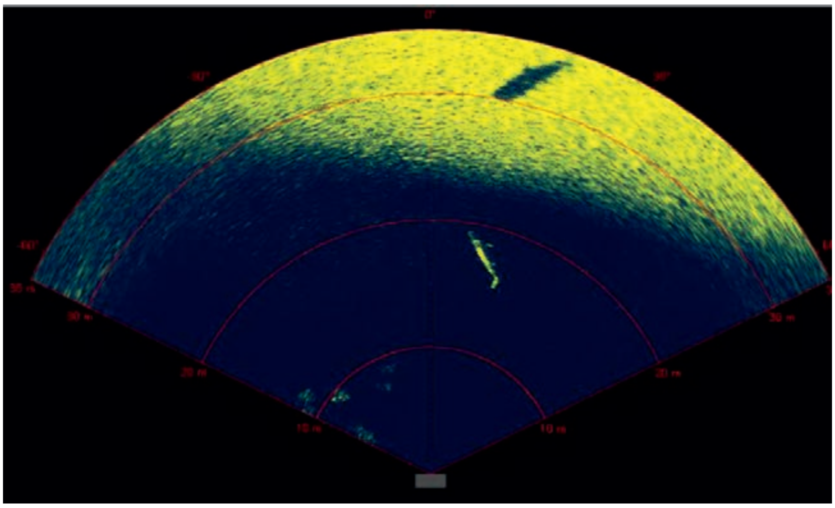

Figure 5: A basking shark showing its shadow on the seabed.

indicator for prey availability, was measured with an in-situ fluorometer (Minitracka II, Chelsea Technologies Group) at 5m depth via a towed line that also included Star-Oddi mini-loggers that continuously measured temperature and salinity. Additionally, daily satellite data of sea surface temperature, temperature fronts and *chl a* were obtained from the Plymouth Marine Laboratory (The Natural Environment Research Council Earth Observation Data Acquisition and Analysis Service).

Impact of MRE installations on marine life still uncertain

Target Tracking

Post-processing of at-sea bio-physical measurements will include comparison with satellite-derived data to allow quantifications of the oceanographic conditions during shark encounters. Subsequent target tracking uses shark position registered using the boat's GPS, compass heading and multibeam tilt angle, coupled with parameterisation of key target features. More specifically, we will use image processing algorithms for shark detection and tracking from multibeam sonar images which are being written in National Instruments software LabVIEW. Initial detection relies on thresholding by intensity, dilation and then thresholding by particle size and ellipse ratio (Figure 4). Most observations were made from a relatively constant distance of 20-30m and included synchronised swimming, nose-to-tail following and zig-zag feeding, both at the surface and when submerged. Occasionally sharks also swam towards the boat. When fully submerged, basking sharks often left a distinct wake behind or created a shadow on the seabed (Figure 5).

Conclusions

This successful application of a high-resolution multibeam sonar to detect and track basking sharks has proven a useful tool to visualise their movements and behaviour, which is currently being analysed. A vessel-mounted multibeam sonar can be used either statically, i.e. for monitoring a specific site, in transect surveys or active tracking. The addition of a flexible pan and tilt mechanism has allowed for observations at the surface and mid-water tracking. This set-up allows for acoustic detection from a distance consistent with minimising disturbance. In order to explore the key processes causing variability in basking shark behaviour, we recommend integrating a synchronised multi-frequency echo sounder to allow additional prey quantification (such as zooplankton) to test a range of hypotheses addressing predator-prey interactions and courtship/mating activity. Information derived from combined oceanographic and behavioural datasets will underpin model predictions of how changing oceanographic conditions attributable to offshore installations may impact vital basking shark habitat.

Acknowledgements

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Further Reading

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Many Tasks in Many Shapes and Sizes

ROVs as **Versatile Workhorses**

The concept of ROVs does not seem to change too much over time. Basically, they are self-propelled instruments working in deep waters up to about 6,000m that are linked to a vessel-based controller. This distinguishes them from AUVs that move underwater without a tether to a vessel. As with any other machine, they are available in many shapes and types, evolving over time. With a hydrographer's eye, we give an overview of the varieties available and the direction in which ROVS are moving.

ROVs are available in different classes, which as such point at their main use. Observational, light work and work class are well-known and describe their duties quite accurately. The observational class sometimes also features further differences, for instance, micro, eyeball and fly-out. The first two indicate size (an eyeball ROV is generally a smaller ROV mainly containing a camera for observations). The Fly-out is a category further developed by AC-Cess where the ROV is hosted by a larger ROV (for example, inspection or work class), and launched closer to the job to be an extra pair of eyes on the job or to enable operators to see the job from a different perspective. It can also be used to inspect places that are too small for the larger 'mother' ROVs.

Compact ROVs and Sonar Payload

The main developments appear to be found in the category of the smaller observation class ROVs like the AC-Cess, Deep Trekker and VideoRay products. Their size enables them to excel in accessing smaller areas and they can operate in confined spaces or shallow water. Traditionally, their video cameras or imaging sonar were their main asset. The video camera is ideal for showing the conditions of constructions, coatings, undersea equipment or environmental characteristics – i.e. visual inspections. Imaging sonar is useful for creating an image of constructions or establishing positions or objects in deeper waters or when visibility is limited. However, as they are more readily available in compact sizes, sonar equipment like side-scan sonar or even multibeam sonar can also be integrated and used to map or inspect shallow waters, breakwaters and constructions. Deep Trekker, for example, is versatile and can be equipped with USBL positioning, thickness gauges, CP and CO_2 probes.

Just grab the smaller ROVs, go to the place and see the results themselves

Their sizes make them popular in science for observations. Where in some cases divers make observations and interpret them, scientists can just grab the smaller ROVs, go to the place and see the results themselves. This is something that scientists use for habitat mapping, however, it also applies to maintenance duties like underwater wall inspections, water outlets at hydropower dams or shipwreck surveys.

Observation Class Adopts Diver Tasks

Whereas the compact ROVs are mainly dedicated to observations and inspections, observation class machines have fewer size constraints. They can house more powerful thrusters for propulsion and have more space for payload. There is a variety of sensors like side-scan sonar, multibeam sonar, video cameras and heavier equipment such as ADCP. They can also be mounted with sampling systems. The very confined spaces are not a place where they are likely to operate but they are still capable of accomplishing a versatile range of duties. They take over some of the divers' tasks: in dangerous areas (strong currents, polluted waters or very limited view) they can make their observations. Mapping of dams and hydropower plants with strong and changing currents can easily be done with these types of ROVs. Their size allows the ROVs to access environmentally sensitive areas as well. Small does not

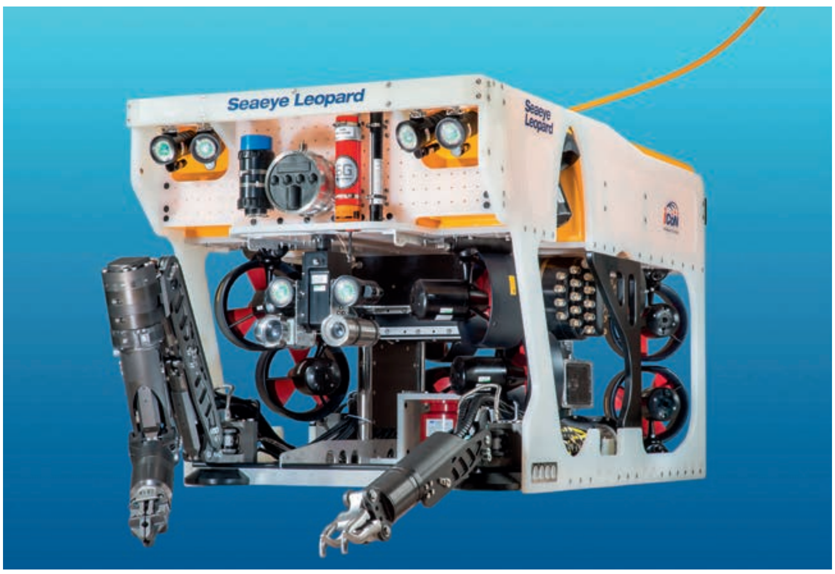
▲ *Figure 1: VideoRay ROV with Blueview Imaging Sonar.*

▲ *Figure 2: Outland 1000 observation class ROV.*

always have to be a limiting factor as Teledyne Seabotix mentions - ROVs have been used for cable inspections in the oil & gas industry, lasting for 27 hours in currents up to 0.7knots and waves of 3m.

