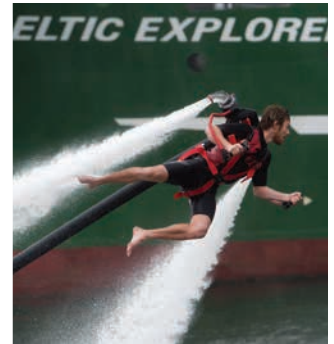


# ANNUAL REPORT // 2017 »



*Foras na Mara*  
*Marine Institute*

# Serving Science and the Sea

To the Minister for Agriculture, Food and Marine

In accordance with the requirements of the Marine Institute Act, 1991, I have the honour of presenting the Annual Report and Financial Statements of the Marine Institute for the year ended 31 December 2017.

**Dr John Killeen, Chairman**

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The Marine Institute is the national agency which has the following general functions:

'to undertake, to co-ordinate, to promote and to assist in marine research and development and to provide such services related to marine research and development, that in the opinion of the Institute will promote economic development and create employment and protect the marine environment'

**Marine Institute Act 1991**

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## Our Vision:

*A thriving maritime economy in harmony with the ecosystem and supported by the delivery of excellence in our services.*

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*Foras na Mara*  
*Marine Institute*

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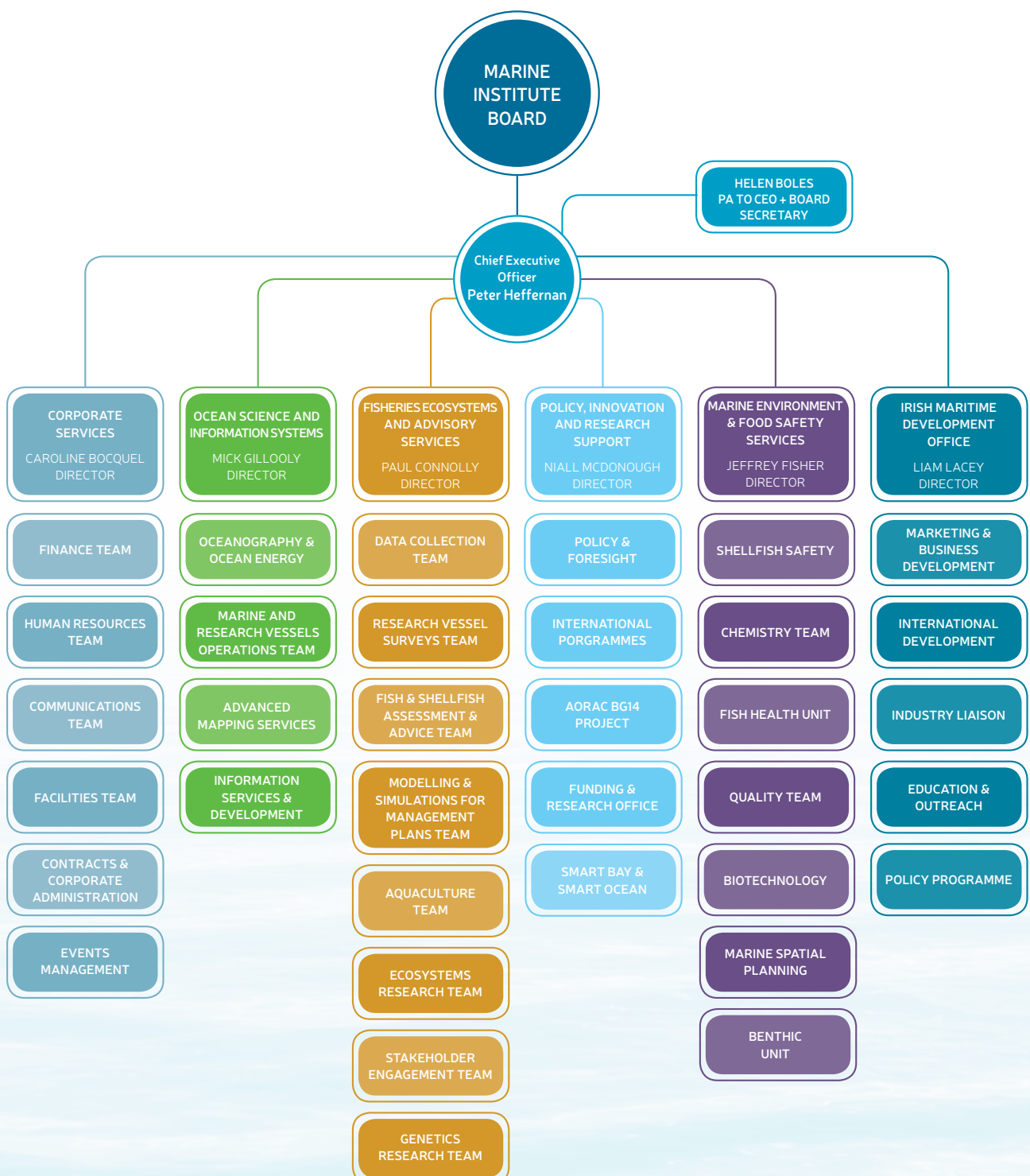
TUARASCÁIL BHLIANTÚIL 2017 is available at the end of the English report.

The Marine Institute Annual Report can be downloaded from [www.marine.ie](http://www.marine.ie).



*Foras na Mara*  
*Marine Institute*

# Marine Institute Organisational Structure





Marine Institute Headquarters, Galway. Photographer Laoise Dillon

# Introduction and Organisational Structure

The Marine Institute is the national agency for marine research, technology, development and innovation. It seeks to assess and realise the economic potential of Ireland's marine resource, promote sustainable development of marine industry through strategic funding programmes and essential scientific services, as well as safeguard Ireland's natural marine resource through research and environmental monitoring.

Ireland has a marine area of approximately 880,000 km<sup>2</sup> under the sea, which is over ten times its land area, representing an enormous seabed and marine resource. The Marine Institute promotes the sustainable development of this vast resource through research, the application of new technologies and by providing credible science-based advice to industry, the government and the EU.

**The Institute provides essential marine research services including:**

- National research and development funding programmes
- Fish stock assessment and management advice
- Fish health services
- Marine food safety monitoring
- Environmental monitoring
- Research vessel operations
- Seabed mapping
- Data management
- Maritime development services

**The Marine Institute has six service areas and the Office of the CEO. The service areas include:**

- Corporate Services
- Ocean Science and Information Services
- Marine Environment and Food Safety Services
- Fisheries Ecosystems Advisory Services
- Irish Maritime Development Office
- Policy, Innovation and Research Support.

The organisation is supported by a strong focus on corporate governance, integrity and ethical conduct, with an emphasis on prudent financial management, which was an important contributor to the success of the Institute. This report highlights the key deliverables and progress made towards our vision during 2017.

# Board Members



## Dr John Killeen (2014 – 2019)

Dr Killeen is an engineer and a native of County Roscommon who became an Honorary Freeman of Galway City in 2012. His career spans working with local government, with a multi-national construction company that built the Grand Canal tunnel in Dublin in 1973 and seven years with a Shell International subsidiary. Dr Killeen was President of Engineers Ireland (1995-1996) and was founding President of the Academy of Engineering in Ireland (1996-1998). He is retired CEO of the Colas Group in Ireland and retired managing director of Cold Chon Galway Ltd.

Dr Killeen was appointed to the West Northwest Hospitals Group Board in 2013 and is currently acting as the interim chair. In 2009 he was chairman of the Volvo Ocean Race event in Galway and in 2012 was president of the Volvo Ocean Race Festival and finale which broke all attendance records for a sporting event in Ireland, valued at approximately €80m in tourism and business income to the city. Dr Killeen is President of the Timoney Leadership Institute - a charity that promotes international leadership training for Irish CEOs.



## Professor Patricia Barker (2013 – 2018)

Professor Barker is a Fellow of the Institute of Chartered Accountants in Ireland, having qualified in 1973. Prof Barker completed an MPhil in Gender Studies at Trinity College Dublin. Her PhD developed a paradigm of disclosure of financial information to employees in organisations. She served her articles with Stokes Bros & Pim in Dublin and worked for Peat Marwick Mitchell in Manchester. Prof Barker later became a partner in an accounting practice in Manchester for six years, and worked in Manchester University as a principal lecturer.

Prof Barker was appointed lecturer in Dublin City University (DCU) in 1980 and progressed through senior lecturer, Associate Dean (Business School) and University Vice-President (Academic). She has worked as a visiting professor in universities in New York, Boston, Angers, Malawi, Dares Salaam, Sydney and Cape Town and has been an external examiner for universities and professional bodies. She served as Chairman of the Institute of Chartered Accountant's accounting committee for eight years and was on the Council of the Institute of Chartered Accountants for four years in the 1990s. She is currently a member of the Council. She represented Ireland on the Accounting Standards Board in London for nine years and chaired the

expert group reporting to the European Union on the role, structure and functions of the European Court of Auditors. She had several tours of duty as Election Supervisor for the Organisation for Security and Cooperation in Europe (OSCE) in Bosnia-Herzegovina, Republika Srpska, South Africa, Kosovo, Kazakhstan and Belarus.

Prof Barker worked as a Human Rights Monitor in Israel and Palestine. She has been a member of the Boards of Women's Aid, the Sonas Housing Association, the National Chamber Choir and the Higher Education Authority (chairing the Audit Committee), and was chairperson of the Irish Blood Transfusion Service for three years.

Prof Barker is currently a director of Dublin Bus Ltd and Tallaght Hospital, and is chair of the Education Board of Chartered Accountants Ireland. In addition, she is chair of the Internal Audit Committees for the Marine Institute, Dublin Bus and Rehab. She is currently a voluntary counsellor and trainer for the Dublin Rape Crisis Centre. She has written books on group accounting, flexible working in the profession and, more recently, on women who have succeeded in the accountancy profession, as well as on corporate governance and professional ethics.



## Mr Dermot Clohessy (2015 - 2020)

Mr Dermot Clohessy (BSc Eng) is an engineer by profession with postgraduate qualifications in both business strategy and finance. He has an extensive understanding of foreign direct investment having spent 28 years with IDA Ireland.

Dermot was the IDA's Executive Director/COO from 2006 to 2015 and was directly involved in the development and successful implementation of the IDA's corporate strategies during this period. His broad responsibilities included expanding the global markets in which Ireland competes for investment and developing new business areas for FDI into Ireland.

Dermot was a member and a sub-committee chairman of the Development Task Force established to support the implementation of *Harnessing Our Ocean Wealth - an integrated marine plan for Ireland*. Prior to joining the IDA in 1987, Dermot worked with an engineering design consultancy and as technical director of a construction-related manufacturing company.

He is now a consultant, working internationally on investment attraction and business development strategies for both the private sector and government bodies which include strategic advisor with the Ireland-based International Economic Development Consultancy.



### Professor Alan Dobson (2015 - 2020)

Professor Dobson studied biochemistry at NUI Galway and following his PhD worked as a Post-Doctoral Research Fellow at Baylor College of Medicine in Houston, Texas. Prof Dobson then moved to the School of Microbiology at University College Cork (UCC), where he is currently Chair of Environmental Microbiology.

From 2005 to 2014 Prof Dobson was Director of the Environmental Research Institute at UCC. His main research interest focuses on the study of microorganisms in marine and terrestrial environments and their potential biotechnological exploitation. His research group has published numerous scientific papers in this area.

Prof Dobson was a Fulbright scholar in 1992 and was awarded the Royal Irish Academy Medal in Microbiology in 1999. He was subsequently awarded a DSc in Microbiology & Molecular Biology in 2005 from

the National University of Ireland, and was elected a Member of the Royal Irish Academy (RIA) in 2013.

Prof Dobson was a member of the European Space Agency's Life and Physical Science Advisory Committee (LPSAC), 2003 – 2005. From 2009 - 2012 he was a member of the panel of experts that advised the then chief scientific adviser to the Irish government, Professor Patrick Cunningham. He has also been a member of the working group that prepared the European Science Foundation and Marine Board position paper *Marine Biotechnology: A European Strategy* in 2010 and has been a member of External Review Working Group (ERWG), monitoring the quality of the scientific outputs of the European Food Safety Authority (EFSA) (2012 - 2015). He is currently a member of the International Advisory Group of the Marine Biotechnology ERA-NET (ERA-MarineBiotech) and is a board member of the International Marine Biotechnology Association.



### Dr Berna Grist (2016 – May 2017)

Dr Berna Grist BL, a barrister and chartered town planner, is Adjunct Professor in the School of Architecture, Planning and Environmental Policy at University College Dublin. She holds a PhD from the University of Ulster on *The Legislative and Regulatory Framework for Development in the Republic of Ireland* and has published widely in the fields of planning and environmental law, public policy and governance. Together with the late James Macken SC, she coedited the *Irish Planning Law Factbook* (2003), which she continues to update annually, and in 2012, published the second edition of *An Introduction to Irish Planning Law*.

Dr Grist was appointed deputy chairperson of the Aquaculture Licences Appeals Board on its establishment in 1998. During the period 2001-2006 she served as a member of An Bord Pleanála and in 2013 was appointed to the expert group advising the Minister for Housing and Planning on a successor to the *National Spatial Strategy 2002-2020*. She has contributed to a number of environmental research projects sponsored by the Environmental Protection Agency and is a member of the Irish Environmental Law Association.



### Mr Donal Kelly (2013 - 2018)

Mr Donal Kelly is managing director of Fast Fish Ltd, a successful fish sales and oil supply business based in Castletownbere, County Cork. Mr Kelly served on the Celtic Sea Herring Management Committee for ten years, and on the West Pelagic Committee for three years.

Mr Kelly has served on a number of boards, both in the private and voluntary sector: the Cork County

Community and Voluntary Forum; the Cork County Development Board and has acted as chairman of Castletownbere GAA Management Committee. He is also a member of Berehaven Golf Club and the Castletownbere Community Development Association.



### Professor J Owen Lewis (2015 - 2020)

Professor Lewis is Emeritus Professor of Architectural Science, University College Dublin (UCD). He is vice president of the Royal Dublin Society, chair of the Energy Institute in Ireland, and a member of the Boards of the Grangegorman Development Agency, the National Gallery of Ireland, the Irish Green Building Council and the Tipperary Energy Agency.

Professor Lewis is a former chief executive of the Sustainable Energy Authority of Ireland (SEAI) (2009 – 2012) and was chair of the inter-departmental and inter-agency Ocean Energy Steering Committee. As a qualified architect, engineer, and energy technologist he has practised professionally in Ireland, England

and Zambia. Prof Lewis was executive director for Innovation and R&D at Bord na Móna from 2006 - 2008. He was Dean of the Faculty of Engineering & Architecture at UCD; and later Principal of the UCD College of Engineering, Mathematical & Physical Sciences 2001 – 2006; and was director of the UCD Energy Research Group 1974 - 2008. He has published about 200 papers and books as author, joint-author or editor. Expert advisor to the European Commission, and coordinator of various European Commission energy R&D projects 1986-2003, with sub-contractors in all Member States. In 1976 Prof Lewis cofounded the Solar Energy Society of Ireland.



### Mr David Owens (2012 - 2017)

Mr David Owens FCA is currently Senior Vice President, Finance and Operations for SolarWinds. Prior to joining SolarWinds, Mr Owens worked for Red Hat Inc., an enterprise software company for over seven years where he served initially as Director of Global Logistics and Production and later as Senior

Director of Finance EMEA.

Mr Owens qualified as a chartered accountant with Ernst & Young and is a member of Chartered Accountants Ireland.



### Mr Lorcán Ó Cinnéide (2015 - 2020)

Mr Lorcán Ó Cinnéide is currently national secretary of the Irish Fish Processors' and Exporters Association (IFPEA) and board member of the European Fish Processors Association (AIPCE). He is a former member of the board of the Aquaculture Licences Appeals Board (ALAB) and a former CEO of the Irish Fish Producers Organisation (IFPO) and has participated in many forums and management structures related to the fishing industry in Ireland and at EU level over the past two decades. He is a member of the Sea Fisheries Protection Authority Consultative Committee (SFPA). He has also been involved in the

evaluation of various marine science programmes on behalf of the EU Commission. A former fishing vessel owner, Mr Ó Cinnéide has a degree in Economics and Politics from Trinity College Dublin. He maintains a wide range of local development and conservation interests including TV production, and is secretary of the Blasket Foundation. He lives in the Dingle Peninsula, County Kerry.

This is Mr Ó Cinnéide's second term as a board member of the Marine Institute, and is a former chairman of the Institute's Audit Committee.



# Chairman's Statement



The Board of the Marine Institute worked closely with management and staff during 2017 to develop an ambitious new Marine Institute Strategy 2018 – 2021 due to be published in 2018. The board continued to focus on corporate governance and risk management with effective engagement with the executive management team.

