

## Welcome from the General Manager

Welcome to the latest edition of the SmartBay newsletter. Since the start of this year we have seen the successful completion of the first phase of the deployment of the SeaPower device at the test site. This part of the project allowed SeaPower to gather vital performance and survivability data over the trial period. In January, we hosted a very successful EU funded MARINA H2020 Project workshop on the technical and policy related barriers to the development of the future wave energy industry in Ireland. The subsea observatory node was successfully redeployed using the Granuaile, following an extensive maintenance overhaul which included a recalibration of instruments and the installation of new sensors. The SmartBay team continues to pursue new EU project opportunities and to manage existing National and European projects.

Cathx Ocean, an Irish manufacturer of subsea cameras and lights for deep sea vehicles, is utilising the cabled observatory to test an

innovative subsea optical system. The system was deployed on the subsea node and a second phase of this trial will involve the use of this system to monitor vibration. The SmartBay Ireland H2020 COLUMBUS brokerage workshop was held at Dublin City University on the 24th May. Irelands Maritime Festival, SeaFest will take place in Galway from June 29th to July 2nd and there are a number of events taking place including the Harnessing Our Ocean Wealth and Digital Ocean conferences. I am delighted to report that SmartBay Ireland has been short-listed for the Marine Industry Supplier of the Year category at the Marine Industry Awards 2017 which will be held in Galway on the 29th June.

Finally, I would like to extend a warm welcome to Toni Kelly who has recently joined the SmartBay team to provide financial and administrative support for our many EU projects.

*John Breslin*  
General Manager



Above: Port of Galway during Seafest 2016

## Conferences

### Marine Renewables Industry Association Conference

The annual Marine Renewable Industry Association event took place on the 3rd of February. Once again, the attendance at the event continues to grow. There was an afternoon session devoted to the investigators and companies involved in SFI MaREI Centre and the kick off meeting for MARINET2 project was held the day before the event. The event involved talks from various companies and stakeholders and reviewed the progress of the industry over the previous year and what to focus looking forward. The majority of stakeholders in Ireland attended as well as a number of interested parties from Europe and internationally. John Breslin presented a 5 minute snapshot on SmartBay's previous yearly achievements and future progress.

### SeaPower Update

SeaPower has successfully completed its survivability testing programme by deploying its prototype device in SmartBay over the winter period from November to March. Testing was supported by SmartBay Ireland and the Marine Institute and P&O Maritime Services teams and this expertise assisted SeaPower to gather valuable performance data that will help the company better understand the forces on the structure and moorings and how the device responds to various wave frequencies and heights. This information will help SeaPower to identify improvements in the design of the device and its moorings, thereby reducing costs, improving efficiency and progressing the device on its pathway

### Oceanology International North America

John Breslin and Rogerio Chumbinho attended the North American event of Oceanology International (OI) hosted in San Diego. This was the first time OI was held in the Americas, specifically targeting the American market and collaborations with American companies. Besides the networking and consolidation of contacts with European, US and Canadian companies working in the marine sensors and marine renewable energy sectors attending the event. John and Rogerio delivered two presentations, one in the "Near and Far Market Trading" track, in a session hosted jointly with the MI (IMDO) and IDA, and the other in the "Sensors and Instrumentation" track ("The Viability of Autonomous Platforms in Biological and Chemical Oceanography").

### Ocean Business

The annual Ocean Business event was held in the first week of April in Southampton. Rogerio Chumbinho attended the event on SmartBay's behalf and made contacts with potential and existing users of the test site. The event incorporates an international ocean technology exhibition and training forum and is attended by over 300 companies from manufacturers and technology developers to service providers.



Above: Rogerio Chumbinho presenting at Oceanology International

towards commercialisation. Funding was provided by SEAI's Prototype Development Fund.



Above: The SeaPower wave energy converter prototype deployed at the SmartBay Test Site

## SmartBay Facilitated Research

### Understanding Underwater Video Content

Investigating object detection and recognition for the SmartBay camera platform  
National Infrastructure Access Program - DCU Project

The goal of this project is to uncover previously hidden marine knowledge by analysing the visual data captured by the SmartBay camera platform. The cabled observatory from SmartBay provides images and videos of the underwater landscape in the bay of Galway that allows the study of marine activities without interfering with their normal behaviour. During the initial phase of the project, a fish density estimator has been built and evaluated. This potentially allows us to filter out images that are not particularly interesting prior to deeper analysis. As shown in Figure 1, the estimator categorises the captured images into four classes corresponding to low, medium-low, medium-high and high density in terms of the number of fish present. Visual inspection shows that this initial result is very promising. In the next phase of the development, a more advanced Convolutional Neural Networks (CNN) model will be trained and evaluated. CNN have shown to provide impressive results on several computer vision tasks. Within the scope of this project, a CNN model will be trained for the task of semantic segmentation, which may provide a more accurate estimation of the fish density. Possibilities of recognising and tracking species as well as abnormal event detection will also be investigated. By combining the state-of-the-art image processing and artificial intelligence techniques from the computer science domain and the SmartBay's state-of-the-art infrastructure, the project is one step forward to uncovering the mysteries of the underwater marine environment along the Irish coast.