Some of these ROVs still do not need a launch and recovery system (LARS)

The advantage of these observation class ROVs is their small footprint in the water, but also on vessels they require less space compared to full diving support equipment. Some of these ROVs still do not need a launch and recovery system (LARS) adding to the flexibility of mobilisation. The US Navy is using the Outland 1000 and 2000 ROVs as they can be launched by hand and are still capable of having a versatile payload like multibeam and tracking. Apart from saving space, it is also cost effective as ROVs can complete the tasks faster than divers. In general, fewer staff are required for ROV operations.



▲ *Figure 3: Saab Seaeye Leopard, an example of a work class ROV.*

As this type of ROV is still relatively light and has limited space for thrusters, environmental conditions such as strong and changing currents may be a limiting factor in using observation class ROVs and the heavier and more powerful work class ROVs would need to be chosen.

Work Class - Less Focus on Survey

The bigger horses are the workhorses and so are the work class ROVs. Their size allows them to be equipped with a higher number of and more powerful thrusters, to withstand strong currents and to have advanced equipment as payload. In addition to the sensors and tooling of observation class ROVs, the bigger work class ROVs add CTDs, sampling equipment with more capacity. They are used in the oil and gas industry for maintenance jobs with a wide array of tools, including manipulators, cutters, water jets and grinders. The work class ROVs can be precisely positioned and are more stable than the lighter observation class ROVs. For scientific purposes, they are suited to work in difficult conditions, like very deep water. Their size allows them to be equipped with redundancy systems that take over when parts break down or are damaged. Saab Seaeye mentions use of sampling from seamounts off Portugal and analysing sea ice algae in Antarctica.

Cost Efficiencies

As mentioned earlier, the use of ROVs can be more cost efficient compared to divers. Osiris Projects mentions that both the oil and gas industry and renewables are looking for cost efficiencies. In the operational sides, there is a trend towards the use of ROVs for shallow-water depth cable burial rather than divers. This is challenging work with few options available making an ROV an attractive alternative.

Another development for pipeline surveying has been developed by the Swedish survey company MMT and Kyst Design. Their challenge was to accomplish pipeline surveys both precisely and cost effectively. For this type of job, AUVs are often used, however, they were not meeting all MMT's criteria. They developed an ROV equipped with an ultra-high resolution multibeam (Kongsberg EM2040 Quadro), two inward tilted laser systems allowing it to fly 5m over a pipeline and achieve precise mapping of the pipe at high speed

▲ *Figure 4: MMT's Surveyor Interceptor has been developed for pipeline surveys.*

(double compared to traditional ROV surveys). The Interceptor Surveyor, as the ROV has been named, can also make videos, sub-bottom profiles and still images with high positioning accuracy, high resolution and at high speed (up to 6kn). First tests have achieved more than 50% time savings and 75% time saving on post-processing and a higher quality imagery compared to previous work.

AUV More Attractive for Surveying?

For surveying, there is a strong case for the use of AUVs. AUVs share many characteristics with the ROV – however they are not connected. The AUV should be more flexible in operation and Osiris Projects mentions this aspect. One of the advantages of the ROV above the AUV for some survey projects may be the fact that there is a direct link with the surface vessel where the survey data can be seen in real time. This is one of the time gainers for MMT in the application mentioned above. The AUV is not yet capable of depth of burial, taking samples and similar tasks – they can just survey the sea floor using sonar, ADCP, CTD and other payloads.

An AUV is also pre-programmed so if there is a particular observation during a survey, it only can be seen when the data have been unloaded from the device and processed. The live link with ROVs facilitates immediate action or a refocus on a discovery, thus saving time.

The hybrid option that solves this issue is a development by ISE. Their control systems manage their ROVs as well as their AUVs – for example leading to the development of a multi-vehicle docking station.

Conclusion

ROVs are versatile in their use, even though AUVs seems to be the more attractive solution for surveying as they are free-swimming. Looking at the mini observation ROVs, their attraction increases with the reduction in size of (multibeam) sonar systems, making them easy to handle for small teams and still returning valuable data, especially from shallow water. New developments lead to increased speed and dedicated solutions for applications such as pipeline surveys, where the direct link with the surface vessel proves to be an advantage over an AUV, where data is only available once it has been downloaded. ◀

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Using Synthetic Aperture Sonar as an Effective Hydrographic Survey Tool

Great Potential for SAS in Hydrography

Synthetic Aperture Sonar (SAS) has been around for over a decade but its primary purpose has been in mine detection rather than hydrographic surveying. To use SAS effectively a stable survey platform is required such as an autonomous underwater vehicle (AUV). These platforms are becoming more commonly used in hydrographic surveying and as a result the viability of SAS as a survey sensor seems a logical progression for the industry with the suggested benefit of increased data quality, better resolution and a pathway to a more modern data centric survey deliverable.

SAS is a technique for creating high-resolution seabed reflectivity images and bathymetry that shares many similarities with Synthetic Aperture Radar (SAR). The forward motion of the sonar is used to synthesise an array that is much longer than its physical length by combining multiple pings in software rather than adding more hardware as a way to gain higher resolutions. SAS uses signal processing to compare the multiple observations of the same area of seafloor to calculate its depth. See Figure 1. It also allows us to circumvent the usual trade-off between range and resolution in conventional sonar in that it provides high-quality data over the entire swath.

Although military applications, such as naval mine countermeasures, have been the major driver of development, SAS is a multi-use technology with great potential for offshore oil and gas surveying, regional surveys for charting, underwater archaeology, benthic habitat mapping and deep sea mining. Figure 2 shows an example SAS image from a sea trial conducted by the US Naval Undersea Warfare Center (NUWC), which illustrates a constant 3*3cm resolution to 200m range in a water depth of 27m; this constant and high resolution is a major benefit of using SAS.
In addition to reflectivity images, SAS can produce highly detailed terrain models of the seafloor by detecting the angle of arrival of seabed echoes coming from a given range grid location. In a configuration known as Interferometric SAS (InSAS), the returns from two vertically separated receive arrays are cross-correlated to measure the delay, which gives the angle of arrival that is used with the range to calculate the depth measurement, as shown in Figure 3.

When the InSAS bathymetric resolution approaches that of the corresponding SAS image, it becomes possible to overlay the reflectivity and topography to create a true 3D representation of objects on the seabed, which is another benefit of using SAS as a hydrographic survey sensor. The ability to generate centimetre-scale resolution in all three dimensions has the potential to provide significant improvements in the detection and inspection of small seabed objects.
A third benefit is as an alternative solution to video capture and review which has been a time consuming part of pipeline inspection survey projects with remotely operated vehicles (ROVs). By using an AUV that is capable of capturing a combination of SAS imagery, bathymetry and on-demand high-definition still photography and delivering these as high-resolution co-referenced datasets there is the potential to save data review time, and provide data from the field as a GIS deliverable.

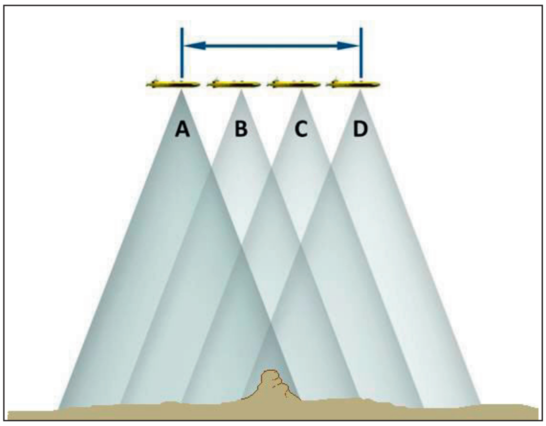
> **SAS technology seems destined to become a multi-purpose surveying tool**

SAS Processing Considerations
In order to use this technology efficiently for hydrographic survey purposes there are a series of processing requirements and questions that need to be considered.