Full compliance with the 2016 *Code of Practice for Governance of State Bodies* was achieved with five internal audits throughout 2017 providing governance oversight and high levels of assurance to the Board.

SeaFest, Ireland's national maritime festival, now the biggest and most spectacular maritime festival, continued to grow with a three day event, 30 June – 2 July 2017, attracting more than 100,000 visitors in Galway. The event, coordinated by the Marine Institute on behalf of the Government Marine Coordination Group, is a key outreach event in realising the *Harnessing Our Ocean Wealth* Goal of engaging the public with the sea.

The *National Marine Research and Innovation Strategy (2017-2021)* was launched by Michael Creed, TD, Minister for Agriculture Food and the Marine at Our Ocean Wealth Summit, 30 June in Galway. The Strategy, prepared by the Marine Institute on behalf of the Marine Coordination Group, will ensure that the outputs of new research and innovation will support Ireland's goal to generate real socio-economic benefits by reaching the 2020 target of a €6.4 billion ocean economy in a sustainable manner.

The Marine Institute and P&O Maritime services personnel supported the search for the missing wreckage of the Rescue 116 Irish Coastguard helicopter during March and April 2017. The Institute provided the national research vessel, RV *Celtic Voyager* and the remotely operated vehicle ROV *Holland I* and the search was supported by our staff and seabed mapping experts, together with INFOMAR programme colleagues at Geological Survey Ireland.

2017 also saw a new lease awarded to the Institute to operate the Galway Bay Marine and Renewable Energy Test Site to support the testing of quarter scale renewable ocean energy devices, marine sensors and Information Communications Technology (ICT). We are looking forward to working with our partners including SEAI to facilitate the development of technology that will, one day, harness the power of the ocean and convert it into clean, renewable energy for all our futures. Excellence Through People accreditation was achieved, once again in 2017, showing the investment in Marine Institute staff, who play a pivotal role in maximising efficiency and building the capabilities of the organisation.

These achievements show both the abilities and dedication of the people that make up the Marine Institute and I'd like to take this opportunity to acknowledge Dr Peter Heffernan and the Marine Institute staff for their achievements this year and their commitment to the delivery of excellence in the services they provide.

**Dr John Killeen**

Chairman, Marine Institute

# Chief Executive's Report



2017 was a busy and productive year for the Marine Institute as we continued our work to create detailed maps of Ireland's extensive marine territory - an area more than 10 times Ireland's land mass; understand the health of fish stocks in Irish waters; monitor the marine environment; advance marine technology and the opportunity to harness the power of the ocean; and further our understanding the impact of climate change on the ocean.

The RV *Celtic Explorer* and the RV *Celtic Voyager* together completed 586 days at sea and 58 surveys last year. The Marine Institute carried out annual fisheries surveys for the Annual *Stock Book* which provides the latest impartial scientific advice on 61 commercially exploited fish stocks of interest to Ireland. The *Stock Book* is used by the Department of Agriculture, Food and the Marine (DAFM) at the annual fisheries quota negotiations with the EU every December and throughout the year at fisheries management meetings. Our scientists also participated and contributed to the scientific advice of ICES, the International Council for the Exploration of the Seas.

A major transatlantic collaborative survey led by the Marine Institute and National University Ireland to study the impact of climate change on the ocean was also carried out on the RV *Celtic Explorer*. The GO-SHIP A02 survey team of scientists from six countries is a great example of the *Galway Statement* in action: working together to better understand and increase our knowledge of the Atlantic Ocean and its dynamic systems, and promoting the sustainable management of its resources.

Together with our INFOMAR programme partners, Geological Survey Ireland, we continue to map Ireland's extensive marine territory. In 2017 high resolution seabed maps were created for over 2877 km<sup>2</sup> of the Celtic Sea.

We maintained a strong focus on the delivery of key scientific services, including seafood safety and protection of the marine environment. We provided scientific and technical advice to a range of agencies including the Department of Agriculture Food and the Marine; Food Safety Authority of Ireland; Environmental Protection Agency; and the Department of Communications, Energy and Natural Resources. Internationally, our scientists

continue to participate in scientific and technical fora such as the International Council for the Exploration of the Seas (ICES) and the Oslo and Paris Convention 1992 (OSPAR).

We managed €8.26m in new investment awards in 2017 under the Marine Institute's Marine Research Programme, funded by the Government's Marine Research Programme 2014-2020. In November, Minister Creed announced €2.5m in funding awards to 14 Higher Education Institutes and five SMEs for specialist research and marine equipment and small infrastructure. The Irish research community had success in winning EU Horizon 2020 competitive funding in 2017, with Irish marine researchers awarded an estimated total of just under €7m in EU funding.

We continued to develop our Explorers Education programme, reaching almost 15,000 primary school students in 2017 and working with more than 600 primary school teachers to promote the use of marine themes and ocean awareness in the classroom.

We were delighted to coordinate the fourth Our Ocean Wealth Summit, which took place at NUI Galway 1 July 2017, forming a key part of the Government's *Harnessing Our Ocean Wealth Strategy*. We look forward to continuing the collaboration with all our partners including Bord Iascaigh Mhara (BIM), Bord Bia, Enterprise Ireland, IDA Ireland, Fáilte Ireland, Science Foundation Ireland (SFI), Sustainable Energy Authority Ireland (SEAI) in 2018.

My sincere thanks to all the staff of the Marine Institute for their continued commitment and consistently high standard of service delivery, and to the Board for their oversight and diligence in maintaining the highest standards of corporate governance.



**Dr Peter Heffernan**

Chief Executive, Marine Institute

# Corporate Services

## Director's Statement »



The continued general economic improvement coupled with the Marine Institute's success in securing competitive research projects has resulted in sustained growth and increased activity across all areas of the Institute. In 2017, our focus was on providing a professional, efficient, responsive service to internal and external customers; maximising value for money by providing a pro-active, customer-driven service with a clear focus on best practice corporate governance.

### Highlights of 2017 included:

- Retention of Excellence Through People (ETP) accreditation under the NSAI Standard – ETP 1000:2012. ETP is Ireland's only national human resource management scheme dedicated to the role of people and their impact on business. The Marine Institute has held this prestigious award continuously since 2005. It reflects the Institute's investment in our staff who play a key role in maximising the efficiency of our business and building organisational capabilities.
- Full compliance as of December 2017 with the *2016 Code of Practice for the Governance of State Bodies* with governance oversight including five internal audits, all of which reported high levels of assurance to the Board.
- The Marine Institute hosted SeaFest 2017- Ireland's national maritime festival - in Galway from June 30th - July 2nd 2017. The weekend festival attracted more than 100,000 visitors and is an important outreach event in realising the *Harnessing Our Ocean Wealth* goal of engaging the public with the sea.

- Expansion of the Explorers Education Programme which reached almost 15,000 primary school students, and worked with over 600 school teachers promoting the use of marine themes in the classroom.
- An organisation-wide *Get Greener* Energy team made substantial progress implementing the *Energy Strategy 2016-2020* with energy reductions of 14per cent achieved to date.
- A strong focus on safety and wellbeing with high safety standards resulting in no significant accidents, and seven minor incidents. Promotion of health and safety and employee wellbeing remains a priority to maintaining a safe and healthy workplace
- Increased social media engagement over a range of channels including our website [www.marine.ie](http://www.marine.ie) which recorded almost 240,000 visits in 2017, was a substantial increase on the previous year. Supported by a range of on-line services and accessible, user-friendly data and information, we continue to optimise our services to ensure they meet user's needs in a responsive and efficient manner.

**Mrs Caroline Bocquel**

Director: Corporate Services

## Human Resources

2017 saw a human resources focus on leadership development, employee engagement and recognition as well as building resilience and supporting career development. The Human Resources Charter for 2017 supported the Marine Institute to successfully deliver multiple high-performing programmes and provide a broad range of services including recruitment and retention; supporting staff to achieve their best through continuous learning and development; managing performance; promoting positive working relationships, engagement and wellbeing; risk management and business continuity planning. We continued to work with staff representatives to support the success of our Great Place to Work Group which delivered initiatives around communications, career and personal development and team building.

A €450,000 investment was made in our Learning & Development Programme. Outside of mandatory and essential training there was a focus on the standardising of the approach and delivery of leadership and management development training, as well as data and related technical training. Extensive training was provided in respect of performance management as well as safety and wellbeing. Formalised Mentoring and Buddy Programmes were devised with staff.

Twenty-four opportunities were recruited primarily for EU and alternately-funded temporary projects across a range of scientific, technical and administration disciplines.

Our third Transition Year programme ran in February, offering a taster week and communications/ team-building training to twenty-two students from schools in the local community and across Ireland. This included fisheries, chemistry, oceanography, seabed mapping, shipping & maritime development, applications development and a poster presentation.

In September we retained our Excellence Through People Certification under the NSAI Standard ETP 1000:2012.

The Health & Safety Committee, representing all locations and Programmes, held seven meetings throughout the year. Risk Assessments were completed, including an independent review of Health and Safety for our headquarters in Oranmore and facility in Newport County Mayo. The Marine Institute has a culture of safety and wellbeing, and upholds high safety standards as well as maintaining a consistent and robust approach to safety. Seven relatively minor accidents, incidents or near misses were recorded and assessed. Health, safety and wellbeing promotions took place throughout the year promoting physical and mental wellbeing, resilience and supports.

In line with Risk Management and Business Continuity policies, the Marine Institute board and their audit and risk committee, with the executive and risk officers, reviewed and signed off on the appropriate policies and processes. The Risk Register and Risk and Business Continuity Plan reports were reviewed quarterly. Risk management and related processes were independently reviewed during the year. Six business critical processes had their continuity plans tested in 2017.

## Finance

The Marine Institute operates to best practice corporate governance principles in line with the guidelines set out in the *2016 Code of Practice for the Governance of State Bodies*. The Institute has fully adopted this revised Code and affirms its compliance with all sections in the Code. The Marine Institute has in place a range of procedures, policies and guidelines to ensure compliance with the Code, and it is the policy of the Institute to support the development and strengthening of an effective control environment, risk management system and audit function. The Marine Institute has a properly constituted internal audit and risk function in accordance with the principles set out in the code of practice and has a formal charter that has been approved by the board of the Marine Institute.

An Audit and Risk Committee, (a sub-committee of the Marine Institute board), is in place to oversee and advise on matters relating to financial, operating and governance risks, including overall risk management, and the effectiveness of the internal controls and risk management within the Institute.

In line with the internal audit programme, the Internal Audit and Risk Committee met eight times and met with the Comptroller and Auditor General to discuss the audit certification received for 2016. The internal audit plan for 2017-2018 reflects the risks identified in the Marine Institute risk register, *Code of Practice for the Governance of State Bodies*, requirements of the Comptroller and Auditor General and the internal audit and risk committee.

The system of internal controls are reviewed on an annual basis by the outsourced internal auditors. This formed one of five internal audits undertaken in 2017, affirming the Institute's high standards of governance and ensured that an effective system of internal control is maintained and operated.

Internal audits included financial controls; procurement; vessel usage; Freedom of Information; Access to Information on the Environment, and Code of Conduct.

All internal audit recommendations arising were actioned and reported to the Internal Audit and Risk Committee and to the board.

The Marine Institute has an appropriate public procurement process that is compliant with the current value thresholds for the application of EU and national rules. Centralised purchasing and the use of the Office of Government Procurement has proved to be an efficient and effective means of reducing costs and generating savings and will continue into 2018. Seventy-two tenders were issued of which eight were published in the *Official Journal of the European Communities*.

It is Marine Institute policy to ensure that all invoices are paid promptly within the terms of the *Prompt Payment of Accounts Act 1997* and the *European Communities (Late Payment in Commercial Transactions) Regulations 2012*. Systems and procedures are in place enabling invoices to be tracked and to ensure that payments are made in a timely and efficient manner. Procedures are in place, however, to ensure that interest is paid for late payment, if required.

## Facilities

The central focus for the facilities team was the continued provision of support services to all service groups within the Institute, with an increased demand on laboratory and office space. The reorganisation

of offices and laboratories has been required in both Newport and Oranmore due to increase in research activities. Both facilities are now near full capacity, having undertaken internal reallocation of space, while retaining comfortable and safe working environments.

The impact of additional service demands within the Institute has led to an increase in the volume of daily services provided by the Facilities team. A key responsibility is to review all Marine Institute tenders prior to advertising on [www.etenders.ie](http://www.etenders.ie). Assisting with the tendering process and ensuring Institute-wide compliance with Public Procurement Regulations is essential. Monitoring and advising staff on the Office of Government Procurement contracts is key to ensuring efficient procurement of centralised goods. We continue to work on a cross service basis and are involved in health and safety, laboratory management and energy awareness. Administrative support is provided to various units within the organisation as well as providing daily operational services including maintenance, reception, stores, cleaning, security and catering. Using modernising and efficient technologies underpins all of our procurements and services, to ensure we are providing the most effective and responsive service possible, at the best value.

The facilities team has led the implementation of the *Energy Strategy 2016-2020*. A comprehensive review of the laboratory mechanical and electrical plant and operations was undertaken by the team. The review showed the potential for further reduction in energy consumption in relation to fumehood and chemical storage within laboratories. Savings to date are shown within the energy section of this report, with significant savings being realised through Fume Cupboard switch off schedules and reduction in face velocity. Behavioural change has been ongoing through the actions of the multi-disciplinary Get Greener Energy team.

## Library Services

The Oceanus Library continues to provide Marine Institute staff with a sustainable access model to research publications, to renew all necessary journal subscriptions and to provide an inter-library loan service. The Open Access Repository (<http://oar.marine.ie/>) performed well in 2017, providing free online full text access to Marine Institute and staff publications.

During 2017, the Open Access Repository was successfully migrated to a new platform and provider. The new site has a sleek look, is easier to use and has more functionality, including a facility for researchers to upload their profile, picture and publications similar to ResearchGate. The Repository provided access to over a thousand items in 2017, and had 12,965 visits from around the globe.

The library continues to maintain close relationships with key organisations and collaborates with external libraries when the opportunities arise.

## Communications

The Communications team activities include media relations, online communications, events, education and outreach, and library services.

The Marine Institute hosted and supported a number of events throughout the year including SeaFest 2017 - an initiative of the inter-departmental Marine Coordination Group which attracted a record 101,113 visitors over the weekend, and incorporated events including the annual *Our Ocean Wealth Summit*, at NUI Galway on June 30th.

On behalf of the Government's Marine Coordination Group, the Marine Institute coordinated the festival and led the communications for SeaFest 2017, which was also the focus of a thirty-minute episode of *Nationwide* on RTE One television. The Marine Institute's role in promoting awareness and engagement of the ocean also saw the opening of Ireland's first marine science gallery at Galway City Museum. The interactive exhibition spans a variety of topics including the nature of how tides operate, multi-beam mapping, deep sea exploration and marine life along the seashore.

The Marine Institute supported the continued expansion of the Explorers Education Programme [www.explorers.ie](http://www.explorers.ie) where centres in Sligo, Donegal, Mayo, Galway, Clare, Kerry, Cork, Waterford, Dublin and Wicklow reached up to 15,000 primary school students, and worked with over 600 school teachers promoting the use of marine themes in the classroom. A pilot Explorers evaluation game was developed to test teachers and students' pre and post knowledge and engagement of the ocean, which resulted in an increase in knowledge from 60 per cent to post evaluation 88 per cent ocean literacy among students nationwide. The Explorers Education Programme also ran a student teacher training module in collaboration with DCU St Patrick's Campus and professional development training for teachers with Galway Education Centre.

The success of marine science engagement was also recognised by the Allianz Business to Arts Awards, when the project 'Build Your Own Unknown' led by Tulca and sponsored by the Marine Institute, was highly commended in the Best Mid-size Sponsorship category. The project brought ICT, art, and marine science together to teach students about hydrothermal vents.

The Marine Institute participated in events aimed at promoting awareness and updating science and technology, including the Galway Science and Technology Festival Exhibition, and the Mayo Science and Technology Festival during November. During 2017, 105 primary school students visited our research facility in Newport to learn about the research on wild salmon, climate, and aquaculture.

The Marine Institute website [www.marine.ie](http://www.marine.ie) continues to be a key communications platform, where 118 news stories were published during the year. There was a 22 per cent increase in traffic in 2017, attracting 239,826 visits and over 522,659 page views. We continued to develop social media engagement on platforms such as Facebook, LinkedIn and Twitter. Scientists aboard the *RV Celtic Explorer* and the *RV Celtic Voyager* also shared their experiences of conducting research at sea through our scientists at sea blog <http://scientistsatsea.blogspot.ie/>.