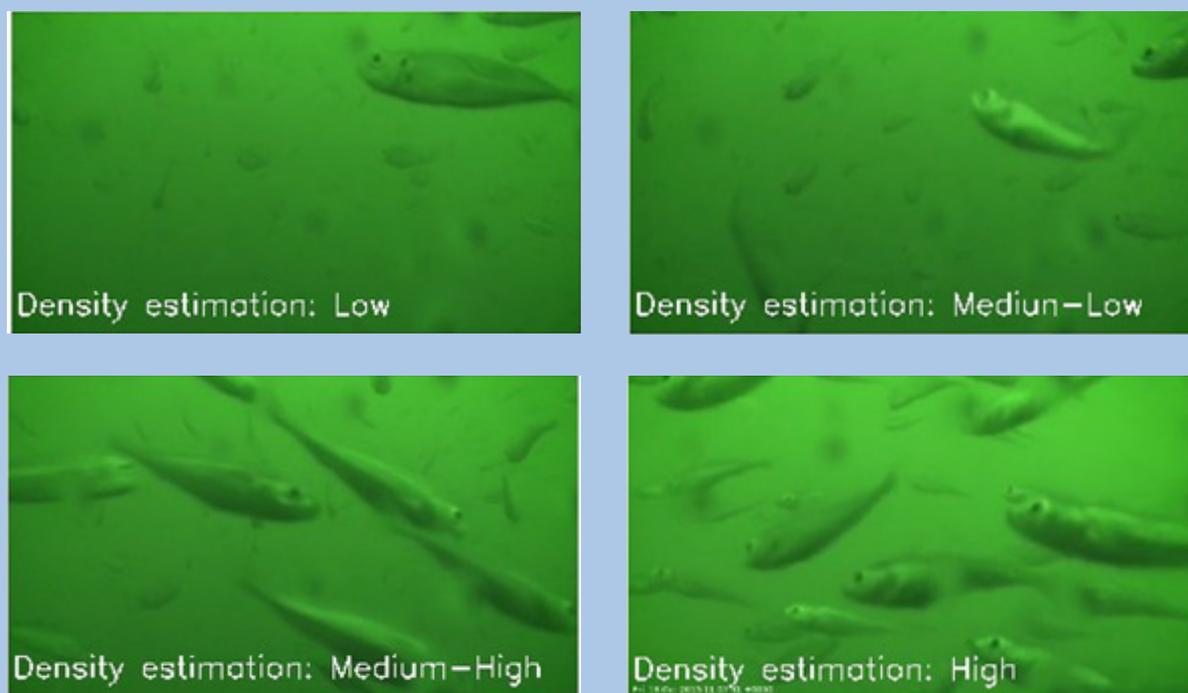


Figure 1: Initial results of fish density estimation using image processing techniques

### Biosensor Platform Development

Daniel McPartlin is a PhD student in the School of Biotechnology in Dublin City University. He is working on developing a biosensor platform that will measure concentrations of the marine algal species *Azadinium spinosum* and its associated toxin Azaspiracid (AZA) in seawater. AZA is a shellfish poisoning toxin that is associated with contamination of mussels and oysters, and which can cause severe gastrointestinal disorders in consumers. Daniel's particular area of interest is the development of antibodies, specialised proteins that can be tailored to bind to virtually any molecule. The aim is to develop antibodies specific to both *A. spinosum* and AZA and incorporate them onto the ToxiSense micro-

fluidic device, developed by the Water Institute in DCU. Using this device, a water sample can be analysed to detect harmful algal and toxin levels. The long-term aim for the project is to deploy the ToxiSense featuring Daniel's antibodies onto SmartBay Ireland's marine monitoring buoy in Galway Bay. Once deployed, periodic ocean samples will be taken and algal and toxin levels will be monitored. This information will then be relayed back to SmartBay Ireland by wireless communication within minutes. Using such information, coastal authorities can make informed decisions about measures to reduce the harmful effects of *A. spinosum* blooms and to prevent potentially contaminated shellfish from entering the market. This will help ensure food safety and may save millions of euros each year.

## Projects

### MARINA

SmartBay Ireland and UCC hosted two related MARINA workshops in Galway in January focusing on the future development of wave energy in Ireland and how the principles of Responsible Research and Innovation could address the challenges and concerns highlighted in the workshops. Participants provided input and developed roadmaps aligned with each RRI principle, with twenty-three attending the morning's industry workshop and seventeen in attendance of the afternoon policy workshop. Some of the key issues highlighted included overcoming engineering barriers, overcoming uncertainty, public participation, a supportive/enabling consenting process, marine spatial planning and a long-term vision and political leadership.

### CEE re-deployment

Significant work was undertaken over the last few months on the cleaning, maintenance and installation of new sensors and technologies on the subsea observatory node by the Marine Institute and P&O Maritime Services teams. This work culminated with the re-deployment of the Cable End Equipment (CEE), equipped with an extended range of instruments, on April 14th and a successful power-up shortly after. At the time of writing, the acquisition of data from the suite of sensors deployed is being monitored and the datasets will soon be available for public use through an improved web portal dedicated to the observatory.

### SmartBay test site foreshore lease application

In line with the Government's Offshore Renewable Energy Development Plan, the Marine Institute applied in April 2016 for a new foreshore lease for the SmartBay test site to allow testing of a wider range of marine renewable energy devices. This will provide researchers and those involved in developing ocean energy devices with a world-class permitted site in which to safely test and demonstrate ocean energy converters and related technologies. Public consultation on the application closed in September 2016. A determination on the application from the Department of Housing, Planning, Community and Local Government is being awaited.

### COLUMBUS

The COLUMBUS project aims to capitalise on the European Commission's significant investment in marine and maritime research by ensuring accessibility and uptake of research Knowledge Outputs by end-users. SmartBay Ireland hosted a workshop on the 24th May as part of the knowledge transfer process in 2017. The workshop focussed on topics on technical components for offshore devices, corrosion and biofouling, monitoring systems and sensors.



Above: John Breslin introducing the MARINA project

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