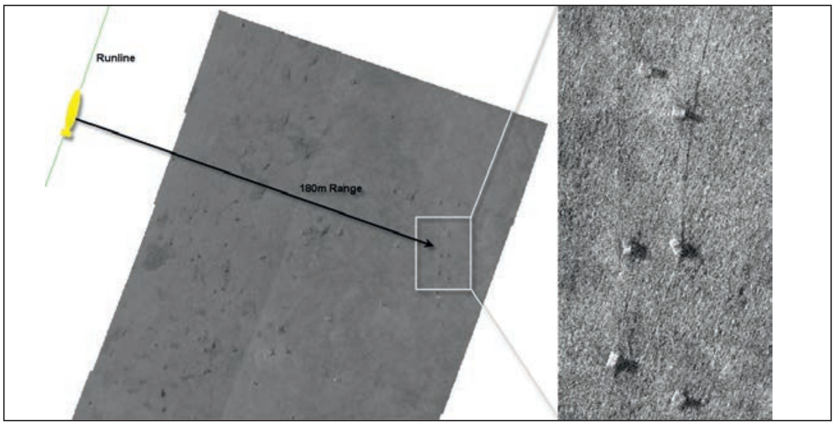
Sensor Configuration
The locations of the arrays may present a configuration challenge as dual receivers will likely be used for InSAS systems. The correct display of the data is important if subsequent image processing, target detection and contact digitising tasks are to be efficient and accurate.

The SAS may also be accompanied by a gap filling sonar, to infill the nadir gap between port and starboard channels. These configuration aspects need to be understood in order to determine an effective line plan.

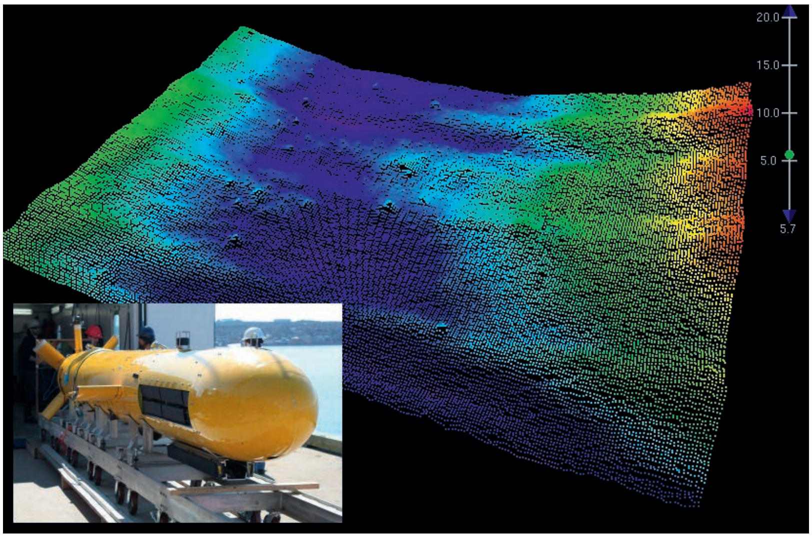
Line Planning
A pipeline inspection project requires the highest resolution bathymetry, imagery



▲ *Figure 1: Synthesising the size of the array gives higher resolution.*



▲ *Figure 2: SAS mosaic highlighting lobster pots with connecting rope at 180 metres range.*



▲ *Figure 3: InSAS Bathymetry (inset shows ISE Arctic Explorer with InSAS arrays).*

and photography to be captured along the pipeline and its immediate corridor. If the AUV flew down the pipe with the SAS transducers mounted port and starboard then no imagery and bathymetry data would be captured in the area of interest. The required approach would be to fly the AUV with an optimal horizontal offset from the pipe to ensure that the pipeline is fully captured, see Figure 4.

Another consideration is that the horizontal offset may cast the far side of the pipe into shadow due to the low grazing angles needed to obtain the required resolution; this may require a second line offset on the other side of the pipe.

Unfortunately, running lines offset to the pipe does not aid the capture of still photography directly along the pipe. The need for camera or video capture could reduce the efficiency of the survey.
The resolution close to nadir of a modern narrow beam angle multibeam system would be close to that of the SAS and therefore could act as an excellent gap filler.

For a regional survey project, the aim would be to achieve the required survey order or level of accuracy with the minimum number of lines. An AUV with SAS, supplemented by a downward looking / gap filling sonar would be a highly effective mapping platform.

Navigation

SAS typically requires integration with the AUVs Inertial Navigation System (INS), in addition to a series of other surface (e.g. GPS or WiFi) and sub-surface positioning methods (USBL). Once the AUV has dove the INS will provide the primary position which can be post-processed after collection to gain better accuracy.

Frame and Data Placement

Most SAS systems have a concept of frames or tiles of imagery and bathymetry. These datasets will likely require further manipulation in order to display the data properly in processing software.

Total Depth Calculation

An essential processing step is the combination of the SAS depth measurements with the AUV depth, to get a total water column depth rather than a relative one. The AUV depth is usually determined by a pressure sensor. This depth calculation may be done at the time of collection or as a post-processing step.

Sound Velocity

AUVs typically fly at an altitude of between 5 and 50m above the seafloor. In shallow-water surveys (<100m), the greater the flying height the more important it is to measure the changes in sound speed as there is more water column available for variations to occur. If the AUV is surveying in deep water (2,000m) and is flying between 5 and 50m above the seafloor, then there will be less significant changes in sound speed so a sound velocity measurement at the transducer face is probably enough to ensure that the seafloor is accurately modelled.

The re-application of sound velocity is also problematic as SAS data is delivered as frames rather than range and angle data.

Local Versus Continuous Coverage

When mine hunting with AUV mounted SAS it is normal practice to sweep the area looking for targets and then to home-in and conduct a high-resolution postage stamp survey around the target in question. However, regional or route surveys will require constant high-resolution coverage, which is much more demanding.

Data Volumes and Storage

SAS is capable of capturing very high-resolution imagery and bathymetry. These high-resolution datasets will demand lots of disk space, which is potentially problematic when considering that the SAS data is

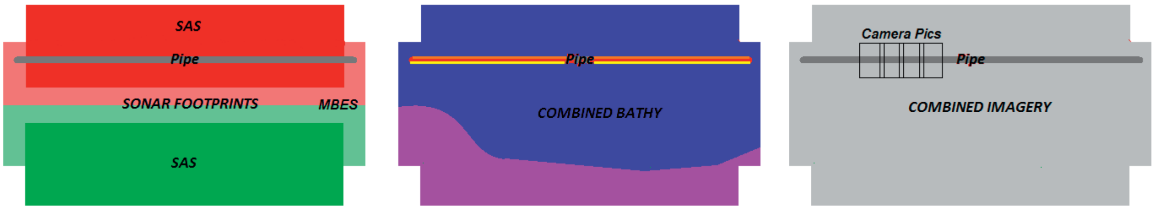


Figure 4: Sonar coverage of pipeline survey with SAS, multibeam and still camera.

collected on an AUV that might be deployed for hours at a time. Add into the mix a gap filling sonar and the disk space requirements would get even more demanding. The time required to transfer this data from AUV disk to ship-based data storage will be greater than the time taken to acquire, therefore swappable drives are an essential part of the survey set-up allowing the data to be read directly.

Data conversion is a basic first processing step in most workflows; this would likely result in a duplicate file-set at least as large as the raw data itself. This process would also take a lot of time. When dealing with large data volumes the need for on board near real-time processing becomes quickly apparent; if data could be streamed directly into a batch process capable of applying some basic processing steps then the size of deliverable coming from the AUV would become much more manageable.