We produced a number of short videos showcasing our work which can be viewed on our Vimeo and YouTube channels: <https://vimeo.com/marineinstitute> and <https://www.youtube.com/user/marineinstitutetRL>. They include a video on the collaborative transatlantic GoShip Survey on ocean climate led by the Marine Institute and NUI Galway on the *RV Celtic Explorer* during April and May.

The Marine Institute also supported Sea Fever Productions, who joined deep sea surveys on the *RV Celtic Explorer* during filming of their new series for RTE television, *Ireland's Deep Atlantic*, which will be broadcast in 2018.

## Accessibility

The Institute was fully compliant with the Disability Act during 2017.

# Irish Maritime Development Office

## Director's Statement »



Ireland's economy grew at a faster rate than other EU member state in 2017, fuelled to a large degree by a strong trading performance. This underlines the robustness of the Irish economy in the face of the trading challenges and uncertainty that emerged in the year under review, and brings reliance of the Irish economy on international trade links and by extension, on the maritime industry, into sharp focus. By researching and understanding the maritime industry, the IMDO is positioned to fulfil its mandate to inform policy makers and government on the adequacy of port capacity to meet the needs of the growing economy and the competitiveness of this strategically important industry.

Equally important, policy makers must be assured that the maritime industry is equal to the challenges posed by Brexit and that its response to the risks involved is balanced and commensurate. To this end, the IMDO participated in numerous inter-departmental, industry and national fora, with the objective of teasing out the challenges that the maritime industry will face post-Brexit. The IMDO worked closely with Irish ports and shipping companies to ensure that the needs of the sector were understood and, where appropriate, fed into policy responses.

The IMDO continues to promote the opportunities that exist in Ireland's maritime industry, specifically in sectors such as shipping, port services, education and maritime commerce. Ireland's heavy reliance on international trade means that maritime transport is of significant interest to most industry sectors, drawing the IMDO into diverse, yet related sectors of the Irish economy

In line with its statutory mandate, the IMDO continued to closely monitor and report on the performance of the shipping and ports sectors through its quarterly bulletins and the publication of the *Irish Maritime Transport Economist* (IMTE) on an annual basis. The importance of the IMTE, as a reference

document for policy-makers and industry practitioners has become more apparent as ports, shipping companies and the State begin to prepare for Brexit, with increased emphasis being placed on research to assist in scenario planning and to inform policy.

Outside of its routine monitoring of the industry, the IMDO commenced work on a number of important bespoke reports dealing with:

- *The Implications of Brexit on the Use of the UK Landbridge*
- *Port Capacity – 2018 and Beyond (required under national Ports policy)*
- *Irish Ports Offshore Renewable Energy Services (IPORES)*

In addition, research projects are ongoing in *Improving Port Efficiency and Building Maritime Commerce Clusters*. These research projects are supported by the Marine Institute's Cullen Fellowship Scheme.

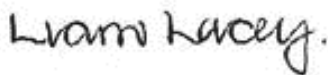
The IMDO continues to improve the quality of its economic research by working closely with the Socio Economic Marine Unit (SEMURU) in NUI Galway. In 2017, it conducted regular horizon scanning exercises to identify the issues that will affect development of the maritime industry. It participated in a range of national and international fora that shed light on how the global maritime industry is developing and performing, enabling it to be positioned in a global context.

Most importantly, the IMDO continues to discharge its development role by promoting Ireland as a country of enormous opportunity across all sectors of its marine industry, giving strong voice to the message in the government's integrated plan to develop the marine industry, *Harnessing Our Ocean Wealth*, that Ireland is open for marine business. The IMDO played a pivotal role in the business events at 'Our Ocean Wealth Summit' in Galway, increasing business attendance in all sessions of the Summit and working closely with other agencies such as

IDA, Enterprise Ireland, and SEAI on the highly successful digital ocean event and trade show.

The IMDO supported the important efforts of Irish ports to attract development funding from EU programmes, and participated in EU events in Malta, Estonia, Belgium and the United Kingdom. The IMDO also worked with port companies on a SmartPorts Initiative that uses data analytics to increase port efficiency and improve socio-economic impacts. The SmartPorts Initiative can also improve the ability of ports to address some of the key funding pillars present in many EU programmes, most particularly the aim to improve integration, drive efficiency, and inject innovation into funding applications.

Overall, 2017 was a busy, challenging, exciting and important year for the maritime industry. The IMDO has been centrally involved in the collection, examination and dissemination of information that informs industry and policy makers. This work was undertaken by the excellent staff of the IMDO with the support and collaboration of colleagues in a variety of government departments, most particularly within the Department of Transport Tourism and Sport, and across the maritime industry. I would like to express my gratitude to all those who contributed to this collective effort to understand, develop and promote our maritime industry.



**Mr Liam Lacey**

Director: Irish Maritime Development Office

## Business Development

The IMDO participated in a number of international events and conferences during 2017. Where possible, collaboration with other development agencies was sought to strengthen the impact of Ireland's presence at these events. At the Norshipping conference in Oslo, Norway in May, the IMDO and Enterprise Ireland led a trade mission that included representatives of the IDA and the National Maritime College of Ireland. Ireland's presence at the conference was greatly enhanced by the professionalism and support of our embassy staff in Norway, led by Ambassador Gardner. This coordinated effort is indicative of the growing collaboration that is taking place between development agencies to address the growth potential of our marine industry.

At the Our Ocean Wealth Summit in Galway in June, development agencies came together to communicate the business opportunities and abundant competitive advantages that exist in Ireland's marine industry. The business programmes were led by the IMDO, IDA, Enterprise Ireland, Sustainable Energy Authority of Ireland, and Bord Iascaigh Mhara. Collectively, these agencies attracted more than 800 delegates to business-related events

at the Summit. In addition, more than 60 companies exhibited at a trade show that showcased all that Ireland does well in the marine economy.

Responding to opportunities created by the UK's decision to leave the European Union, the IMDO intensified its business development activities in the UK. At London Shipping Week in September, the IMDO hosted an event at the Irish embassy, attended by more than 100 guests, to communicate the attractiveness of Ireland as a centre for maritime commerce. The presence of colleagues from the IDA and the excellent planning of the Irish embassy staff contributed enormously to a hugely successful event that resulted in maritime commerce companies choosing Ireland as a base for their operations in Europe.

Other international events in which the IMDO participated included Oceanology International Exhibition, European Shipping Week conference, Ocean Business conference, Connecting Europe conference, Bluetech conference, and Digital Transport Days conference. These events presented opportunities to stimulate inward investment and to build our knowledge about how high-performing maritime economies achieve success.

In all, the IMDO participated in 25 international events, leading trade missions to the UK, Norway, the USA, Estonia, Belgium, Holland, Sweden and Malta. The IMDO hosted international delegations from the UK, Korea, Sweden, China, the USA, Cyprus and Belgium during the course of the year. In all cases, the IMDO promoted Ireland's maritime sector and took advantage of opportunities to highlight the development potential that exists in other sectors of the broader marine economy.

The IMDO's coordinated approach to business development engages all relevant government departments and development agencies. It appeals to international investors and inspires confidence that the strategies of government agencies involved in developing the marine industry are carefully aligned.

Turning to our indigenous industry, the IMDO engaged with industry stakeholders, working assiduously with ports and shipping companies on projects related to Brexit, port capacity, SmartPorts and a variety of EU funding applications. Together with Enterprise Ireland, the IMDO progressed the development of the Irish Marine Industry Network (IMIN), creating networking opportunities and events for indigenous marine companies. This is an ongoing project that the IMDO will continue to support in the interest of increasing cohesion within the industry, increasing the interdependency between indigenous companies and creating opportunities for mutual benefit.

## Economic Analysis

The advice provided by the IMDO to the Department of Transport, Tourism and Sport relies heavily on economic and socio-economic research. Quarterly bulletins are issued which track seaborne trade volumes through Irish Ports by transport mode and by port. These data are used when compiling the annual *Irish Maritime Transport Economist*, which has become a reference text for anyone interested in Ireland's maritime industry. In 2017, the 14th edition of the IMTE was issued, adding to an invaluable time series of maritime data. More generally, the Marine Institute continues to value the work by the Socio-economic Marine

Research Unit (SEMRU) in NUI Galway of measuring the value and tracking the growth of the broader marine economy in its biennial publication *Ireland's Ocean Economy*. It also works closely with SEMRU on the analysis of the maritime sector.

The IMDO also produces bespoke reports and submissions requested from time to time by the Department of Transport, Tourism and Sport or made necessary by changing industry circumstances. In 2017, work commenced on studies relating to the implications of Brexit on the maritime industry, port capacity and the ability of ports to cope with economic growth, and marine renewable energy, and the ability of Irish ports to service the development of this emerging and important energy source.

Growth in Ireland's maritime sector is closely correlated with national economic growth. In 2017, strong GDP growth fuelled a 7per cent increase in utilised trade through Irish ports. Unitised trade comprises Ro/Ro and Lo/Lo traffic types that are heavily concentrated on Dublin Port. The IMDO's iShip index - a composite measure of all maritime traffic types - grew by five per cent in 2017. The resurgence of traffic volumes through Irish ports and the likely impacts of Brexit on port operations brought forward the need to conduct a review of port capacity across Ireland's ports network. This work, which is required under National Ports Policy, commenced in 2017 and will be delivered in 2018.

## Policy Support and Port Development

The IMDO's mandate requires it to provide policy support and advice to the Minister and the Department of Transport, Tourism and Sport, which often takes the form of market and economic analysis. Much of the IMDO's policy advice in 2017 related to Brexit and the knock-on effects on ports and shipping services. In 2017, the conditions under which the UK will leave the EU became clearer but were not fully resolved. This required the IMDO to keep a watching brief on the emerging transition arrangements and on the impact that the re-imposition of borders and customs controls will have on trade volumes, shipping services, traffic modes and port operations. Since Ireland's international trade depends so heavily on maritime transport, with over 94 per cent of total trade moving by sea, the importance of maintaining adequate capacity in our ports network and an ability to flex shipping capacity quickly to facilitate economic growth, cannot be overstated, and spawned a range of studies referred to above.

Working directly with ports and shipping companies, the IMDO provided advice on how EU funding programmes can be used to develop our maritime infrastructure. The IMDO participated in a number of EU events being developed in Ireland and which could have a transformative effect on how our ports and shipping services operate. These projects address the six funding pillars identified by Ms Violeta Bulc, EU Transport Commissioner on her visit to Dublin in October. These include: Efficiency, Integration, Decarbonisation, Digitalisation, Innovation, and Investment. In addition, a significant project is being advanced which addresses the increased peripherality that Brexit will impose on Ireland, taking into account the need to redraw the Core Corridor in which Ireland is located, and which currently includes the UK.

The IMDO serves on the Steering Group of the Offshore Renewable Energy Development Plan and participates in the delivery of advice to policy-makers in this important area.

## Education, Training and Outreach

The provision of skilled tradesmen, graduates and trained professionals is the lifeblood of the maritime industry. The IMDO recognises the need to increase interest in the maritime industry among school leavers, graduates, and the general public and acts in a number of different ways to achieve this objective. The IMDO:

- Serves on the advisory board of the National Maritime College of Ireland (NMCI), and promotes the college nationally and internationally as a centre of excellence in maritime education.
- Promotes the training of professional mariners through the Irish Seafarers Education Assistance Scheme, which provides training opportunities for cadets from the NMCI. In 2017, more than €200,000 was paid out under this scheme, enabling more than 80 cadets to undertake training with prestigious international shipping companies and to find employment in the maritime industry.
- Provides outreach programmes to secondary school students through the Transition Year familiarisation programme. In 2017, these programmes reached 1,800 secondary school students.
- Supports professional training and education by funding the activities of strategically-important professional bodies such as the Institute of Chartered Shipbrokers and the Institute of Master Mariners.
- Highlights career opportunities in the maritime industry through the jobs portal on its website.

## Conclusion

The year under review was challenging in many ways. Brexit will pose difficulties for our ports and shipping services. The IMDO conducted valuable research to understand the implications of Brexit for the maritime industry, which was fed into policy and industry advice. Ireland's resurgent economy resulted in increased port volumes and a need to urgently review capacity forecasts for our ports network. Under-provision of port capacity would act as a brake on our growing economy, and responding to a request from the Department of Transport Tourism and Sport, the IMDO conducted two streams of parallel research into port efficiency and port capacity which will significantly influence Ireland's response.

Some flagship projects that can have a transformative effect on the maritime industry were advanced during 2017. These included the proposed creation of an International Shipping Services Centre and the development of a coordinated plan to enable our ports to respond to the challenges of Brexit.

Notwithstanding the challenges, the Irish maritime industry grew significantly in 2017, and the IMDO played its part in this success.



# Marine Environment and Food Safety Services

## Director's Statement »



The Marine Environment and Food Safety Services (MEFS) team provides advisory services to support the sustainable development and management of the marine environment; monitors chemical, physical and biological indicators of Ireland's marine environment to ensure environmental health; oversees the health of Ireland's wild and cultured fish and shellfish stocks by conducting inspections and diagnoses and regulating stock transfers as the Competent Authority; and protects public health by rigorously monitoring shellfish growing waters for harmful algal blooms and the toxins that can accumulate from them in shellfish.

This work is delivered via three core functions: monitoring, advice and technical support and research. All of these functions are underpinned by a robust quality management system that ensures our laboratory and data management procedures are fit-for-purpose to provide confidence in the accuracy of our data and analyses generated for our parent department DAFM, other key government bodies, and the wider public.

The focus of our monitoring services included:

- National shellfish biotoxin and related harmful algal bloom monitoring programmes per EU Directives 2004/853 & 854/EC.
- National residues control programme monitoring for anthropogenic chemical contaminants and veterinary treatment chemicals in seafood per SI 268 and EU Directives 96/23/EC and 2006/113/EC, and in support of the assessment of Descriptor 9 under the *Marine Strategy Framework Directive (MSFD) 2008/56/EC*.
- Inspections of fish and shellfish health and monitoring of movements of fish and shellfish stocks as required under fish health legislation SI 261 and per EU Directive 2006/88/EC.

- Monitoring of priority substances in coastal and transitional waters per the *Water Framework Directive (2000/60/EC)*, and in support of the contaminant and eutrophication assessments under the MSFD (Descriptor 8).
- Monitoring of benthic communities in support of assessments under the MSFD descriptors to assess the status of biodiversity, food webs and seafloor integrity (D1, D3 and D6).

In 2017 our advisory and technical services were provided to a range of Departments and agencies, including:

- Department of Agriculture, Food and the Marine
  - » Appropriate Assessments of fisheries and aquaculture activity in Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)
  - » Aquaculture licensing
- Sea-Fisheries Protection Authority and the Food Safety Authority of Ireland (FSAI)
  - » Food safety
- Department of Housing, Planning, Community and Local Government (DHPCLG)
  - » Marine Strategy Framework Directive (MSFD)
  - » Foreshore lease/licensing decisions
- Environmental Protection Agency (EPA)
  - » Dumping at sea applications and engagement with OSPAR
- Department of Communications, Climate Action and Environment (DCCA)
  - » Implementation of the Offshore Renewable Energy Development Plan

Continued improvements in our quality management system were also implemented throughout MEFS in 2017. Through successful audits within allowed timeframes, we retained our Irish National Accreditation Board accreditation for our laboratories under

ISO 17025 and our certification under ISO 9001 for the work of the Fish Health Competent Authority office transitioned to the risk-based/process-flow standard published in 2015. We extended the scope of our accreditations under ISO 17025 to include the CHE Method for mercury analysis in seawater, and currently have 33 methods accredited in MEFS, with two methods being amalgamated to improve efficiencies in the Fish Health Unit.

The implementation of the Paradigm 3 Electronic Document Management system also advanced in 2017. With this software, only one system is needed to view documents and records to manage non-conformances, equipment records, audits, work requests, reference documents, approved suppliers list, and change control forms, creating a clear efficiency boost for MEFS. The cross-sectional MEFS Quality Integration Team (QIT) also addressed further efficiency opportunities by integrating standard of procedures (SOP's) to ensure procedures are carried out uniformly across laboratory sections. This reduced the numbers of segregated SOPs across MEFS from 90 to 13 integrated SOPs.

Another quality management highlight of note implemented in MEFS, and now applied throughout the Marine Institute, was the introduction of the ChemDoc System. This paperless electronic system manages all Safety Data Sheets (SDS) for chemicals stored at the Marine Institute, allowing for easy access and updating, and for addressing a chronic health and safety programme challenge of the labs by ensuring a single storage area for all SDS.