Combining Datasets

A key aspect of using SAS for hydrographic surveying will be combining of port and starboard SAS data with data from the gap filling sonar. It is possible that the resolutions of these datasets may be slightly different therefore techniques like variable resolution gridding would ensure that optimal resolution is maintained in the most critical areas.

Conclusion

Through the wider use of AUVs, SAS technology seems destined to become a multi-purpose surveying tool. Its ability to combine multiple observations in software provides higher resolution reflectivity and bathymetry that is constant right across the available range. The co-registered nature of the reflectivity and bathymetry data allows for excellent feature detection, paving the way for more intuitive data inspection and quality control.
To use SAS effectively as a hydrographic sensor survey line planning is an important aspect; the use of SAS with a gap filling sonar also highlights the need for sophisticated dataset combination. Typical post-processing activities related to navigation and depth are well understood, but the requirements around motion still require investigation.

Perhaps the biggest challenge on the use of SAS in hydrographic surveying will be around data density. This will drive the need for on board near real-time data-processing resulting in the delivery of digital data products ready for analysis in GIS software.

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Karl Kenny, president and CEO of Kraken Sonar Systems, grew up in a small fishing village in Newfoundland with connections to the sea. Since his early days as a maritime surface officer with the Canadian Navy, Karl has been involved in high technology. In 2012, Karl co-founded Kraken Sonar Systems Inc. to focus on developing Synthetic Aperture Sonar technology.

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Part I - New Guinea

The Amphibious Engineers in World War II

On 21 March 1942, General Douglas MacArthur had just escaped from conquering Japanese forces that had overrun the Philippine Islands. In a speech that day he vowed "… I shall return." A major part of that return involved the formation of Engineer Special Brigades (ESBs) with their attached Engineer Boat and Shore Regiments (EBSRs). These Army Corps of Engineers units were a specialised group of hybrid soldier-sailors. Their mission was to transport men and equipment in shore to shore operations, construct pier and dock facilities, roads and landing strips. These brigades were composed of 360 officers, 7500 enlisted men and 550 landing craft – 36-foot LCVPs (Landing Craft Vehicles and Personnel) and 50-foot LCMs (Landing Craft Mechanised).

The development of these units began on 20 May 1942, with the activation of the Army amphibious training command at Camp Edwards, Massachusetts. As the army had little small-boat experience and less navigation experience at this time, training for these critical skills was done by Coast and Geodetic Survey officers on loan to the Army. Commander Leo Wilder, C&GS, was head of boat operation instruction and Commander Clarence Burmister, C&GS, was head of the navigation school. Burmister was cited for being "particularly outstanding in developing navigation aids which later proved highly successful in the prosecution of a new and effective type of amphibious warfare." In addition, a number of C&GS officers were assigned to ESBs as regimental navigators, hydrographers and nautical experts on staff to various brigade headquarter units.

Following training at Camp Edwards, the EBSRs proceeded on to Carrabelle, Florida and/or Fort Ord, California for further training until shipped overseas. Although the EBSRs operated in both the European and Pacific Theaters of Operation, this article will concentrate on Douglas MacArthur's stepping-stone offensive against the Japanese beginning with the retaking of New Guinea. While the Navy and Marines were assaulting the Gilbert and Marshall Islands, MacArthur was mounting a parallel attack up the coast of New Guinea.
As compared to Navy and Marine operations, there was little resource devoted to hydrographic operations with the exception of clandestine hydrographic reconnaissance. However, the skills of hydrographers in navigation, understanding of tides and currents, and map interpretation were used on a regular basis throughout the New Guinea campaign. The following are a few vignettes from this campaign.

Hydrographer's skills were needed for reconnaissance surveys and planning of landing operations

Uncharted Waters

Operations of the EBSRs in New Guinea began in November 1942 with the arrival of the 2nd Engineer Special Brigade with its associated boat and shore regiments. Its operations ultimately encompassed over 1,600 miles of poorly charted coastline running from Milne Bay at the southeast tip of the island to Sansapor in the northwest. MacArthur's strategy was to bypass and isolate Japanese strongpoints and attack weak Japanese defensive positions. Prior to 1944, the bulk of fighting had been carried on by Australian troops who defended Port Moresby and then secured the southeast corner of the island.

With the coming of American troops and the EBSRs, Milne Bay and Buna became the first major US bases. These served as the staging areas for the MacArthur's first major amphibious operation, the attack on

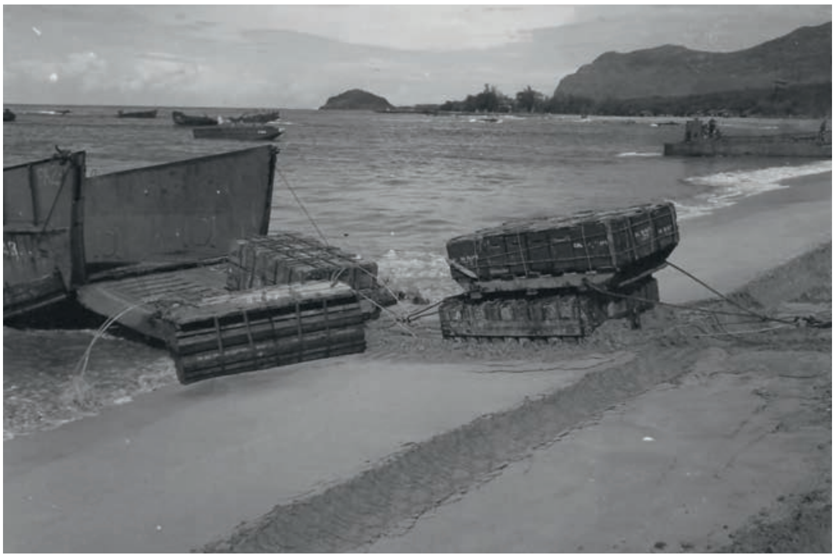
▲ *Figure 1: The beach of Biak in 1944.*

Lae. The 2nd ESB, under General William Heavey, was an intrinsic part of that attack transporting men of the Australian 9th Division and supplies to the landing beaches. Lieutenant Colonel John Ellerbe (transferred from the C&GS), was on Heavey's staff as nautical advisor and described the operation as follows:

"Upon my arrival at Oro Bay, I was plunged immediately into the thick of the planning of the Lae Operation… The usual work of preparing charts, tracks, diagrams, tables, and so forth, was the order of the day, except that, now that the landing was 'for keeps' instead of merely a training routine, we had only maps, photos, descriptions, and so forth, of the proposed far shore, from which to obtain our data. A few PT boats (Navy) had brought back sketchy reports, from investigations at night by radar and hand lead, on depths of water, reefs, and so forth, but most of the information was obtained from photos taken by the Air Corps."

"General Heavey planned to take four of the staff officers, including myself, along on the landing. Accordingly, on 2 September we boarded a PT boat, and were landed a few hours later at Morobe, some 100 miles to the north. This bay was the point at which the Amphibian Regiment going into operation was bivouacked, and we made it our headquarters for the next two days…."
"Heavey and his staff boarded the lead ship of the attack convoy at Morobe and about midnight of 4 September we picked up about 50 Brigade boats,— they had proceeded northward several days before and were in hiding in a small bay. They fell in astern of the LCTs and the convoy proceeded, arriving off Red Beach at about 0400, 4 September. Since H-hour was 0645, there was a considerable period of waiting, laying to, until time to move in toward the beach. This period was without doubt the most nerve-wracking part of the entire operation, since we knew that we were at the mercy of the Japanese Air Force. Our vessels (close to 200 in number, since all the echelons had now come together) lay on the smooth calm waters like ducks sitting on a pond, and a hundred planes at daylight could easily have wrecked the convoy…."

▲ *Figure 3: Francis X Popper plotting hydrographic survey in New Guinea - Regimental navigator for Army amphibious engineers - May and Larusso standing guard.*



▲ *Figure 2: Landing craft unloads supplies on Biak Beach.*

"The naval bombardment of the beach was a beautiful thing to see. Tracers of all colours, from the DD's 5-inch guns, curved lazily toward the beach, then striking, ricocheted toward the hills in the background in blazing loops of fire. The thunder of the guns was incessant, and shortly the explosions ashore had enveloped the entire area in clouds of smoke and dust, making a gray haze through which the landing craft had to make their way."

"Promptly at 0645, the first waves hit the beach, and the invasion was on. Wave after wave, LCI, LCM, LCV, LCT, LST, hit, unloaded men and materials, retracted, and returned to the rendezvous area. By 0830, thousands of men and tons of gear were ashore…."

Following the taking of Lae, the next target was Finschhafen. Major Ector Latham (transferred from C&GS) of the 532nd EBSR was cited for "outstanding services during the development of the Finschhafen, New Guinea area from 22 September 1943 to 15 November 1943. At night and under adverse weather conditions, Major Latham piloted Naval and Brigade craft through uncharted and dangerous waters without mishap. He personally navigated the majority of early resupply missions from Lae to Scarlet Beach and Finsch Harbor. He displayed rare courage and coolness under enemy fire, always being an example to the officers and men under his command. In addition, Major Latham has prepared detailed hydrographic surveys of Kedam Point, Scarlet and Godowa Beaches. From these surveys he has charted and prepared sailing directions for Finsch Harbor, Langemak Bay, Schneider and Dreger Harbors."

Following the capture of Finschhafen, Latham was also involved in an action north of Saidor, New Guinea, which is noteworthy as an example of hydrographic reconnaissance under combat conditions. On the night of 3-4 March 1944, Latham accompanied a motor torpedo boat (PT -193) to shoreline for the purpose of collecting hydrographic and topographic information. The vessel entered Sek Harbor at Alexshafen, New Guinea. When about 50 to 75 yards offshore, north of Sek Island, PT-193 opened fire on what was assumed to be a Japanese shore battery. The PT boat turned around and was leaving the vicinity while continuing to fire at the gun emplacement when it was fired upon by a machine gun emplacement. Most of the boat's guns were firing at the first battery and could not be brought to bear on the firing machine gun. Latham manned an extra machine gun, firing on the hostile gun position. Subsequently, a twin 50 caliber was brought to bear on the Japanese weaponry. Unfortunately, the twin 50s were so arranged that, when firing, the muzzles were about one foot over his head. Latham suffered severe ear trauma and was under hospital care for about two months and received the Purple Heart Medal for this injury. He recovered in time for the Leyte landings in the Philippine Islands.

Lieutenant Colonel Ross Gilmore (transferred from C&GS) arrived in Milne Bay on 23 May 1944, and spent his first months in New Guinea ferrying LCMs up to Buna where they were relayed further up the coast for the Wakde, Biak, and Sansapor operations. On 10 August, he led 60 combat-loaded LCMs with approximately 2,000 troops up to Maffin Bay near the northwest end, a distance of 875 miles, in poorly charted waters with ongoing enemy activity. Many bypassed Japanese strongholds still existed on the New Guinea coast. The LCMs were 50- to 56-foot square-snouted vessels that made 6 knots under ideal conditions and 2 to 3 knots with full loads in a seaway. Gilmore was the navigator for all 60 boats and travelled in the lead boat approximately 1 mile ahead of the others. One night off the Sepik River, he awoke to check on the progress of the flotilla and looked over the ramp to see the black shape of a Japanese submarine lying on the surface not 50 yards off. He narrowly avoided colliding with the sub, but fortunately, the sub crew must have been as startled as Lt. Cdr. Gilmore as they chose to dive instead of open fire with their deck gun. On 25 August, he arrived safely in Maffin Bay with all boats, equipment and the 2,000 troops. Gilmore's regimental commander angrily inquired where he had been to which Gilmore replied "Colonel, I've been getting your damned boats up here."

Another 120 boats were convoyed up there without loss following the path blazed by Gilmore. Because of the poor to non-existent charts, these small-craft convoys with no naval escort travelled as far as 35 miles offshore during this operation. At Maffin Bay they staged for the Morotai landings. On 15 September, Gilmore landed at H+15 minutes at Red Beach and conducted lighterage operations until 20 September when he took over as beachmaster. With the capture of Morotai at the northeast end of the storied Moluccas, the stage was set for MacArthur's liberation of the Philippines. Although hydrographers of the ESBs did not conduct large area surveys as did their naval counterparts, their skills were needed for reconnaissance surveys, planning of landing operations, piloting of small craft and management of beach operations. Their work aided in the reconquest of New Guinea and would prove to be invaluable in the liberation of the Philippines. ◂

▴ *Figure 4: US invasion troops on Aitape New Guinea Beach.*

Its connection with the 3rd Barcelona World Race

Second International **Ocean Research** Conference

Nine years after the first Conference, the Intergovernmental Oceanographic Commission (IOC) of the UNESCO and The Oceanographic Society (TOS) organised a second conference from 17-21 November 2014 in Barcelona, Spain, to review progress made in ocean science in the last twenty years and to plan ahead.

The choice for Barcelona was supported by the Oceanic Navigation Foundation (FNOB), an institution based at the headquarters of the El Far Consortium of Barcelona. This support was essential for the success of the Conference.

An ice-breaker reception was offered by the Mayor of Barcelona in the historical City Hall, welcoming scientists from 75 countries. Another social event was the reception in the renovated Maritime Museum.

The opening session was chaired by Dr. Wendy Watson Wright, executive secretary of IOC, with the participation of Jane Lubchenko, former NOAA administrator now professor of the Oregon State University. Dr. Lubchenko mentioned Goal 14, which has been inserted into the proposed 17 goals to be submitted to the UN General assembly as follow-on of RIO+20.
The text of Goal 14 is: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Present amongst the attendees were Rear Admiral Carlos Alejandro Abascal Andrade, director general of Oceanography, Hydrography and Meteorology of the Mexican Navy, accompanied by Commander Jesus Olaguibel Dominguez, director of Oceanography.

Many other scientists participated in panels and discussions. The majority of the discussions dealt with physical and biological oceanography. The use of the gliders to fill the gap due to the lack of ships available for the oceanographic research was explained. The conference organisers were able to ensure the presence of Spanish research vessels in the port of Barcelona. *Ramón Margalef* and *Francisco De P Navarro*, both operated by the 100-year-old Instituto Español de Oceanografía (Spanish Institute of Oceanography) and the Oceanographic Catamaran of SOCIB, operated by the Balearic Institute of Oceanography. Next to the three oceanographic ships was moored a prototype of the IMOCA 60 class yacht. These boats participated in the 3rd Barcelona World Race (BWR), which departed on 31 December 2014. The race is organised and controlled by the Oceanic Navigation Foundation of Barcelona (FNOB). Almost all the attendees were able to visit the

▲ *Figure 1: IOC executive secretary Dr. Wendy Watson Wright delivering the opening keynote. Image courtesy: Commander De Olaguibel.*

▲ *Figure 2: Departure of the IMOCA boat* Renault *at the Barcelona World Race on 31 Dec 2014. (Image courtesy: Thilbaut Le Carpentier).*

ships and were warmly welcomed on board by the captains and the crews.

During the panel sessions, ample attention was given to the gliders' operation. Of particular interest was the news that the two crews of the IMOCA 60 sailing boats would make oceanographic measurements while underway and each boat has deployed oceanographic buoys of the Argo Project in selected ocean areas, ensuring a strong link between the sailing sport and oceanographic research, which is an example to be followed. The link with oceanographic vessels and sailing helped make the second International Ocean Research Conference particularly interesting. The executive secretary of the IOC (Ms Wendy Watson Wright), the director of the Oceanic Navigation Foundation (Mr. Andor Serra Merkens) and the chairs of the panels were key to making the conference a success. The Barcelona Municipality again proved its continuing support to maritime and scientific initiatives.

The use of vessels of opportunity reflected the policy of compensating the lack of specialised vessels by using other crafts that have sufficiently trained people able to participate in the sea research. This is reminiscent of the concept of crowdsourcing data as proposed and debated during the V Extraordinary Hydrographic Conference (October 2014). The data gathered by the eight IMOCA 60 boats participating in the BWR include salinity, surface temperature, micro-plastic and oxygen, which will be fed into the GLOSS system.