Internationally, our scientists continue to participate in scientific and technical fora such as ICES and OSPAR on topics including aquaculture; food safety; hazardous substances and eutrophication; ocean acidification; environmental aspects of the offshore industry; encounters with dumped munitions; disposal of dredged material; marine spatial planning; common indicators under the MSFD, and fish health.

Finally, active participation in research programmes and projects that support our core environmental and seafood safety monitoring and advisory roles continued in 2017, as briefly summarised below.



**Dr Jeff Fisher**

Director: Marine Environment and Food Safety Services

## Monitoring Shellfish Safety

Under our remit as the EU designated Irish National Reference Laboratory for both marine biotoxins and shellfish microbiology, the shellfish safety unit of MEFS carries out a number of programmes to protect consumers' health and to ensure Ireland's compliance with EU regulations on food safety, as outlined in 853/2004/EC and 854/2004/EC.

The unit provides a continuous year-round monitoring service that assesses over 100 inshore shellfish production sites and offshore fishing grounds as part of these programmes. The work is carried out in close co-operation with the Seafood Fisheries Protection Authority and the Food Safety Authority of Ireland with strong industry collaboration as part of national official controls on seafood safety.

Programmes of activity included testing for biotoxins in shellfish flesh; monitoring seawater for harmful phytoplankton species and assessing microbial contamination in classified shellfish production areas – the latter monitoring complimentary to that required under the *Shellfish Waters Directive 2006/113/EC*.

Naturally occurring biotoxins in shellfish are monitored using chemical analyses, supported by phytoplankton monitoring and molecular biological assays to detect the presence of toxins and their causative organisms. In 2017, 2,978 shellfish samples were analysed for shellfish toxins; 14,799 analyses were completed.

These tests included the most important toxin groups in Ireland: Diarrhetic Shellfish Poisoning (DSP), Azaspiracid Poisoning (AZA), Paralytic Shellfish Poisoning (PSP) and Amnesic Shellfish Poisoning (ASP). The pattern of toxicity was somewhat similar to the previous year with a toxic period mainly restricted to the summer months in the southwest.

A total of 3,331 seawater samples were analysed for toxic and harmful phytoplankton species in 2017. These data are considered along with the biotoxin data to ensure toxic shellfish do not enter the human food chain. Daily reports are produced to indicate the open status of production areas. These data are also used to produce a weekly online report that gives a synopsis of toxin and harmful algal bloom presence, and a short-term forecast of the likelihood of status changes. These synoptic reports have been well received by regulatory authorities and aquaculture industry stakeholders.

Ongoing microbiological testing of *E. coli* levels in shellfish production areas was used to update the classification of shellfish production areas. Advice was again provided to the SFPA to assign appropriate classification to each area. A testing service for norovirus (NoV) in oysters was continued. This testing service provides support to industry wishing to give quality assurance to customers in sensitive markets such as the Far East. Over 1,200 samples of NoV were analysed in 2017 for industry support, research and statutory programmes.

## ICMSS Conference

A particular highlight for the shellfish safety team this year was its successful hosting of the 11th International Conference on Molluscan Shellfish Safety (ICMSS), convened at NUI Galway with more than 200 international delegates in attendance. The ICMSS is the only international conference that focuses specifically

on molluscan shellfish safety. The event brought together food safety professionals, scientists, regulators and industry experts to exchange ideas, information and the latest research findings, and it also provides the opportunity for delegates to review current and future prospects in molluscan shellfish safety.

### Website and Database Redevelopment

The shellfish safety programmes rely on producing rapid results to allow the industry to harvest their product and place it on the market within tight time constraints. Efficient publication of results relies on having a database on which the basis of rapid decisions can be made and published online in an efficient, quick manner. The system used in the Marine Institute is HABs - Harmful Algal Blooms - and has been in place since 2002. In 2017, however, the HABs II system went online. This web-based communication system offers relevant information to producers, food business operators, and customers alike, and has already improved the monitoring efficiency of shellfish production areas by allowing us to perform our food safety role in a more efficient and effective manner.

### Residues and Contaminants Monitoring in Seafood

The chemistry unit of MEFS carried out the farmed finfish component of the 2017 National Surveillance Monitoring Programme for Residues in Farmed Fish to ensure compliance with European Commission legislation 96/23/EC and to ensure farmed fish are fit for human consumption. The results will be reported in 2018. The 2016 results, in which the results of more than 691 tests and 1,933 measurements were presented, were published in 2017.

This report reflected full compliance with European standards, with the exception of two harvested salmon samples reported as noncompliant due to levels of oxytetracycline above the maximum residue limit. Additionally, fishery samples from non-EU countries collected at border inspection posts were tested for contaminants and veterinary residues.

Monitoring and additional surveys of levels of environmental contaminants in Irish shellfish, crustaceans and wild fish were also undertaken in conjunction with the FSAI and SFPA, demonstrating compliance of Irish seafood with European and national regulatory limits defined in 2006/113/EC and SI 268, respectively.

### Shellfish and Fish Health Monitoring

Similar to 2016, mortality reported for molluscs was low across the country in 2017. The fish health unit investigated 14 reports of abnormal mortality events affecting Pacific oysters. These mortality events were principally associated with the presence of either the bacterial pathogen *Vibrio aestuarianus* or with osterid herpes virus-1  $\mu$ Var. In total, 2,748 molluscs were tested for diagnostic, research or surveillance purposes.

An epizootic investigation into the finding of *Bonamia ostreae* in native oysters (*Ostrea edulis*) in Kilkieran Bay, County Galway in December 2016, was completed during the year. While it was not possible to determine with certainty the source of infection, all known routes of infection were considered in the course of the investigation. It was concluded that the greatest risk was posed by the possible unauthorised introduction of oysters from an infected area.

Over 3,000 finfish, primarily Atlantic salmon, but also trout, wrasse, lumpfish and coarse fish, were also screened for pathogens

in 2017. Mortalities in a small number of marine salmon farms caused by jellyfish blooms were of concern in the early autumn, and cardiomyopathy syndrome persisted on one salmon farm.

Koi Sleepy Disease caused by the cyprinid edema virus (CEV) was detected in koi carp in a garden pond in County Dublin. Although this disease is widespread in Europe, it was the first occurrence of it in Ireland.

During 2017, four outbreaks of crayfish plague were confirmed by the NRL, following reports of abnormal mortality in white-clawed crayfish (*Austropotamobius pallipes*). Crayfish plague outbreaks were confirmed, initially in the River Suir, then the River Deel, the Lorrha River in County Tipperary, (which is within the Shannon catchment) and finally in the River Barrow. Genotyping analysis by OIE reference laboratories in the UK and in Finland have shown that at least three different genotypes of *Aphanomyces astaci* are present in Ireland. This genetic diversity of *A. astaci* suggests there have been at least three separate introductions of the disease into the country. There is now an urgent need for a better understanding of the possible sources of the disease, its routes of transmission, and its current spread.

A hundred samples of velvet crab, *Necorapuber*, were sampled as part of a project evaluating the disease status of stocks, with a focus on the prevalence of *Paramarteilia* sp. in conjunction with colleagues in Fisheries Ecosystems Advisory Services. These samples were collected from Galway Bay, Howth and Casteltownbere. Further sampling will continue in 2018 with screening and characterisation work focusing primarily on *Paramarteilia* sp. *Haematodinium* sp. and *Microsporidian* sp.

### Competent Authority for Fish Health

The Marine Institute is the competent authority in Ireland for the implementation of *Council Directive 2006/88/EC*. This addresses the health of aquaculture animals and the prevention and control of certain aquatic animal diseases. In this role, the Fish Health Unit directs and monitors the work of the DAFM Veterinary Inspectors who work in the aquaculture field. In 2017, 185 inspections were completed under the legislation; 2,034 movements (imports, exports and internal movements) of live aquatic animals were authorised; zero Compliance Notices were issued and nine new Fish Health Authorisations were granted, bringing the total number of authorised aquaculture production businesses in the country to 402.

### Environmental Monitoring

On behalf of the EPA and DHPCLG, the Marine Institute conducted environmental monitoring as part of the 2016-2020 cycle of the EU Water Framework Directive to assess the ecological and chemical status of transitional and coastal waters and OSPAR's coordinated monitoring. Selected Water Framework Directive waterbodies and designated shellfish growing waters were sampled for a variety of water quality indicators to determine whether they met 'good ecological and chemical status as defined under the *Water Framework Directive*.

Physicochemical parameters were analysed from 492 samples; priority substances and other pollutants in water and biota were analysed from 308 samples, and phytoplankton from 222 samples. Additionally, 330 grab samples were collected from 28 waterbodies and analysed for benthic invertebrates, including 197 samples from nine coastal water bodies collected during the annual winter environmental survey aboard the RV *Celtic Voyager*

in February. These data are collectively used by Marine Institute scientists to assess annual trends and the status of pollutants in the North-East Atlantic for OSPAR, and to develop common indicators under the Marine Strategy Framework Directive.

### Finfish Farm Monitoring

The Benthos Ecology Group carried out its annual review of reports from finfish growers arising from benthic surveys to examine seabed conditions below fish cages, in accordance with DAFM Benthic Monitoring Protocols. A review is prepared annually by the Benthos Ecology group and is submitted to DAFM.

### Open Ocean Observations and Biogeochemistry

In February, MEFS chemistry and OSIS teams undertook the southern Rockall Trough oceanographic/ climate section survey using the RV Celtic Explorer. A major undertaking in 2017 was the lead role of MEFS, OSIS and NUI Galway in the Global Ocean Ship-based Hydrography (GO-SHIP) A02 transatlantic survey. This was part of a global effort to collect decade-repeated hydrographic measurements of essential ocean variables: pCO<sub>2</sub>, pH, total alkalinity, temperature, nutrients, and dissolved inorganic carbon along key ocean "reference" sections. This is the first time Ireland led such a survey which involved 11 institutes from six countries. This survey involved profiling these physical and chemical parameters through the full water column at 58 stations between the Newfoundland and Celtic Sea continental shelves over 27 days.

### Advice and Technical Support

#### Aquaculture Licensing

MEFS continues to provide advice to DAFM to inform aquaculture licensing decisions that may have implications to marine SACs, SPAs and/or other environmental concerns. In 2017 this advice included:

- Completion of eleven full Appropriate Assessments for marine SACs and SPAs at Mulroy Bay SAC; Tralee Bay and Magharees Peninsula, west to Cloghane SAC; Tralee Bay Complex SPA; Ballymacoda (Clonpriest and Pillmore) SAC; Ballymacoda Bay SPA; Mullet/Blacksod Bay Complex SAC; Broadhaven Bay SAC; Glenamoy Bog Complex SAC; Blacksod Bay / Broadhaven SPA. These assessments will allow progression of approximately 85 licensing decisions. Revisions on foot of requests from DAFM were provided for three Natura sites.
- Ongoing monitoring of mitigation measures relating to oyster culture and bird interactions continues in Dungarvan SPA and the Bannow Bay SPA.
- Environmental Impact Assessment screening for non-salmonid licence applications and Appropriate Assessment screening for licence applications in non-NATURA sites.
- Advice on 101 aquaculture licence applications, covering 129 individual sites.
- Development of technical protocols for aquaculture structures.

#### Shellfish Safety Advice

The shellfish safety team provided advice on shellfish food safety to the SFPA and the FSAI on ongoing official controls under the monitoring programmes for shellfish biotoxins and microbiological classification. To this end, negotiations with the European Commission were extensive in 2017 (and continue) on the validity

of provisions they have asserted to ensure the safety of scallops harvested from offshore unclassified waters, and their potential for domoic acid contamination. In these negotiations, we provided the SFPA and FSAI with sound scientific evidence to support that the current analytical methods conducted by the Marine Institute on the shucked product are fit-for-purpose, and ensure that levels of domoic acid in marketed scallop product are well below regulatory risk levels.

The team also continued to provide support to competent authorities in Ireland and at European level on microbiological food safety issues associated with bivalve shellfish. In particular, the team participated in an ongoing European Food Safety Authority technical group aimed at providing support for a planned EU-wide baseline survey to determine the prevalence of NoV contamination in oysters.

This survey is an important step towards establishing European regulatory controls. The shellfish safety team continued to provide scientific advice to the SFPA and FSAI regarding the provisions asserted by the European Commission for scallop testing from unclassified offshore waters.

### Marine Spatial Planning Advice

Marine Spatial Planning (MSP) is a planning tool to enable the consideration of when and where human activities could sustainably occur in the marine environment. *Directive 2014/89/EU establishing a Framework for Maritime Spatial Planning (MSP)* was transposed into Irish legislation in September 2016. The Department of Housing, Planning and Local Government is responsible for drafting and implementing the Marine Spatial Plan by March 2021, while the Marine Institute's role is intended to provide integrated technical and scientific services in an inter-departmental partnership, with co-funding. Our technical role is focused on assembling spatial data and evidence products which will be useful for the marine spatial plan, as conceptualised in the *Enablers Task Force on Marine Spatial Planning Report* to the Inter-departmental Marine Coordination Group.

The data requirements for MSP include administrative borders; physical/chemical/biological information (e.g. oceanographic characteristics, habitat or pressures); activities/uses; spatial policy and socio-economic data (e.g. aquaculture, fishing, renewable energies; installations and infrastructure; maritime traffic and ports; protected areas; military, cable and pipeline, tourism and recreation; underwater cultural heritage and coastal defence. The Institute began analytical processes in 2017 to support MSP by identifying and cataloguing relevant spatial datasets that may be potentially useful for MSP. Over 400 internal data sets, and others external to the Marine Institute, will be 'mined' by the Institute and contractors to produce spatial outputs in 2018 and beyond for use by DHPLG in the crafting of the MSP.

### Other Advisory Service

In addition to the more extensive advice provided for aquaculture licensing and shellfish safety, MEFS also supports other key clients by advising in other marine areas. In 2017, this included:

- Technical advice to ports on disposing dredge material at sea by providing pre-application technical support, assessments of sediment suitability, and providing recommendations to the EPA. MEFS also participated in the EPA Dumping at Sea Advisory Committee, and prepared the 2016 annual national report on dumping at sea for OSPAR.
- Advice on 20 applications for foreshore leases/licences

by way of participation on the DHPLG Marine Licence Vetting Committee.

- Advice on the environmental aspects of offshore hydrocarbon exploration and production to industry.
- Advice to DCCAE on the use of and monitoring for offshore chemicals and appropriate permit conditions.
- Reporting to OSPAR on the annual discharges, emissions and spills from the offshore oil and gas industry in Irish waters.
- Support and advice to the Department of Communications, Energy and Natural Resources on implementing the Offshore Renewable Energy Development Plan through participation in the steering and environmental working groups.
- Input into and review of relevant Strategic Environment Assessments on behalf of DAFM.

### Research Activities

The MEFS team continued its involvement in European and nationally-funded research programmes in 2017, carrying out applied research to support delivery of our monitoring programmes and advisory services. Collectively across the MEFS sections, 22 papers were published in peer-reviewed journals, addressing past research. A similar number of presentations and/or posters were also given at scientific meetings representing current research projects. This level of research production, on balance with the heavy statutory service support, is a testament to the hard work and dedication of the scientists in MEFS and throughout the Marine Institute.

In the area of shellfish safety, research activities included: completion of the NoroRisk Project with UCD to develop a risk assessment framework for norovirus in Irish oysters, and the completion of the laboratory work for the Cullen Fellowship work on norovirus sample material stability. Also in the area of shellfish viruses, the FoVira project with the Irish Virus Reference Lab, commenced investigations and method developments for Norovirus, Sapovirus, Hepatitis and A&E virus in shellfish. Other research activities included the MARBioFEED that carried out isolation work, culture experiments, stable isotope labelling and isolation of DTX2 material. This project also facilitated a 12-week exchange with NRC to work on the culturing of *Azadinium* and optimisation of toxin production.

The ongoing PhD Cullen Fellowship on Azadinium Biological Oceanography continued and included a ten-day RV *Celtic Voyager* survey in August. A project was completed to develop an in-house method to detect tetrodotoxin in Irish shellfish. Initial results from this work are promising: nearly 500 2015-archived samples from Irish coastal waters representing a variety of invertebrate species were analysed and the toxin was not detected.

Two new projects were funded under the INTERREG Atlantic Area call: Alertox Net looked at new and emerging toxins (Institute total: €254,000) and 'PRIMROSE' which will continue developments in shellfish biotoxin and microbiological contamination forecasting (Institute total €688,000).

In the fish and shellfish health arena, research highlights included:

- Completion of the DAFM–FIRM-funded project 'REPOSUS'. The main focus was the characterisation of isolates of *Vibrio aestuarianus* collected during mortality events through infection trials designed to assess the pathogenicity of *Vibrio aestuarianus* and sequence analysis.