▲ *Figure 3: Departure IMOCA boat* Neutrogena. *(Image courtesy: Thilbaut Le Carpentier).*

The winner of the race is expected to arrive in Barcelona at the end of March 2015. Readers can follow the race on the website of the Barcelona World Race (website 1). ◀

More information

1. www.barcelonaworldrace.org/en/

TechWorks Marine Ltd.

Greater Awareness of Coastal Environment

TechWorks Marine is based in Dublin, Ireland, from where we service clients worldwide in the provision of oceanographic products and related data services. Our expanding team has a diverse range of skills relating to electronic engineering and marine science as well as mechanical engineering and earth observation.

TechWorks Marine is a privately owned SME, founded in 2002 by Charlotte O'Kelly (managing director) and Philip Trickett (technical director), which develops data loggers for use on multi-sensor oceanographic data buoys in the marine sector.

The TMBB range of data acquisition and transmission systems are core to all the integrations supplied to clients (data buoys and other data platforms). Over the last 12 years we have grown the business from 2 to 12 staff and from an Irish client base to an international one, servicing clients across Ireland, the UK, France, Norway, Sweden, the US and as far afield as Tonga.

"When we initially started the business we offered our clients bespoke data acquisition systems and integrated them with a variety of sensors depending on the clients' applications.

▲ *Figure 1: Lowering the sensor payload in a SmartBay Data Buoy.*

Today we offer a range of data acquisition systems to our growing client base as well as fully integrated data buoys for coastal and offshore applications. In addition, we offer full project management and consultancy services around metocean equipment deployment for sectors such as marine renewables and coastal engineering. We are also expanding into Earth Observation and modelling, and integrating these areas with our original core business to create exciting new products and opportunities", explains Charlotte.

Who we Are

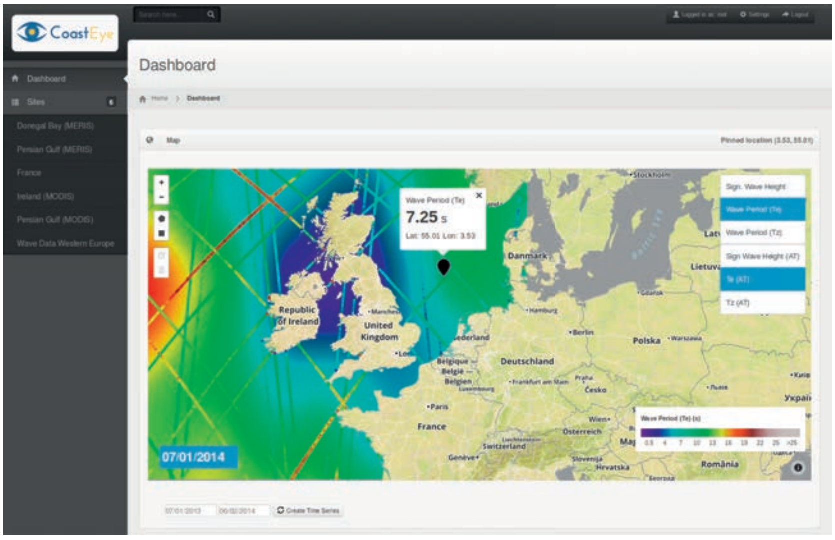
"We aim to consistently deliver operational data platforms that deliver at least 98% data return over 24 months or more. At the same time, we are improving and upgrading both our technology and methodologies to ensure data quality. Remotely monitoring and controlling platforms as well as ensuring our staff deliver world class metocean surveys in the harshest of environments with 98% data return or more are core to our business success."

Deliver world class metocean surveys in the harshest of environments with at least 98% data return or more

We currently service a range of different industries:

- **Marine Renewables**. Current and wave equipment, deployment activities, data analysis, resource assessment, numerical modelling, earth observation, hydrographic surveys, ROV operations
- **Ocean and Environmental Science**. Water quality monitoring, current and wave equipment, deployment activities, data analysis, numerical modelling, earth observation, GIS services
- **Coastal Engineering**. Current and wave equipment, deployment activities, data analysis, numerical modelling, earth observation, hydrographic surveys, GIS services
- **National Infrastructure**. Data buoy networks, centralised web-based buoy management and data visualising systems
- **Aquaculture**. Water quality monitoring, early warning systems, ROV operations, numerical modelling, earth observation, hydrographic surveys

The TechWorks Marine Black Box (TMBB) range of data acquisition and transmission systems is the core of all integrations we supply clients (data buoys and other data platforms). In recent years we have delivered a number of complex monitoring systems for



▲ *Figure 2: CoastEye portal for viewing and analysing near real-time and archived data.*

key clients such as SmartBay Ireland and the Swedish CoDAS data buoy network. In 2015, we will be providing a buoy network to Irish Water, the national water agency. We plan to further expand this market internationally in 2015. Other areas of expansion include the provision of metocean services, with our increasingly large equipment pool to ensure we can serve clients in a professional and timely manner internationally.

One of our new areas of interest this year is commercialising our Earth Observation and modelling service portfolio. Over the last 3 years, through a number of European Space agency projects, we have built up a team of four Earth Observation and numerical modelling experts. In 2014, we completed the development of our suite of water quality products, which are now commercially available. We plan to launch a range of forecast and hindcast services aimed at the marine renewables area (offshore wind, wave and tidal sectors) later in 2015, based on EO data and modelling. The integration of Earth Observation, modelling and in situ products and data services has huge potential, as we can now offer a complete service including fully validated data products in any area of interest. To complement this, we have developed the CoastEye (coasteye.eu) web portal through which users can access and analyse our data products in an easy to use, intuitive way.

International and Global Scope:

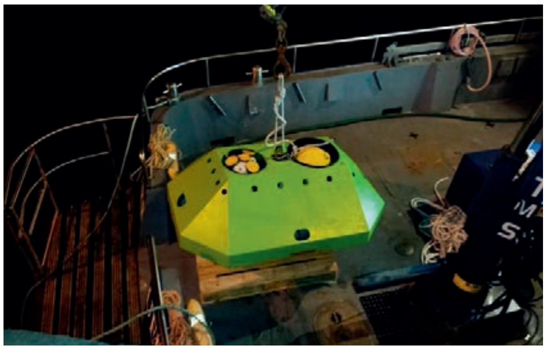
Our multidisciplinary team works closely with our clients to ensure that we deliver cost effective de-risked solutions for their operations. We are developing relationships with local partners in key overseas markets, to tap into the huge global market for real-time integrated data buoys. To date, most of our larger sales have been international, and although we value and are looking to increase our activities in Ireland, our focus is very much an international one and will continue to be so.

We strongly believe that being able to offer our clients a full end to end service from equipment provision to secure web-based data service is essential to our future growth internationally. In the world we live in, people expect to be able to access a diverse range of data from remote coastal or offshore buoys in an easy to use intuitive way. We provide the ability to set up the network remotely, add and remove buoys when necessary as well as the micro management of buoys such as sensor swap-out and upload of new calibrations, and all the Quality Control which goes with it. Sensor technology is also becoming more cost-effective, which will in time generate growth in the deployment of long-term operational buoys by national organisations to commercial ones, for example in the case of offshore windfarms.

The Future

To consistently deliver operational platforms that operate at least 98% data delivery over 24 months or more is challenging at the best of times, but this is what we in TechWorks Marine aim to deliver and have proved with existing clients. At the same time we are always improving and upgrading both our technology and methodologies to ensure data quality and remote monitoring and control of platforms as well as ensuring our staff deliver world class metocean surveys in

▲ *Figure 3: Delivery of the CODAS Buoy network in Sweden.*



▲ *Figure 4: ADCP frame ready for deployment.*

▲ *Figure 5: TMBB data acquisition system on CODAR buoy platform.*

the harshest of environments with 98% data return or more.