- Year two of the VIVALDI (Preventing and mitigating farmed bivalve diseases) project, funded under H2020. Trials were completed in six bays around the coast to investigate the importance of management factors in relation to mortality in *C. gigas*.
- A Cullen Fellowship on cardiomyopathy syndrome in farmed Atlantic salmon started in October, in conjunction with the School of Biological Sciences, UCD.
- A Marine Institute-funded PhD project on Amoebic Gill Disease in Atlantic salmon was completed.
- A PhD project in collaboration with UCD, University of California Davis and Marine Harvest Ireland is nearing completion. The main focus of the research related to network analysis, import risk assessment, and biosecurity benchmarking associated with the Irish salmon industry.
- A project evaluating the disease status of velvet crab stocks with a focus on the prevalence of *Paramartelia sp.* in conjunction with colleagues in Fisheries Ecosystems Advisory Services.

In the marine chemistry unit, ongoing research projects included:

- Year 2 of the AsMARA (Arsenic in Marine Algae and implications for Commercial Uses) project with NUI Galway, funded by DAFM under the Food Industry Research Measure initiative. This research involved establishing a method for determining inorganic arsenic in marine algae of commercial interest, and a study of factors influencing total and inorganic arsenic levels in Irish seaweeds.
- An ongoing partnership with NUI Galway on a post-doctoral project on biogeochemical cycling of carbon and nutrients in marine and estuarine waters which examined seasonal carbon dynamics of selected bays and estuaries was completed, and a final report was submitted. The MEFS chemistry team continue to work very closely with NUI Galway on ocean biogeochemistry in support of the VOCAB project (Variability /Vulnerability of Ocean Carbon and Biogeochemistry) commenced in 2017.
- The INTERREG COMPASS project commenced in which MEFS chemistry and OSIS teams are involved in the oceanography work package to implement a coherent network of monitoring buoys across the regional seas of the Republic of Ireland, Northern Ireland and West Scotland.
- Year 1 of a Cullen Fellowship on contaminants in seabird eggs was completed with significant progress on sampling, and chemical analyses are well underway to progress through Year 2.
- Finally, on the marine spatial planning side, the SIMCelt project is nearing completion in Q1 of 2018. This two-year pilot project was conducted to support the implementation of marine spatial planning in the Celtic Seas by demonstrating enhanced cross-border cooperation between EU member states. By addressing the strategic and jurisdictional barriers to marine spatial planning implementation, the SIMCelt project aims to enhance transnational cooperation on implementing marine spatial planning, to enable the sustainable use of marine resources across the entire Celtic Sea region. Publications from the SimCelt project are anticipated in 2018.

# Fisheries Ecosystems Advisory Services

## Director's Statement »



The work of Fisheries Ecosystems Advisory Services (FEAS) is focused on data collection, resource assessment and the provision of high quality scientific advice. This advice ensures sustainable exploitation of marine fisheries resources and the protection of the marine ecosystems in which they live. The waters around Ireland contain some of the most productive fishing areas in Europe, with international fleets annually landing over one million tonnes of fish worth an estimated €1 billion.

This fishing activity is a significant contributor to many EU coastal communities and the Blue Economy. Clear, impartial scientific advice on the state of this valuable resource and on the marine ecosystems which support the resource is the cornerstone of our service delivery to the Department of Agriculture, Food and the Marine (DAFM).

International cooperation is an essential element of our work programmes, and we work closely with the EU and the ICES (International Council for the Exploration of the Seas) to craft the scientific advice that underpins the implementation of the EU Common Fisheries Policy for the waters around Ireland. FEAS also works with other international organisations including the OSPAR and NASCO (North Atlantic Salmon Commission) to coordinate key components of our scientific work.

The services team provided regular scientific support to DAFM at the annual Coastal States and EU Council fishing negotiations that determined fishing opportunities for the Irish fleet. Our extensive data sets and scientific capabilities also support the key ecosystem policy areas of *NATURA 2000* and the *Marine Strategy Framework Directive*. The FEAS aquaculture programme is focused on sea lice monitoring and on applied research which supports sustainable aquaculture. We work very closely with our colleagues in MEFS and OSIS on a variety of cross-cutting programmes (e.g. data standards) to ensure a high quality service delivery to DAFM.

Highlights included:

- In November, the *Stock Book* was presented to the Minister for Agriculture Food and the Marine. It provides a summary of the latest scientific advice on the status of the marine fisheries resource in the waters around Ireland. This is the primary reference during the EU negotiations that determines Ireland's fishing opportunities for 2018. The fish stock summary information was a key component of the Minister's sustainability assessment that was presented to the Oireachtas in November.
- The EMFF is the main funding source for most of FEAS work in relation to collecting data and providing scientific advice. Funding of €8 million was secured for data collection under the EMFF for 2017 as part of a wider funding package that ensures funding from 2014 to 2020.
- The scientific data collected under the DCS (Data Collection Scheme), serviced the end-user needs of ICES and the EU. In 2017, over 500,000 fish/shellfish were measured, and aged data were collected from over 50,000 individuals to provide data for the models used in international stock assessments at ICES.
- Regional coordination of the DCS was enhanced through the establishment of regional coordination groups (RCGs) to support cooperation between EU Member States.
- FEAS worked closely with OSIS to create a new regional data model to be used in future ICES data calls.
- FEAS staff participated in over 110 scientific meetings focused on coordinating data collection (including research vessel surveys), standardisation of methodology, stock assessment and advice and training. FEAS participation at these meetings was funded under the EMFF.
- FEAS conducted a broad programme of surveys on the RV *Celtic Explorer* and the RV *Celtic Voyager* which produced 269 days at sea and 2,331 scientist days at sea. These included groundfish, acoustic and underwater TV surveys, and provided indices of abundance for input to fish stock assessments.

- FEAS staff responded to more than 12 international data calls for fisheries-related data that supports international stock assessment and advice. Responding to these data calls in an efficient and effective manner, is a key performance indicator for Ireland in relation to EU finding.
- Eleven new projects were set up under the EMFF marine biodiversity scheme to cover the areas of species restoration, fisheries and aquaculture interactions with NATURA and support for MSFD.
- FEAS conducted regular meetings with the fishing industry and BIM through the Irish Fisheries Science Research Partnership (IFSRP), which met quarterly throughout 2017.
- An Atlas of fishing activity inside six nautical miles was produced for DAFM, and an Atlas of Shellfish Fisheries inside 6nm was also published.
- A comprehensive analysis of the fishing activity of the Irish fleet in Irish and in UK waters was carried out. This included mapping the seasonal and spatial fishing effort and catches of both Irish, EU and UK vessels in the Irish and UK EEZ's. These reports were used by DAFM in developing preliminary BREXIT fisheries positioning by Ireland and the EU.
- The annual Bursar scholarship programme was successfully implemented with 24 students selected for 17 different projects across the Marine Institute between June and September.
- There was a close cooperation with the third level sector through supervising joint PhD students, including nine Cullen PhD Fellowships.
- Aquaculture and foreshore licenses were secured for Newport and the sea cage research site at BeirtreachBui bay, which is now operational.
- A considerable amount of staff time is spent at sea, port sampling and participating at key national and international meetings. Planning and communications continue to be a critical component of our work programmes. Regular staff and management meetings throughout 2017, coupled with the implementation of the Marine Institute's staff performance, management and development system ensured an efficient and effective service delivery to our main client, DAFM.



**Dr Paul Connolly**

Director: Fisheries Ecosystems Advisory Services

## European Maritime Fisheries Fund

The European Maritime Fisheries Fund (EMFF) is the funding source for most of FEAS work in relation to providing scientific advice. Funding of €30 million has been secured for the data collection scheme (DCS) under the EMFF for the period 2014 to 2020. The DCS was fully implemented in 2017 and included submission of a comprehensive work plan that was evaluated and approved by the EU. The annual report of activities for 2016 was also approved by DAFM and the EU.

The DCS cost statement for 2014 to 2016 was also approved by DAFM. The scientific data collected under the DCS service the end-user needs of ICES, the EU and OSPAR. In 2017, over 500,000 fish/shellfish were measured, and aged data was collected from more than 50,000 individual fish aged across all scientific programmes. These data were used as inputs to the models used in international stock assessments at ICES.

Over 160 at-sea sampling trips were carried out on commercial fishing vessels. Management of the sea sampling programme was contracted out to Emerald Marine Environmental Consulting which has resulted in significant improvement in the number of at-sea sampling trips carried out. The FEAS team developed a statistically sound sampling design for selection of observer trips.

In 2017, regional coordination of the DCS was enhanced through the establishment of regional coordination groups (RCGs) to support cooperation between EU Member States. Inter-sessional work of the North Atlantic RCG included task sharing and cooperation on fisheries surveys; analysis of sampling data; evaluation of the impacts of the landings obligation on sampling, governance issues and liaison with end users. This group was co-chaired by Ireland and the first annual meeting was held at the Marine Institute in September 2017.

Eleven new projects were set up under the EMFF marine biodiversity scheme to cover species restoration, fisheries and aquaculture interactions with NATURA and support for MSFD. Projects included an enhanced bycatch sampling programme for set net fisheries; an offshore reef mapping survey; species restoration for crayfish, rays and skates, and informatics to support ecosystem-based fisheries management. Projects under this programme fostered close collaboration between the Marine Institute, National Park and Wildlife Services (NPWS) and Geological Survey Ireland (GSI).

## Research Vessel Surveys

FEAS carried out a broad range of research vessel surveys throughout 2017. Seventeen surveys were carried out on the RV Celtic Explorer, the RV *Celtic Voyager* and chartered commercial fishing vessels. These surveys comprised 269 sea days and 2,331 scientific days at sea. Many of the surveys have a strong international dimension as FEAS collaborates with scientists from Norway, Iceland, Portugal, Spain, France, Belgium, Netherlands, Germany, Denmark and the UK. These surveys represent a major human resource commitment by FEAS staff in terms of preparations, vessel mobbing, conducting the survey, vessel demobbing and result analysis. The FEAS team work closely with the research vessel management team in OSIS to ensure an efficient and effective delivery of the research vessel survey programme.

A full acoustic survey programme was carried out including the six-week WESPAS survey covering shelf waters from Northern Biscay to Northern Scotland and including the Porcupine Bank and Eastern Celtic Sea. The survey provides indices of abundance for input to the assessments of blue boarfish and herring stocks and integrates with third-level institution research programmes on seawater chemistry and zooplankton.

The *Nephrops* resource is worth over €62 million annually to the Irish fleet, and the results of the Underwater TV survey programme were a critical input to advising on fishing opportunities for 2018. Underwater TV (UWTV) surveys were carried out on the Porcupine Bank, the Aran grounds off the South Coast and in the Irish Sea. The Marine Institute successfully completed *Nephrops* UWTV surveys, completed assessments and provided management advice for all the main fisheries around Ireland in 2017. FEAS collaborated with the Agri-Bioscience and Food Institute (AFBI) in Northern Ireland and CEFAS in England to carry out UWTV surveys for *Nephrops* in the Irish Sea. FEAS also collaborated with IFREMER in France who chartered the RV *Celtic Voyager* to carry out an annual UWTV survey in the Bay of Biscay. During 2017 FEAS procured a new UWTV imaging system that can simultaneously capture high definition video and ultra-high definition stills images. This new technology will allow the Marine Institute to remain at the forefront of using UWTV surveys to assess *Nephrops* stocks and monitor the marine ecosystem.

The Marine Institute established a new dedicated monk-megrim survey programme in 2016 on the RV *Celtic Explorer*. This 42-day survey programme continued in 2017, and focused on improving data for stock assessment and scientific advice on these economically important stocks. The monk and megrim stocks are worth over €150 million in annual landings to EU fleets fishing off the west coast of Ireland.

The Irish groundfish survey was carried out over a 40-day period in the Celtic Sea and off the west coast of Ireland. This survey investigates the distribution and abundance of fish species, especially the juveniles (the commercial catch of tomorrow). The acoustic survey programme is focused on assessing the blue whiting, boarfish and herring resources worth over €90 million to all the commercial fleets fishing in north Atlantic. FEAS also conducted acoustic surveys on Celtic Sea herring. Scientists worked closely with the Celtic Sea Herring Management Committee on the design of the acoustic survey to accommodate changes in herring distribution and behaviour.

## Information Technology

Data is the raw material for our scientific advice and considerable efforts were devoted to developing our databases and information technology. Twenty FEAS applications and their respective databases were supported and developed in 2017, while 63 software releases were performed during the year and 114 support calls were resolved. Some important database servers were also migrated to newer technology. FEAS worked closely with OSIS to create a new regional data for future ICES data calls. Data leadership is a key part of the FEAS work programme and we participated at meetings of the Regional Database Steering Committee, the ICES Data and Information Group, the STECF expert working groups, the Data Governance,

Data Quality, Technical Working, and Steering Groups.

We successfully responded to data calls to ICES for more than seven expert groups. The cross services EMFF Informatics project was initiated with colleagues from FEAS and information services and development. Recruitment was completed, a new team was established and the first outputs were produced. A new data base (Paradigm 3) was developed to implement a more efficient management of FEAS safety equipment.

## Stakeholder Interactions

Stakeholder engagement is a strong component of our work programme. FEAS conducted regular meetings with the fishing industry and BIM through the IFSRP that met quarterly throughout 2017. Established in 2008, the IFSRP addressed issues including gap areas in research, funding additional surveys, assessment of resources, data quality, blue fin tuna, gear trials and selectivity, the landings obligation and herring genetics. FEAS also held quarterly meetings with the environmental non-governmental organisations to discuss similar issues around fisheries and their impact on marine ecosystems.

There was also considerable cooperation and interactions with the EU Advisory Councils (North Western Waters Advisory Council and the Pelagic Advisory Council). FEAS also participated at the regional Inshore Fisheries Forum (RIFF) and the National Inshore Fisheries Forum (NIFF) which focused on issues related to stock assessment and advice for the inshore shellfisheries resources and on NATURA 2000 obligations. FEAS chaired and participated in a stakeholder workshop to develop ecosystem and food web models for the Irish Sea (WKIRISH4). The aim of the WKIRISH process is to develop a holistic approach to the management of the main fish stocks in the Irish Sea. Cooperation with FEAS staff participated at a series of port open days focused on the landings obligations. These were organised by the SFPA and involved industry, BIM and the Marine Institute.

## Scientific Advice

Scientific advice is the core business of FEAS. During 2017, FEAS staff participated in over 110 scientific meetings focused on coordinating data collection (including research vessel surveys), standardising methodology, stock assessment and advice and training. Other issues addressed included NATURA 2000, MSFD, MPAs, MSY reference points, ray and skate assessment, management plan evaluation and the landings obligation. Most of these meetings were funded by the EU through the DCMAP.

FEAS chaired the ICES benchmark meeting for pelagic stocks that conducted new assessments for mackerel and two horse mackerel stocks. A new index for juvenile horse mackerel derived from the Irish groundfish survey data was developed and successfully incorporated into the new Western Horse Mackerel assessment. In 2017 there was a heavy workload of advisory work through ICES ACOM (Advisory Committee). This included drafting and approving advice on all the stocks of interest to Ireland. Particular attention was paid to quality issues with ICES advice and issues around mixing between Irish Sea and Celtic Sea herring stocks. This mixing issue spawned a successful bid for EU EASME funding in 2017. This successful application will



involve a collaborative project between Marine Institute, UCD and Marine Scotland. This project will use state-of-the-art next generation sequencing and Morphometric analyses to segregate herring stock around Ireland

FEAS was actively involved in the ICES review of fish stock assessments in the Irish Sea (WKIRISH). This resulted in the upgrade of cod, haddock, whiting, plaice and herring in the Irish Sea and a significant improvement in the scientific basis for the management of fish stocks in the Irish Sea. The new assessment for cod indicated that the stock had recovered and a non-zero catch advice was provided for the first time since 1999.

In 2017, FEAS scientists carried out work to improve the assessment model for monkfish. This new model will be tested and evaluated by ICES in 2018. A major EU research project to look at the ageing and stock discrimination of monkfish commenced in 2017 and will include microchemistry techniques to develop a better understanding of the ecology of this important commercial fish species. The MYDAS project started and focuses on developing MSY reference points for data-limited stocks.

In November, the *Stock Book* was presented to the Minister for Agriculture Food and the Marine. It provides a summary of the latest scientific advice on the status of 74 fish stocks that are exploited by the Irish fleet in the waters around Ireland. This resource is worth over €200 million to the Irish fleet. The *Stock Book* is the primary reference during the EU negotiations that determine Ireland's fishing opportunities for 2018. The fish stock summary information was a key component of the Minister's sustainability assessment presented to the Oireachtas in November. It also included a section on the state of fish stocks in relation to Ireland's obligations under the MSFD.

## Inshore Shellfisheries

FEAS conducted a broad range of data collection programmes on inshore shellfisheries. This provided the raw material to deliver stock assessments and advice for DAFM. An *Atlas of Commercial Fisheries for Shellfish Around Ireland* was produced for DAFM; and an *Atlas of Shellfish Fisheries inside 6nm* was also published.

The shellfish survey programme was expanded to include a significant new survey of razor clams in the north Irish Sea. Over 70 vessels are now involved in this fishery. Assessment methods for survey data were developed and automated.

A report of a three-year project on VMS systems for inshore fishing vessels was produced for DAFM and SFPA, and a new tender to continue and expand the project was published in December 2017.

A new EMFF-funded project on restoration of the valuable spiny lobster was begun. The project involves mapping inshore reefs, tag and release programmes with the commercial fleet and larval dispersal modelling.

A review of the technical conservation measures including the 20-year v-notch programme implemented by BIM and used to manage the important lobster fishery (>900 vessels involved) was completed and presented to industry groups.

## Aquaculture Finfish Monitoring

The FEAS aquaculture programme is focused on sea lice monitoring and on research for sustainable aquaculture. Work continued on implementing the *DAFM Strategy for Improved Pest Control on Irish Salmon Farms*. The strategy outlines a comprehensive range of measures to enable enhanced sea lice control. Continuous on-farm sea lice checks facilitated early interventions, resulting in better sea lice control during 2017. The results of the 2016 programme were published and circulated to stakeholders in March. Alternative approaches to complement medical treatments, coupled with a rigorous proactive regulatory oversight, meant that sea lice levels in Ireland in 2017 were generally managed well.

The strategy for the Newport research facility includes a strong aquaculture component and linkage to a sea cage facility. Aquaculture and foreshore licences were secured for Newport and the sea cage research site at Beirtreach Bui bay, which is now operational. A service contract was put in place to manage the site as an aquaculture research facility. The "old" hatchery at Newport was upgraded to assist with experiments that require a flow through hatchery, small-scale recirculation and bio-secure facilities.

Work commenced on two new flagship aquaculture research projects. The first is TAPAS (Tools for Assessment and Planning of Aquaculture Sustainability), which is a four year project looking into cost-efficient management tools and practices for the European aquaculture sector. TAPAS conducted a broad-scale consultation with aquaculture stakeholders across Europe to identify the current bottlenecks and problems regarding licensing and regulation. An interim report on perceived impacts and bottlenecks in the licensing frameworks was presented and discussed at a very successful two-day workshop with the project partners. This will feed into a consultation document on new and flexible approaches to aquaculture regulation in Europe and is due to be published in March 2018.

The second flagship project is IMPAQT (Intelligent Management system for integrated multi-trophic Aquaculture), which is a H2020 project with a focus on sustainable aquaculture production. The project will develop and validate new sensors and emerging technologies. Advanced monitoring, modelling, data analytics and decision-making are key components of the project.

## Marine Institute, Newport, County Mayo Research Facility

The Marine Institute board adopted the Newport Strategy in September 2015 and work continued on its implementation. The strategy is based on 13 research clusters that are supported by a mix of third-level researchers and Marine Institute staff. The research projects are focused on work that maximise the use of the facility and its data assets.

The FEAS team at Newport continued their work on stock assessment and advice for salmon and eel, and participated at key ICES expert group meetings in these areas. The Burrishoole fish (salmon, trout, and eel) census programme, forms the basis for much of the Institute's stock assessment and advice for

salmon and eel. Special emphasis is now also being placed on evaluation of marine survival and growth, especially in relation to changes in the environment and on developing eel survey techniques to support the EU Regulation on the Recovery of the Eel Stock. The Marine Institute formed an ad hoc assessment group with IFI to provide the national catch advice for salmon in 2017, pending the formation of a new Standing Scientific Committee for salmon to be established by IFI. FEAS provided the chair for the Scientific Advisory Group of NASCO's International Atlantic Salmon Research Board in 2017 and were also co-opted to NASCO's standing Scientific Committee for 2017. FEAS also chaired the Standing Scientific Committees on Eel.

The joint Marine Institute / Galway-Mayo Institute of Technology / Loughs Agency / Institute of Marine Research, Bergen, PhD project on Ecology of Salmon at Sea was successfully completed in 2017. This work highlights the importance of examining times series of marine survival and post-smolt growth of salmon in relation to climate change and ecological changes faced by highly migratory fish species. Fieldwork associated with the Galway-Mayo Institute of Technology (GMIT) Cullen Fellowship on Acoustic Telemetry programme (partitioning mortality of salmon smolts during spring migration) was successfully completed.

DAFM have placed a priority on understanding the movements of blue fin tuna (BFT) in the waters around Ireland. The BFT tagging programme continued throughout the year. Successful collaboration with Stanford University California, Acadia University Nova Scotia and Queens University Belfast, resulted in the tagging of eleven BFT. These fish were tagged close to the Donegal coast with satellite pop-off tags. A further three fish were tagged with accelerometer tags to investigate stress levels in the fish. The 2017 BFT tagging programme built on the 2016 work, where 16 BFT were tagged off Donegal. Satellite tag data were also recovered from two fish in January, two fish in March and two fish in August/September. These data are currently being examined by the consortium involved in the research project.

Sea bass work is based in Newport and in Dunmore East on the south coast. The Marine Institute / UCC collaborative PhD on sea bass was successfully completed in 2017. The work showed strong site fidelity of sea bass on the south coast. Sea bass tagged with satellite tags were also tracked. One sea bass tagged off Wexford moved up into the Irish Sea to Liverpool. The first primary publication from this study was accepted for publication in a major journal. In 2017, sea bass migration research was funded for a further four years through the BLUEFISH project (Ireland/Wales INTERREG programme).

The Marine Institute pollock initiative commenced in 2017 with support being provided for ICES working groups developing catch advice in ICES Areas 6 and 7. Work was also carried out on improving the assessment and Irish data being used for the assessment as well as a retrospective analysis of Irish pollock landings data. A biological sampling and tagging programme commenced in Clew Bay to examine migration and distribution of pollock, along with onset and extent of spawning migrations. This work will include collecting genetic samples from commercial fisheries and research sampling to establish stock identity and fidelity to feeding and spawning sites. The programme was presented to the Industry Science Partnership meeting in October 2017.

Successful maintenance of the core Long-term ecological research (LTER) data streams from the Burrishoole catchment in Newport, including the fish census (see Annex 6), juvenile fish and eel surveys. More than 30 data requests and additional data provision for the Cullen PhD and new CLUSTER projects were successfully delivered.

The Newport Research facility is involved in several new projects that use its unique data assets. DETECT is an Environmental Protection Agency-funded project that aims to develop an assessment framework to support the identification of the principle stressors constraining ecological recovery in water bodies. PROGNOSE uses the Newport facility as a case study. The project examines lakes and reservoirs that are under continuous pressure from urbanisation and agricultural intensification, and from changes in climate, including increasing occurrence of extreme climatic events. WATExR uses a co-development framework in which water quality modellers, climate experts on seasonal prediction and end-users from seven case studies in Europe and Australia will develop tailored solutions relating to the impact of climate extreme events on water supply, fisheries, and the implementation of the Water Framework Directive.

Four Cullen Fellowships in Burrishoole are progressing well and beginning to produce peer-reviewed publications (see Appendix 2). (2017). In conjunction with OSIS, three tidal/water level gauges were installed in Clew Bay, Burrishoole Estuary and at the Salmon Leap outflow from Lough Feeagh. Fixed PIT tag readers were installed in the Salmon Leap Upstream and Downstream traps. These tag detectors will provide additional information on fish tagged in the Juvenile Salmonid Cullen project, the core salmon and trout census, the eel stock assessment programme and also some of the external projects such as the UCC ERC project on sea trout.

Repairs carried out to the Mill Race River in 2016 were successful, and restored full passage for migrating fish in the 2016 and 2017 seasons. The ranched salmon programme generated income of €23,000 during the June – August 2017 season.

Fish welfare is a very important component of research activity at the Newport facility. The Marine Institute works closely with the Health Products Regulatory Authority (HPRA) to ensure our research complies with required animal welfare legislation. Newport was inspected by HPRA in February 2017 and successfully passed the audit. This inspection was conducted as part of the process for renewing Marine Institute's HPRA breeder/supplier/user authorisation and to confirm that the establishment operates in accordance with the scientific animal protection legislation.

## Applied Research

Understanding how marine ecosystems work and the impact of fishing activity and climate change on ecosystems are important aspects of FEAS research work. This work enhances our scientific advice and is funded through national and international collaborative research projects.

In 2017, FEAS started the FishKOSM project (Fisheries Knowledge for Optimal Sustainable Management). This is a collaborative DAFM-funded project examining options within the Maximum Sustainable Yield concept for combining fishery and ecosystem sustainability. It is a collaboration with QUB, AFBI, GMIT and UCC.

FEAS carried out an innovative workshop with fishermen and NGO stakeholders. The main aims were to reconstruct the food web for the Irish Sea in our base year of 1973 and to reconstruct effort time series by gear also back to 1973. This was tremendously successful, with the stakeholders and scientists finding the exercise fun and educational.

Within the H2020 funded project DiscardLess (Strategies for the gradual elimination of discards in European fisheries), we completed an initial avoidance manual that included tactical, strategic and gear-based approaches, agreed by scientists and fishers, to avoid discards.

FEAS continued work on an SFI-funded project "Creating the knowledge for precision fisheries management: spatially aware 'nudging' to achieve Maximum Sustainable Yield using real-time fisheries incentives". Twenty face-to-face interviews with fishermen, NGOs and other stakeholders were carried out. Results were presented at the 2017 ICES Annual Science Conference.

Work on the Irish Sea cod tagging project continued. This work, which involves close collaboration with Northern Ireland scientists, is funded through the European Commission and tagged 2,624 cod in 2017.

A PhD Cullen Fellowship started in 2017, which focused on modelling the food web in the Irish Sea in the context of a depleted commercial fish community. This project is carried out with the Scottish Association for Marine Science in Oban and is linked to an ICES series of workshops. It is aimed at discovering why the commercial stocks in the Irish Sea have shown poor recovery despite decreased effort.

# Ocean Science and Information Services

## Director's Statement »



Ocean Science and Information Services (OSIS) continued to provide a wide range of services. This included deploying infrastructures, technology initiatives and significant observation and mapping programmes to acquiring data – through to data analytics and data services including operational modelling. High quality data are the fundamental building blocks used for marine research, technology, development and innovation, as well as to manage the marine resource. This includes services for national and international marine clients, including programmes involving much of the activity of the Marine Institute.

The OSIS teams participated in a wide range of national, European and international programmes and were active across many EU-funded programmes including new projects. This improves our capacity to provide support services tailored to the needs of integrated science programmes that inform cross-sectoral policy advice.

Significant activities of the year include:

- The research vessels *RV Celtic Explorer* and *RV Celtic Voyager* had a notable year of 586 science days as highlighted below.
- Advanced Mapping Services with our partners, GSI, mapping over 2,877 km<sup>2</sup> of seabed in the Celtic Sea during 87 allocated vessel days and value-added activity.
- Significant advances in oceanographic activity by the Oceanographic Services Team included new operational modelling activities, providing marine input as part of national climate change adaptation and mitigation planning and developing potential new EU-funded projects.
- One of the key highlights was the highly successful transatlantic GO-SHIP during April/May on the *RV Celtic Explorer* and led by Ireland (NUI Galway and Marine Institute) with significant staff participation by OSIS staff including project management.

- The ocean services team continue to support DAFM towards preparing its Marine Sectoral Adaptation plan, and sits on both the Sectoral Adaptation Committee and Governance Sub-Group, coordinated by the DCCAE.
- ROV *Holland I* and other equipment, OSIS and P&O Maritime Services personnel supported the search for the missing wreckage of Irish Coast Guard helicopter Rescue 116 in March/April 2017.
- The information services and development team was very active in strategy planning and implementation, including the definition of a new IT Strategy, rollout of the Data Strategy, development of data integration initiatives across the Institute in support of developing MSP and MSFD programmes, and input of related items into the Institute's strategy planning. The team was also active in further developing the Irish Digital Ocean concept of making Ireland's marine digital assets more readily available for public services, research and innovation. In December 2016, the Marine Institute was awarded a lease for the test site to support testing of quarter-scale renewable ocean energy devices, marine sensors and ICT.
- OSIS also continued to operate the SmartBay Cabled Observatory, the subsea marine research and technology demonstration platform in Galway Bay, and continued to provide a wide range of services as part of our Service Level Agreement with SEAI. The SeaPower wave energy device was deployed at the site until March – the first quarter-scale device deployment for some years.

The wide range of highly technical services provided by OSIS is a testament to the dedication, professionalism, technical expertise, public good ethos and fantastic teamwork of the staff and the wider Marine

Institute, collaborators and contractors. I look forward to another significant year of achievement and associated highlights in 2018, particularly in added-value data programmes with an emphasis on integration and advancing the IT and data strategies; observation and marine climate; marine modelling; technology testing and adding further value to the INFOMAR programme.



**Mr Michael Gillooly**

Director: Ocean Science and Information Services

## Research Vessel Operations

The research operations team mission is to coordinate and manage the operation of the Marine Institute's two research vessels, *RV Celtic Voyager*, *RV Celtic Explorer* and the deep-water Remotely Operated Vehicle, *ROV Holland I* and to provide support services to the users of these vessels, including instrumentation and engineering support services.

The vessels had an intensive year of activity in 2017 with 586 science days completed on both vessels. *ROV Holland I* completed three scientific surveys in 2017; one taking place on the *RV Celtic Explorer* and two on *ILV Granuaile*. The *ROV Holland I* was also used to support the search for the missing wreckage of Irish Coast Guard helicopter, *Rescue 116*, in March/April 2017.

### *RV Celtic Explorer*

The *RV Celtic Explorer* completed 17 surveys, with dedicated maintenance periods taking place at the start and end of the year. An oceanography and environmental monitoring survey in the German Bight and Baltic Sea marked the first survey of the year. The vessel was on charter to German: Bundesamt für Seeschifffahrt und Hydrographie. Primary operations included CTD casts along a predetermined track.

The following two months comprised Marine Institute-led surveys including the annual Rockall oceanography survey, four legs of the anglerfish and megrim trawl survey and the blue whiting acoustic survey.

A key *RV Celtic Explorer* highlight was completion of the transatlantic Global Ocean Ship-based Hydrographic Investigations Programme (GO-SHIP) during April/May which was accomplished through the cooperative approach envisaged in the Galway Statement. The programme was led by scientists from the Marine Institute and NUI Galway, and included an international partnership with on-board teams from Canada, Germany, the UK, and the USA, along with additional offshore support from experts in Denmark and France. The survey involved taking continuous underway measurements, including surface seawater conductivity and temperature, along the A02 line survey. The A02 line runs from the margins of the Grand Banks, south of Newfoundland, to the shelf edge of the Celtic Sea off southern Ireland. The survey was carried out over 27 days.

Following the transatlantic trip was the first *ROV Holland I* survey of 2017, led by Dr Louise Allcock, NUI Galway. The Exploiting and Conserving Deep-sea Genetic Resources survey was funded by a Marine Institute/Science Foundation Ireland grant. Survey objectives included collecting high definition video footage and biological samples at five locations: two specific sites at either end of the Whittard Canyon; a site in the Gollum Channel; one in the vicinity of the Belgica mounds and one in a small unnamed canyon to the northeast of the Porcupine Seabight.

Following the ROV demobilisation, the vessel commenced the first leg (24 days) of the Western European Shelf Pelagic Acoustic Survey (WESPAS), led by Institute scientists using acoustic techniques to collect boarfish spawning stock information along a predetermined track in the Celtic Sea. The

survey had a break to visit SeaFest 2017 in Galway city, and welcomed over 9,000 visitors to the vessel for tours over three open days. The second leg of the WESPAS survey commenced with the survey track stretching from Galway to Malin Head and north to the Outer Hebrides over 18 days. The scientific complement included four BBC staff who recorded footage of the vast array of marine life encountered over the three-week survey for airing on *The One Show* in January 2018.

The first RV *Celtic Explorer* INFOMAR survey of the year commenced at the end of July and involved collaboration between scientists from the Centre for Coastal and Ocean Mapping/Joint Hydrographic Centre (CCOM/JHC) and Dalhousie University, Canada. Mobilisation included installing the moving vessel profiler (MVP) to enable smoother and more time efficient data acquisition from the vessel's two multibeam systems, the shallow water EM2040 and the deepwater EM302. Multibeam mapping took place in the Celtic Sea in parallel with running the EK60 ships echosounder and an Acoustic Doppler Current Profiler (ADCP). The survey area covered 1,280 km<sup>2</sup>.