The expansion and development of the marine renewable energy sector is an exciting one in terms of growth potential globally. We have been involved in this sector for the last 8 years and have seen huge changes. We are living in exciting times, there is a shift towards greater awareness of our coastal environment, which is going to drive monitoring programmes and the way we approach and deliver monitoring solutions. As a company focused on integration, control and data access for both temporal and spatial data we look forward to growing internationally over the coming years. ◀

More information
www.techworks.ie

SUNRISE Project

Connecting the Oceans

Creating the 'Internet of Underwater Things' is a crucial challenge that is strategic to the future of humanity. Thanks to the international project SUNRISE, seas, lakes and rivers will soon create large digital highways for data transfer from sensors, robots, Autonomous Underwater Vehicles (AUVs) and next-generation vehicles capable of performing tasks usually too dangerous for humans. These include environmental monitoring (e.g. underwater volcanoes or geological faults), de-mining, surveillance and protection of submerged archaeological sites, and searching for new oil fields.

Connecting the oceans appears to be madness, a project from 'the twilight zone'. However, similar thoughts were to be had when mankind decided to send a probe to Mars.

There is a fundamental difference between space exploration and the exploration of the seas: despite centuries of navigations on its surface, the ocean remains largely uncharted 'territory'. We are still unaware of most of its 'rules', of the mechanisms governing the changes of its environmental parameters making them hostile environments for humanity and its 'modern' needs. The technological challenge that SUNRISE has embraced concerns the fundamental understanding of how to improve reliability and performance of communications in the harsh submarine environment and how to exploit cutting-edge communication technologies for interconnecting heterogeneous teams of AUVs and sensing devices into a network, allowing them to cooperate to perform complex tasks. Only once these fundamental questions have been answered will we be able to start connecting the underwater world to the Internet.

▲ *Figure 1: Acoustic modems made by University of Rome La Sapienza. (Image courtesy of all images: Marco Merola).*

Organisation

SUNRISE is a project lead by the University of Roma 'La Sapienza', funded by the European Union through the VII Framework Programme. The team is developing the software architecture for enabling devices to communicate so that they can be self-configuring and autonomous, and report to the control room of different countries what is happening underwater. In other words, the Internet of things is becoming the Internet of Underwater Things.

The SUNRISE team includes the NATO STO Centre for Maritime Research and Experimentation of La Spezia; the European company Evologics that builds acoustic modems; the universities of Twente (the Netherlands) and of Porto (Portugal); the Turkish company SUASIS; the Italian company NEXSE, specialising in system integration; and an American partner, the University at Buffalo, of the SUNY system.

Underwater Challenges

"The technologies we take for granted in our everyday life cannot be used underwater as they are" remarks project coordinator Prof. Chiara Petrioli. "We often cannot use radio communications, which would enable communication within just a few metres; we can seldom use optical communications, which enables high data rates in the terrestrial Internet backbone. We therefore have to mimic the ways in which underwater mammals (e.g. whales and dolphins) communicate, which is by use of acoustic communications. Acoustic communications is challenging as it suffers from high propagation delays, low data rates and varying quality. We need to build networks that can provide a reliable communication infrastructure despite the fact that single links are not reliable. We need to develop adaptive communication technologies, able to change the waveforms and protocols adopted based on application needs and channel conditions. This is enabled by the Software defined Open Acoustic Modems and Software Defined Communication Protocol Stack developed within SUNRISE."

The Success of the First Year

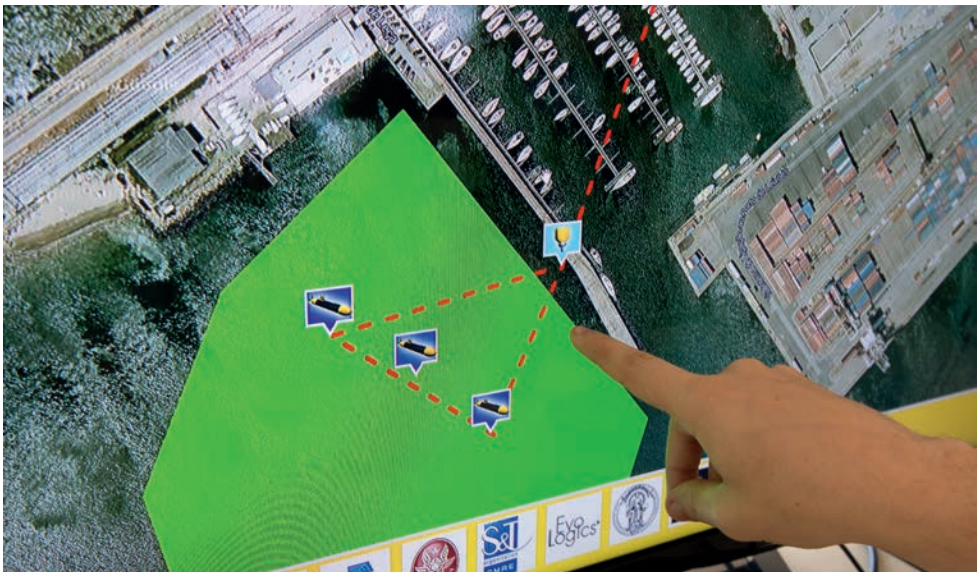
Halfway through the project, SUNRISE has already lead to significant innovations. The University of Twente team has developed fully reconfigurable underwater sensor nodes for wireless monitoring and a Software Defined Acoustic Modem allowing developers and researchers to dynamically change the different settings of the modem. University of Rome 'La Sapienza' and its spinoff WSENSE s.r.l. have focused on SUNRISE Software Defined Communication Stack and on deployment support tools. They have designed and developed a novel infrastructure to support the communication and cooperation of a heterogeneous network of underwater assets. Mobile underwater and surface robots, and drifting and moored nodes communicate and cooperate in an efficient way to accomplish challenging tasks. They can be equipped with a large variety of sensors to monitor the marine environment in an efficient way and to report the collected data to the end users. Using the developed infrastructure, operators at the command and control station can interact with, reconfigure and instruct the underwater assets remotely (also over the Internet) and all this in real time. The use of acoustic links and networking functionalities facilitate this interaction even when the nodes are submerged. The network of nodes is able to adapt in an autonomous and distributed way to failures and environmental changes in order to accomplish the requested tasks. The developed system will also be compliant to emerging NATO standards such as JANUS, a physical layer protocol in the process of becoming the digital underwater communications standard enabling interoperability among multi-vendor solutions. In 2014, CMRE developed a fully functional stand-alone modem compliant with standard physical and MAC specifications that can be deployed in a variety of hardware platforms such as ARM or X86 computers, and has been ported to some of the platforms used by SUNRISE.

The project has also developed a federation of testbeds that can be accessed through a web tool, called the SUNRISE gate, developed by NEXSE, an italian systems integrator. It allows users to access the heterogeneous resources offered by the testbeds in a unified way. Resources are localised on a map and their information shown on panels and graphs. Users can schedule and perform experiments and missions using an intuitive and effective web Graphical User Interface (GUI). Even mobile resources, such as AUVs, can be moved and monitored on the map. The SUNRISE gate collects and sends information to the testbeds through their gateways. Testbed resources are abstracted as virtual resources. A specific interface has been designed for connecting more resources and more testbeds, irrespective of their hardware and software implementation.
Five testbeds will be deployed and federated through the SUNRISE GATE to cover the most relevant marine scenarios and environments (lakes, canals, Mediterranean Sea, Atlantic Ocean, Black Sea). Three testing infrastructures are currently connected to SUNRISE federation. University of Porto LSTS group has developed a semi-permanent AUV testbed located in the Porto de Leixões. It can scale up to six AUVs, one surface vehicle and six manta gateways equipped with SUNRISE-developed communication and networking technologies. The testbed is reconfigurable and can be used by third parties running tests on novel underwater communications technologies and cooperative sensing.
NATO STO Centre for Maritime Research and Experimentation (CMRE) has deployed an improved version of its Littoral Ocean Observatory Network (LOON), a pioneering testbed allowing persistent and remotely operated experiments in underwater communications. The LOON has been expanded in SUNRISE with equipment and capabilities (such as arbitrary waveform transmission), with the networking and communication tools developed by University of Rome 'La Sapienza' and connected to the SUNRISE GATE to handle the allocation of the testbed for the different users and experiments. Through this GATE, LOON users benefit from an improved and simplified experience. For SUNRISE experimental campaigns, SUASIS, a Turkish SME, is providing Internet-based testbed facilitities allowing users to access and conduct tests in a tank testbed (operational), in the Sapanca Lake (from spring 2015) and the Black Sea (early 2016).