The vessel also completed a 39-day North Sea oceanographic survey under charter to BSH (Federal Maritime and Hydrographic Agency of Germany) before completing the second leg of the Celtic Sea INFOMAR survey in September, covering an area of 720 km<sup>2</sup>.

The vessel completed the annual groundfish and Celtic Sea herring surveys before heading to A&P yard in Falmouth, Cornwall, for a five-year refit, that includes replacing the SP70 fishing echosounder with a new SU92 unit; overhaul of the bow thruster and propulsion system inspections, and an upgrade to several cabins.

## RV Celtic Voyager

*Celtic Voyager* remained busy throughout 2017 by completing 41 surveys. Following a refit, the survey year kicked off in early February with the annual 'Winter Environmental Survey' involving benthic sampling along major bays on the south and southwest of Ireland. March involved student training from Cork harbour as part of the SMART (Strategic Marine Alliance for Research and Training) programme, in addition to three NMCI student days. The vessel sailed back to Galway for further student training by GMIT.

Following student training, the vessel switched to geophysical activities commencing with the National University of Ireland Maynooth-led survey 'MARA: Malin shelf sediment ReseArch'. The survey involved seismic equipment and multibeam operations in addition to ground truthing activities off Malin Head. The proceeding geology survey was carried out by University College Cork (UCC) and involved shallow seismic data acquisition in the Celtic and Irish Sea. UCC also carried out an additional geology survey at the end of July/start of August off Black Sod bay. The July survey objectives included quantifying offshore mineral sand resources at key locations off the west coast of Ireland using a variety of survey equipment including vibrocore, day grab and sparker.

In early May the vessel completed a Langolf Under Water TV (UWTV) *Nephrops* survey on behalf of the French Research Institute for Exploitation of the Sea (IFREMER) in the Bay of

Biscay for the fourth successive year. The first of two EU-funded, Marine Institute-led BLUEfish surveys took place at the end of May in the Irish and Celtic Seas. BLUEfish 1 used the UWTV equipment to locate scallop ground south of Saltee Islands and south of Waterford. In conjunction, plankton samples were collected using a multinet. Scallop research continued in September during BLUEfish II, which involved the use of using a scallop dredge to collect specimens for abundance analysis.

The vessel completed all three FEAS *Nephrops* UWTV surveys, including the Porcupine grounds, without issue; full coverage of the functional units and grounds was achieved over the course of the three surveys.

The autumn survey season saw two first-time chief scientists on the RV *Celtic Voyager*. The first was an iCRAG biogeochemical survey along the Irish west coast led by NUI Galway with operations involving CTD casts and neuston net deployments. The proceeding survey was a marine mammal expedition that involved a multidisciplinary approach to studying deep diving whales and their habitat. The primary species under investigation was the beaked whale = circa 150km off Mayo. Operations included marine mammal observations in conjunction with pelagic fishing in the mesopelagic layer. Pelagic fishing took place down to 356m, the deepest recorded fishing depth for the RV *Celtic Voyager*. One of the highlights was spotting four separate groups of beaked whale, a rare sighting in Irish waters.

The year ended with a GMIT survey to investigate the distribution of microplastics in Galway Bay. Ground truthing methods, beam trawling and CTD operations were carried out to encompass an ecosystem approach in the survey area.

## Charter Vessels & ROV Holland I

The ROV *Holland I* took part in three dedicated scientific surveys, one on the RV *Celtic Explorer* and two on the chartered *ILV Granuaile*, totalling 49 survey days.

While the RV *Celtic Explorer* was busy carrying out the fisheries acoustic surveys, the ROV *Holland I* was placed on-board the *ILV Granuaile* to collect high definition video footage and geological samples for a deepwater expedition led by Professor Andrew Wheeler, UCC. The 15-day survey commenced from Galway in mid-June and sailed to parts of the Porcupine Bank Canyon (upper northern and middle southern) to investigate unexplored sections of the new cold-water coral habitats.

Investigations also took place at the adjoining canyon where the Hedge Mounds suggested more coral habitats exist. The survey also involved using two new instruments on the ROV *Holland I* including a rock drill and a vibrocorer. ROV video footage objectives were achieved and exceeded, with the ROV spending up to 79 hours on the bottom. Thirteen vibrocore samples were collected with a maximum core length of 1.09 metres from the cold water coral carbonate mounds and associated sediments along the canyon lip and slope. Two cliff face rock drills were completed also using the ROV *Holland I*. The *ILV Granuaile* returned to Galway on the 29th June for Seafest with the ROV *Holland I* on display on the aft deck during the three-day outreach event.

The proceeding ROV survey SeaRover commenced at the start

of the July and was a Marine Institute-led deepwater geogenic reef survey off the west coast. The survey was a collaboration with the National Park and Wildlife Services (NPWS). High definition video footage was carried out at fifty sites with sampling taking place at the vast majority of those stations also.

### Foreign Vessel Observer Scheme

Thirty-three foreign vessel marine research surveys were conducted in Irish waters in 2017. The Northern Irish RV *Corystes* which has blanket approval to operate in Irish waters, accounted for 15 of these surveys. Of the remaining 18 surveys, 10 were UK vessels and the rest were French (1), Norwegian (2), Spanish (1), Dutch (3), and German (1). The Marine Institute placed nine Irish observers, mostly recent marine science graduates, on foreign vessel surveys, totalling 171 days at sea.

### Advanced Mapping Services

The Advanced Mapping Services (AMS) team provided survey coordination, operational, data, research and development, along with advisory support, both internally within the Marine Institute, and for industry, government and public stakeholders, in Ireland, and internationally.

The strategic approach developed by AMS for the DCCAE-funded INFOMAR offshore mapping activities and progress monitoring has been further developed in partnership with Geological Survey Ireland, and is now being adopted for inshore and coastal operations. Progress reporting across the operational, data, and valued-added stands of INFOMAR has been improved and expanded, and will give greater transparency of programme outputs to potential beneficiaries. In particular, national monitoring, management, planning requirements and priorities can better align with INFOMAR plans, activities and outputs.

As part of INFOMAR's Value-Added Exploitation programme the team coordinated and supported research, training, education, outreach and SME R&D activities. Significant progress was also made in developing programme data accessibility, with new charting and data interfaces developed to streamline and simplify download or direct online analysis. Core INFOMAR survey operations involved acquiring 13,182km of multibeam data and mapping over 2,877 km<sup>2</sup> of seabed in the Celtic Sea during 87 allocated vessel days.

### Programme 1 – Data Acquisition, Management, and Interpretation

Operationally, AMS's core focus was to support inshore INFOMAR seabed survey activity in the Irish Sea, and offshore mapping in the Celtic Sea. Multibeam survey data were also acquired in support of the Coast Guard and Air Accident Investigation Unit, to assist with the search and rescue effort for *R116* off the Mayo coast. Supporting national monitoring and fisheries management requirements and a significant ROV reef habitat mapping programme *SeaRover*, were coordinated and carried out along the western continental shelf margin. Funded by EMFF and NPWS, it was carried out in collaboration with GSI, and the Institute's FEAS and research vessel operations teams

and NPWS, with additional support from Plymouth University and AQUAFAC International Services Ltd. Innovatively, remote office-based mapping support was successfully trialled in 2017, facilitating a transatlantic seabed survey transect, as well as multibeam acquisition on the SW shelf margin and submarine canyon, in support of an SFI funded NUI Galway-lead research initiative.

### Programme 2 – Data Integration and Exchange

- 85 per cent of 2017 INFOMAR bathymetry data acquired on board the RV *Celtic Explorer* and the RV *Celtic Voyager* were fully processed, with the remainder due to be completed in Q1 2018.
- Production of the chart templates for the 1:100,000 scale series of INFOMAR charts for the full extent of Irish coastal waters has been completed, and the content will be populated as further data are acquired.
- INSPIRE digital bathymetric contours have been generated and can now be downloaded through the INFOMAR IWDDS (Web Download Service).
- INFOMAR Tile Services have been developed and are now accessible via Digital Ocean for developers to ingest as base maps. These rapid web accessible tiles display shaded relief bathymetry with contours. Backscatter tiles are also currently in development to provide indicative seabed hardness information.
- Content has been populated in a newly-developed map interface prototype for shipwreck inventory access and 3D visualisation.
- Habitat mapping data are being collated from multiple sources, and seabed classification and habitat maps are being developed to contribute to INFOMAR, EMODnet, OSPAR, MSFD and Habitats Directive reporting.
- An online GIS-based Survey Planning Tool has been further developed for INFOMAR field survey planning, incorporating multiple datasets required to assist with logistics and effort prioritisation.

### Programme 3 – Value Added Exploitation

Advanced Mapping Services have been engaged in and supporting significant international and Irish research collaboration, while also providing education, training and capacity build support. By participating in the Atlantic Seabed Mapping International working group and international seabed and habitat mapping-related initiatives, Ireland's key role in seabed mapping and associated technology is acknowledged and communicated. Associated further opportunities are anticipated to arise.

- Two Stage 1 competitive research project proposals were contributed to under INTERREG VA and Ireland Wales Co-operation Programme (MarPAMM, e-INSIST). One Horizon 2020 project proposal is currently in draft and due for submission Q1 2018. Programme work on the DG MARE ProAtlantic and EMODnet Seabed Habitats projects is ongoing, with significant data compilation activities achieved in 2017.
- Researchers and students from Universities of New Hampshire and Charleston, USA, and from Ireland's GMIT coordinated SMART Sea School training programme were hosted on INFOMAR surveys. DIT GIS Masters students from the Omani Hydrographic office were hosted for

office-based work placements, and training was provided to transition year students during Transition Year week. Introductory presentations were given to science and engineering students in Institute of Technology Sligo, Institute of Technology Waterford and Institute of Technology Tralee, as well as Queens University Belfast.

- Extensive networking and public outreach events and activities were supported, including exhibits at the BT Young Scientist and Technology Exhibition, SeaFest 2017, and the Galway Science and Technology Festival's hosting of international mapping experts including the Director of NOAA's Office of Coast Survey, and presentations at various conferences and workshops, including the International Cold Water Corals Conference.

## Oceanographic Services

A key activity for the oceanographic services team, in collaboration with colleagues in information services & development team and MEFS, was the successful completion of the GO-SHIP A02 survey from St John's Nova Scotia to Galway. The Global Ocean Ship-based Hydrographic Investigations Programme (GO-SHIP) aims to document the changes in inventories of heat, freshwater, carbon, oxygen, nutrients and transient tracers, covering the ocean basins from coast to coast or coast to ice, and sampling to the full ocean depth. It was the first time a small nation had led such a survey, which are expensive, logistically demanding and require teams of highly-trained personnel and specialised equipment. By bringing together an international collaboration of expertise, resources and funding, in the spirit of the Galway Statement, Ireland ensured a highly successful outcome and raised its visibility among the ocean observing community.

The oceanographic services team further built on observing efforts through active membership of both the European Multidisciplinary Seafloor and Water Column (EMSO) and Euro-Argo European Research Infrastructure Consortia (ERICs). In November, Ireland took the vice chair of the Euro-Argo Management Board and the team successfully deployed three floats and procured Ireland's first biogeochemical Argo float offering the Irish research community new opportunities for data collection and analysis. A demonstration Argo float, together with the recently refurbished Glider, proved to be very popular exhibits during SeaFest 2017. Both the EMSO and Euro-Argo ERICs have also allowed the Marine Institute to leverage funding through the H2020 programme.

The ocean energy team managed the test and demonstration facilities at the quarter-scale ocean energy test site in Galway Bay while the foreshore lease application process continued along with providing continued operational services at the Belmullet and Westwave ocean energy test sites under a revised Service Level Agreement with the Sustainable Energy Authority of Ireland.

A new 35-year lease for the Galway Bay Marine and Renewable Energy Test Site was granted on December 15th 2017 and will allow for resumption of activities in spring 2018 with many interested developers eager to deploy.

The Cabled Observatory continued to provide a wealth of data with screens installed in key public sites such as the Galway Museum and Galway Atlantaquaria, providing the opportunity to see near-shore ocean observing in action. The Cabled Observatory further provides a platform for a varied range of research projects and

facilitates environmental monitoring, and will shortly be officially recognised as an EMSO ERIC Regional Node. Plans are underway to ensure that the major potential of the observatory will be further exploited during 2017.

The modelling team continues to grow in response to increasing requirement for their services. These include delivering Copernicus Marine Environment Monitoring Service (CMEMS) for the Ireland-Biscay-Iberia region as part of the Ireland-Biscay-Iberia Marine Forecasting Centre (IBI-MFC) consortium. The Marine Institute is responsible for delivering the biogeochemical marine forecasting service. The team continue to provide freely available regular ocean, wave and storm surge forecasts and hindcasts to end users in the Marine Institute and beyond. They further continue to support and develop the service for the Galway Bay inter-agency Search & Rescue initiative, and provide ongoing advice and knowledge to An Garda Síochána, including the newly established National Missing Persons Investigation Bureau.

Work continued apace on the many existing EU-funded programmes including AtlantOS (Optimising and Enhancing the Integrated Atlantic Ocean Observing Systems); COOP+ (Cooperation of Research Infrastructures to address global challenges in the environmental field) EMSOdev (European Multidisciplinary Seafloor Observatory); JERICO-Next (Towards a joint European research infrastructure network for coastal observatories) and the European Marine Observation and Data Network (EMODnet) ProAtlantic sea-basin checkpoints.

As a result of this high quality delivery of EU-funded programmes, the entire oceanographic services team had a very successful year in securing new EU project funding. The modelling team will be contributing to three new INTERREG Atlantic Area projects (CleanAtlantic, iFADO, MyCoast) and the INTERREG VA project, COMPASS. Other new infrastructure projects included the H2020 EMSO-LINK and Maritec-X and the JPI Climate ERA4CS CoCliME project, coordinated by the Marine Institute, kicked off in September. The OS team are further supporting the MEFSS coordinated INTERREG Atlantic PRIMROSE project and the FEAS led H2020 TAPAS project.

The team remains active in the European Global Ocean Observing System (EuroGOOS), Ireland-Biscay-Iberia Regional Operational Oceanographic System (IBIROOS), North-West European Shelf Operational Oceanographic System (NOOS), and in contributing data from the Annual South Rockall Trough Ocean Climate cruise to the ICES Working Group on Oceanic Hydrography.

Throughout 2017, climate change and its impacts have become increasingly visible on the national agenda both in terms of policy and public awareness. The team continue to support DAFM towards preparation of its Marine Sectoral Adaptation plan and sits on both the Sectoral Adaptation Committee and Governance Sub-Group coordinated by the DCCAE. The Marine Institute has also been a driver of increasing efforts towards national coordination of climate-relevant activities across key departments and agencies through regular high-level and technical discussions and co-funding of climate research to address key national needs. Climate change will become an ever more important aspect of work within the oceanographic services team, and across the Institute as we move into 2018.



## Information Services and Development

The information services and development team develops and manages the ICT and data infrastructure across the Marine Institute to provide a robust operational platform. The team also continues to develop new technical capabilities and support improvements in the Marine Institute's service delivery.

In 2017 the team was very active in strategy planning and implementation, including the definition of a new IT Strategy, rollout of the Data Strategy, and input of related items into the Institute's strategy planning. The team was also active in developing the Irish Digital Ocean concept of making Ireland's marine digital assets more readily available for public services, research and innovation.

## Operational Support

The information services and development team serviced over 2,100 internal support requests covering hardware, software and data management, and carried out a range of internal training. With the increasing cyber-security threat and upcoming General Data Protection Regulation (GDPR), the team also focused on reviewing and implementing changes to deal with these changing operational requirements.

Programme support was delivered for Fisheries Data Collection, the INFOMAR and Marine Ocean Energy programmes, and the marine environment data processing and spatial analysis activities.

The team also coordinates the Marine Institute data request service, which processed 175 manual data requests in 2017, representing an increase of 28 requests on 2016.

Accessibility to Marine Institute data is increasing with more data being made available online through websites including <http://atlas.marine.ie>; <http://data.marine.ie>; and [www.oceanenergyireland.ie](http://www.oceanenergyireland.ie). These sites were visited by 44,000 users in 2017. Of particular note was the ten-fold spike in usage of [www.digitalocean.ie](http://www.digitalocean.ie) on the day ex-Hurricane Ophelia made landfall.

## Project Activity

The information services and development team were involved in a range of projects including development of new capabilities for the fish health management systems, an upgrade to the HABS website and significant server and network infrastructure upgrades.