The flexibility and reconfigurability of SUNRISE-developed platforms, sensing and communication technologies has been validated at sea and has proven to result in a more cost efficient, robust, performing next generation of underwater monitoring systems. The project is also developing powerful testing facilities, which can effectively and accurately be used by third party users to assess the performance of novel technologies and solutions in heterogenous underwater environments and application scenarios, leading to systems that are best fitted for requirements of the application at hand. ◄

▲ *Figure 2: Light AUVs photographed in the lab of University of Porto.*

✉ petrioli@di.uniroma1.it



▲ *Figure 3: Testing connections between Light AUVs and control room in Porto de Leixões.*

Hydrographic Society Benelux

Workshop on the Wadden Sea Floor on the Island of Terschelling

Members of the Hydrographic Society Benelux (HSB) and the Deutsche Hydrographische Gesellschaft (DHyG) travelled to the island of Terschelling for a two-day workshop packed with presentations on the profession, standards and of course local surveying as the ever-moving seafloor of the Wadden Sea has been the subject of research.
The 50 Dutch delegates and around 40 from Germany gathered at the Nautical Institute Willem Barentz in West Terschelling, where they were welcomed with coffee, tea and the local Oranjekoek. After opening speeches by Mr G. van Leunen (Marine Institute Willem Barentz), Rob van Ree (organiser) and Holger Klindt (chairman of the DHyG) pitches were held by Captain Marc van der Donck, Dutch Hydrographer; Thomas Dehling, head of the Surveying division of the BSH; Peter Gimpel, director Survey Sytems, L3 Elac Nautik; Ben van Scherpenzeel, director Nautical Developments, Policy and Plans of the Port of Rotterdam; Mr K. Verbeke, head of Survey Division, DEME; Aris Lubbes, chief scientist, Fugro offshore Survey Division; and Michiel van der Munt, head of Survey Division, Allseas. After the presentation of the survey on employment at hydrographic survey companies – which showed an increase in the demand for hydrographic personnel – these speakers were engaged in a forum discussion where the presenters explored the boundaries of technical developments, the options for education and the presentation of hydrographic information in, for example, an ECDIS system.
All delegates were then offered drinks before taking buses to diner in a beach restaurant, where they had the opportunity to meet informally with colleagues from the other country.
The second day was dedicated to technical presentations. Ernst Lofvers of Rijkswaterstaat presented the survey of the inlet between the islands of Vlieland and Terschelling and the consequences that the moving seafloor has for shipping,

▲ *Figure 1: Marc van den Donck emphasising the importance of S-100 as a data standard.*

▲ *Figure 2: Lively discussions during the coffee breaks.*

Hydrographic Society Russia

Round-the-world Expedition Completed

On 18 January 2015, the round-the-world expedition of the oceanographic research vessel *Admiral Vladimirsky* (Captain: member of HSR, A. Pyshkin) of the Hydrographic Service of the Navy came to an end.

For the first time ever, the route of the Russian round-the-world expedition followed the Northern Sea Route. The hydrographers obtained new information about seabed relief and they also evaluated the changes in configuration and location of the coastline of several islands and seas of the Arctic Ocean. The stability of the functioning of modern navigational equipment in polar areas was tested as well as the efficiency of aids to navigation. The expedition confirmed the existence of Yaya Island in the Laptevs Sea and made a survey of its coastline.

While navigating from Kronstadt to Petropavlovsk-Kamchatsky there were naval cadets of Saint Petersburg Naval Institute on board. They gained hydrographic experience under the leadership of HSR members K. Rukhovets, E. Myagkov and A. Leonov.

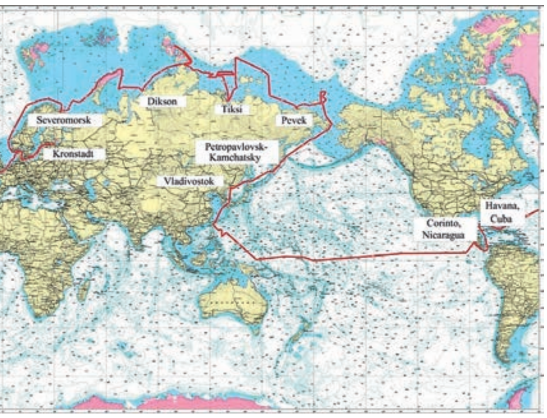
The vessel covered 31,550 nautical miles in 154 days and carried out extensive hydrographic and oceanographic research in the Atlantic, Arctic and Pacific Oceans. The results of expedition will be used for the updating of navigational charts, manuals and navigational publications.◀

▲ *Figure 1:* Admiral Vladimirsky.

▲ *Figure 2: Cadets of the Saint Petersburg Naval Institute.*

including the ferry route. His presentation was followed by one by Therese Maierhofer from Austria who conducted multibeam observations of sand ripple transport near Texel. F. Steinbacher covered a subject that had already been discussed in the first presentation earlier in the morning; digging into the application of laser altimetry and bathymetry in the Wadden Sea, followed by Sicco Kamminga of Nortek explaining what could be derived of currents from radar observations. Christiaan Maushake added a methodological presentation on boundary conditions for numerical modelling of the German Bight before Herman Peeters dug into hydraulic boundary conditions and a measurement campaign the organisation conducts in the Wadden Sea. The main goal is to predict storm surges in time to be able to take protective action, like closing barriers. Firmijn Zijl of Deltares showed current modelling related to drying out shoals. After a final demonstration of oil spill modelling using the open source application GNOME by a 4th year student, it was time to conclude the successful event and to return to the ferry. ◂

▾ *Figure 3: The round-the-world itinerary of the* Admiral Vladimirsky.



MARCH

IEEE/OES Eleventh Current, Waves and Turbulence Measurement Workshop (CWTM)
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→ 02-06 March
For more information:
http://cwtmc2015.org/index.cfm

US Hydro 2015
National Harbor, USA
→ 16-19 March
For more information:
www.thsoa.org

Arctic Technology Conference (ATC)
Copenhagen, Denmark
→ 23-25 March
For more information:
www.arctictechnologyconference.org

APRIL

Ocean Business
Southampton, UK
→ 14-16 April
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www.oceanbusiness.com

MAY

RIEGL Lidar 2015
Guangzhou and Hong Kong, China
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OCEANS'15 MTS/IEEE Genova
Genoa, Italy
→ 18-21 May
For more information:
oceans15mtsieeegenova.org

JUNE

OTE 2015 - Offshore Oil & Gas Technology, Equipment Exhibition
Nantong, China
→ 12-15 June
For more information:
jennifer@uaec-expo.com
www.ote-china.com

TransNav 2015
Gdynia, Poland
→ 17-19 June
For more information:
http://transnav2015.am.gdynia.pl

JULY

South East Asian Survey Congress (SEASC 2015)
Marina Bay Sands, Singapore
→ 28-31 July
For more information:
pat@eventspeople.com
www.seasc2015.org.sg/index.html

RIO Acoustics – Acoustics in Underwater Geoscience
Rio de Janeiro, Brazil
→ 29-31 July
For more information:
secretariat@rioacoustics.org
www.rioacoustics.org

SEPTEMBER

Shallow Survey 2015
Plymouth, UK
→ 14-18 September
For more information:
www.shallowsurvey2015.org

AUVX 2015
Annapolis, USA
→ 21-24 September
For more information:
AUVX@hydroid.com
www.auvx.com

OCTOBER

Teledyne Marine Technology Workshop
San Diego, CA, USA
→ 04-07 October
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