2017 also saw development of the Irish Digital Ocean concept with new ways to access information including real-time data from the Galway Bay observatory model data for search and rescue, and advanced visualisation of data including data from the INFOMAR seabed survey programme.

A key programme was the implementation of the new Marine Institute Data Strategy to support development of data capabilities within the Institute up to 2020. This work will support new cross-organisational programmes, access to data for reuse, as well as improved data governance and management.

The team was also active in EU research projects such as the EMODNET and SeaDataCloud EU data networks, the COMPASS INTERREG project working to coordinate and improve data management and service capabilities with partners in Northern Ireland and Scotland. We continue to work with INSIGHT\_NUI Galway on the OpenGovIntelligence project that will leverage linked data technologies for oceanographic data.

# Policy, Innovation and Research Support

## Director's Statement »



Policy, Innovation and Research Support Services (PIRS) plays a key role in supporting and promoting marine research and innovation within the Marine Institute and at national and international level. Within the Institute, PIRS supports research teams from the other research-active service areas to identify upcoming research opportunities, to build strong research partnerships, to develop high-quality research funding proposals and to manage the financial and administrative reporting requirements on behalf of the Marine Institute participants.

At national level, PIRS coordinates the development of advice and input to ensure that national research strategies and policies are as aligned as possible to the goals of *Harnessing Our Ocean Wealth* and the *National Marine Research & Innovation Plan 2017-2021*. In support of this, PIRS conducts and coordinates policy analyses, science and industry foresight, and contributes to the development of strategy for the Marine Institute and nationally.

PIRS manages the Institute's external research funding programme, implements strategically aligned research and capacity-building funding calls throughout the year and manages approximately €10m capital investment under the Marine Research Measure.

PIRS also hosts or coordinates the Institute's participation at international science policy fora to maximise Ireland's international research collaboration and influence international research agendas. On behalf of the Institute, PIRS provides services to support the Irish marine and maritime research community to maximise their success in winning international research funding.

Key highlights of PIRS Service area include:

- Launch of the *National Marine Research and Innovation Strategy (2017-2021)* by Minister Michael Creed at the Our Ocean Wealth Summit in June.
- The Office of Research and Development managed €8.26m in new investments awarded in 2017 under the Marine Institute's Marine Research Programme.
- In November, Minister Creed announced funding awards of €2.5m for specialist research equipment and small infrastructure to fourteen Higher Education Institutes and five SMEs.
- Irish marine researchers were awarded just under €7m in *Horizon 2020* funding.

Further progress and achievements are outlined in more detail below. Having taken up the position of Director of PIRS in August 2017, I also pay tribute to my predecessor, Mr John Evans, who stepped down in July. Mr Evans led the PIRS team in realising many of the successes outlined here, and leaves a strong legacy of achievement from his many years with the Marine Institute. I wish him every success in the future and look forward to building on his work and the excellent work of my PIRS colleagues in 2018 and beyond.

**Mr Niall McDonough**

Director: Policy, Innovation and Research Support

## Policy Support

One of the key priorities for PIRS was finalisation and approval by government of the *National Marine Research and Innovation Strategy (2017-2021)*, identified as a key enabling action in Ireland's integrated marine plan, *Harnessing Our Ocean Wealth*. Following a review of feedback received through a public consultation in December 2016, the Strategy was finalised and published by Minister Creed during the Our Ocean Wealth Summit in June. The strategy provides a framework for research funders to assess the impact and likely return to the State from research investment in marine-related research themes. It is also designed to ensure that State support of marine research results in Irish researchers being able to compete at international level and participate fully in transnational research projects.

Fifteen broad research themes including Energy, Transport, Biodiversity and Bioresources are covered in the Strategy. Each of these was the subject of a detailed review of the research capability in Ireland, and the steps required to raise this to meet research requirements of national strategies such as *Food Harvest 2025* and the Energy White Paper, *Ireland's Transition to a Low Carbon Energy Future 2015-2030*. This approach was taken to ensure that the Strategy is focused on applied and demand-led research, while recognising the importance of a fully functional marine research system that extends from basic research through applied research, to translational use of research outputs.

In 2017, PIRS continued to provide services to the Marine Coordination Group's Bureau. This included supporting the annual Our Ocean Wealth Summit held at NUI Galway as part of the SeaFest 2017 programme of events. Also coinciding with the Summit, PIRS assisted in the publication of the *Harnessing Our Ocean Wealth Annual Review of Progress*. PIRS also supported implementation of the Integrated Maritime Policy (IMP) in Ireland through hosting and maintaining a dedicated website and social media platform. PIRS also works with service groups within the Institute. PIRS also supported DAFM and colleagues on work programmes under the EMFF 'Union Priority 6 – Fostering the Implementation of IMP' in blue growth and maritime spatial planning.

PIRS contributed actively to several national research policy discussions. A key avenue for this is participation in the Innovation 2020 Group, hosted by the Department of Business, Enterprise and Innovation (DBEI). In 2017, DBEI undertook a detailed process to refresh the 2012 National Research Prioritisation exercise. On behalf of the Marine Institute, PIRS contributed at multiple stages of the process to ensure that key innovation goals set out in *Our Ocean Wealth* and the *National Marine Research and Innovation Strategy* were embedded in the new prioritisation framework. The final version will be delivered by government in early 2018.

PIRS continued to fund and work with the Socio-Economic Marine Research Unit (SEMURU) in NUI Galway on the ongoing collection and analysis of economic data aimed at valuing Ireland's ocean economy. SEMURU research provides the Marine Institute and policy-makers with trends across 13 marine

sectors. The outputs of the research shows that over the period 2014 to 2016, Ireland's ocean economy experienced a 23 per cent increase in turnover, 20 per cent increase in gross value added (GVA) and 10 per cent increase in employment.

## Office of Research and Development

The Office of Research and Development managed €8.26m in new investments awarded in 2017 under the Marine Institute's Marine Research Programme: €2.68m for ship-time on the research vessels and remotely operated vehicle (ROV) and €5.58 on new research projects (full details are provided in Appendix 1).

The ship-time investment funded the research vessels and the ROV for multi-disciplinary marine research and student training in Irish waters and beyond. Under the programme, 68 days were supported for research, 98 days for policy support and 57 days were provided for training on-board the RV *Celtic Explorer* and the RV *Celtic Voyager*.

Co-funded programmes with SFI and EPA/Met Éireann were undertaken through investments of €0.9m and €0.1m respectively. The SFI programme provides a springboard for principal investigators to leverage further funding through Horizon 2020 and future rounds of national funding. The EPA/Met Éireann co-funded project on Ireland's climate status will feed into Ireland's Climate Change Mitigation Plan. The Marine Institute also participated in calls under EU Horizon 2020 ERA-NETs for MarTERA and BioDiversa. These calls will be funded in 2018.

A funding call to support investment in Specialist Marine Research Equipment was launched in May. This call was designed to target a gap in marine research equipment and small infrastructure funding that exists between supports available to Higher Education Institutes via HEA capital grants, and large scale infrastructure from SFI and Enterprise Ireland. The call was very well subscribed with 41 proposals received. Fourteen HEI-led and five Industry-led projects were funded to a value of €1.97m and €0.57m, respectively.

A call postponed from 2016 on Ocean Law and Marine Governance was also launched in 2017. The award was won by researchers from UCC, and the successful project will build essential capacity in Ireland in this research area. The total value of this investment over four years will be €0.8m.

The Institute funded four Cullen Fellowships in 2017, bringing the total number of fellows in the programme to 22. The Cullen Fellows were hosted for a networking and presentation day in November, where new and existing fellows had the opportunity to discuss their research through presentations, networking and poster displays.

The Networking awards were also very successful by funding 81 researchers and nine conferences. The total cost of the 2017 programme was €0.1m.

The final report for the NutraMara project on Marine Functional Foods was also published. This project received total funding of €4.6m provided by the Institute and DAFM.

## International Programmes

In addition to the international collaborations carried out by the other services areas in the Marine Institute, PIRS takes the lead in international research coordination and policy support. This function involves representing Ireland at international research fora to ensure that Irish researchers are kept informed and involved in international initiatives and relevant research, technology, development and innovation opportunities.

In conjunction with DAFM representatives, Dr Fiona Grant is national delegate to the Programme Committee for Societal Challenge 2 of the EU Horizon 2020 Programme. In 2017 she continued to act in her role as national contact point for marine aspects of Horizon 2020 funding. Other representation provided by PIRS included the European Marine Board; EurOcean and the Intergovernmental Oceanographic Commission hosted by UNESCO and the Management Board of the Joint Programming Initiative on Healthy and Productive Seas and Oceans (JPI Oceans). The Institute also hosted the European Marine Board Autumn plenary meeting in Galway in October, attended by forty-two delegates from across Europe.

October also saw the launch of the last and largest phase of funding under the Horizon 2020 programme (covering the period 2018-2020). PIRS organised a dedicated marine funding information event in December to promote open Horizon 2020 calls. A total of sixty-one registrations covered a cross section of participants from the HEIs, research centres, SMEs and public bodies. The event included a session by AquaTT on how to approach Horizon 2020 funding, and a dedicated session on opportunities for SMEs was led by Enterprise Ireland. Roadshow events were co-hosted in the Higher Education Institutes with Societal Challenge 5 - National Contact Points (NCP), and in Northern Ireland with Inter-trade Ireland.

SeaFest2017 saw the official launch of New Connections III - A Directory of Ireland's International Marine Research Projects 2014-2016. Since 2014, 41 Irish marine research centres have successfully partnered in 77 marine-related projects worth over €400 million, bringing a minimum of €29.7 million in EU grant-aid to Ireland through Horizon 2020, INTERREG, Life+ and Erasmus+ instruments. This illustrates a very vibrant participation by Irish marine research institutes and knowledge-based SMEs in European co-funded programmes.

2017 alone saw a significant number of strategic awards across the range of Horizon 2020 funding instruments, marking continued success by the marine research community in Ireland. Under the Blue Growth calls, the SOPHIE (Seas, Oceans and Public Health in Europe) project was approved, bringing funding of €293,463 to NUI Galway – one of eight partners in the project. AquaTT was successful in an Innovation Action entitled SEAFODTOMORROW - nutritious, safe and sustainable seafood for consumers of tomorrow - with a funding award of €329,919. These represent a 15.4 per cent success rate in this part of the programme, with Ireland taking 1.5 per cent of the total EC contribution available. The figures exceed the *juste retour* target of 1.2 per cent of the allocated Horizon 2020 budget.

In the 2017 Sustainable Food Security topics, Irish researchers were very successful in the highly competitive two-stage call on aquaculture (Promoting and supporting the eco-intensification of aquaculture production systems). The top ranked project, GAIN (Green Aquaculture Intensification in Europe), has participants from IBM Ireland (€599,000) and Longline Environmental (€580,000). The Institute and Tyndall are participating in the second-ranked project (IMPAQT - Intelligent management system for integrated multi-trophic aquaculture) with EU contributions of €460,390 and €412,925 respectively.

Under the Research Infrastructures starter communities, UL and the Institute were successful in EU Marine Robotics with awards of €252,345 and €339,911 respectively. The Marine Institute and SmartBay Ireland participated in MaRITeC-X (Marine and Maritime Research, Innovation, Technology Centre of Excellence), which has been funded under the *Spreading excellence and widening participation* programme. The awards totalled €65,346 and €28,408, respectively.

Under the SME Instrument, Resolute Marine Ltd, was awarded a Phase 1 project (€50,000) to demonstrate the economic feasibility of a wave-powered desalination system. A significant Phase 2 project for Design Pro, County Limerick, was also funded to investigate a range of economically viable, innovative and proven HydroKinetic turbines that would enable users to exploit the potential of clean, predictable energy in the world's rivers, canals and estuaries. The total award was €1,934,657. In December, Éire Composites and WIDa announced the award of a €1,650,000 Phase 2 SME Instrument Project for marine composites development. Based on this assessment, the total awards for all Irish marine-related Horizon 2020 funded projects in 2017 was €6,996,364.

## Atlantic Ocean Research Alliance Coordination & Support Action

In 2017, the AORA CSA focussed on helping to define the specific research areas for trilateral cooperation and communicating these efforts across Canada, EU, USA and beyond. January and February saw meetings of the AORA Ecosystem Approach to Ocean Health and Stressors Working Group in Iceland, and the AORA Seabed Mapping Working Group (ASMIWG) in the U.S. In March, the third meeting of the AORA-CSA's High-Level Advisory Board took place in Brussels at the offices of the Irish Permanent Representation to the EU. An update on Galway Statement-tagged Horizon 2020 projects was presented by speakers from ATLAS and SponGES. South Africa and Brazil advised the Atlantic Ocean Research Alliance on the progress being made to develop a South Atlantic Cooperation, and the imminent Belém Statement on South Atlantic Cooperation. In early April, the Galway Statement Implementation Committee met at the US State Department in Washington DC.

In April, the RV *Celtic Explorer* undertook another AORA Atlantic survey transect (TRASNA 2017), demonstrating its commitment to the Galway Statement Atlantic Cooperation and the Atlantic Ocean Research Alliance (AORA). This now brings the number of transects conducted to support the Galway Statement to six, and is the third trans-Atlantic seabed mapping transit for the RV *Celtic Explorer*. Dr Margot Cronin of the Marine Institute participated in the cruise as a member of the international scientific team.

In early June, the AORA-CSA held a highly successful exhibition at the first UN Ocean Conference towards Implementing Sustainable Development Goal 14 in New York, and also assisted with some Horizon 2020 Galway Statement-tagged project side events. The purpose of the visit was to highlight to the wider international community the approach taken by the North Atlantic countries via the Galway Statement on Atlantic Cooperation to help understand our shared resource, the Atlantic Ocean.

In July, the AORA-CSA was invited to participate in a high-level conference in Belém, Portugal, on the eve of the Belém Statement on South Atlantic Cooperation signed between the European Union, Brazil and South Africa. The Belém Statement provides a platform for intensifying EU, Brazil and South African scientific cooperation in areas including climate variability and ecosystem approaches; food security; fisheries management; aquaculture and biodiversity; the effects of emerging pollutants; ocean observation; forecasting and monitoring processes and systems; oceans technology and polar research. EU cooperation in the Atlantic now extends from pole to pole and coast to coast.

In October, the AORA-CSA was invited to attend the Our Ocean Conference 2017 in Malta hosted by EU Commissioner, Karmenu Vella. At this conference, Ireland announced over €6 million in funding in the area of marine research; €4 million of which is directed towards research vessel ship-time (2018-2021) and focuses on activities agreed under the Atlantic Ocean Research Alliance as part of the implementation of the Galway Statement, notably for seabed mapping and ocean observation.

Further meetings of the AORA working groups were held in the latter part of 2017 including the 8th meeting of the AORA Seabed Mapping WG in Halifax, Nova Scotia, Canada (October) and the AORA Seabed Mapping WG Workshop in Bergen, Norway (November). In December, the AORA-CSA WP Leaders meeting in Brussels afforded an opportunity for the European Commission DG Research & Innovation to catch up with the coordination and support action and lay out their needs in terms of progressing the Atlantic Cooperation in 2018. The year 2018 is a significant year as it marks five years since the Galway Statement was signed.

# General Administration

## Audit Risk Committee »

### Membership

During the year ended 31 December 2017, the Audit and Risk Committee (ARC) comprised the following non-executive members of the Board: Patricia Barker, David Owens, Donal Kelly and Dermot Clohessey.

### Meetings

Eight meetings were held during 2017 and member attendance was as follows:

Date	Patricia Barker	Dermot Clohessey	Donal Kelly*	David Owens
January 31	✓	✓	✓	✓
February 28	✓	✓	✓	✓
March 28 *	✓			
April 25	✓	✓	✓	✓
May 30	✓	✓	✓	✓
September 26	✓	✓	✓	✓
November 7	✓	✓	✓	✓
December 5	✓	✓	✓	✓

\*The March 28th meeting was a pre-Audit planning meeting with the external auditors and did not require a quorum.

### The Role of the Audit and Risk Committee

The role of ARC is to oversee and advise the Marine Institute board and the Chief Executive Officer on matters relating to:

- » Financial, operating and governance risks, including overall risk management
- » Effectiveness of the internal controls and risk management
- » Effectiveness of internal audit function
- » Communication with the Comptroller and Auditor General
- » Matters raised by the Internal Auditor
- » The adequacy of governance procedures, and
- » Value for money issues.

While audit and risk committees in general have a duty to appoint and monitor the work of, and receive reports from, the External Auditor, the Marine Institute is audited by the Comptroller and Auditor General. The main duties of the ARC in exercising oversight of the relationship with the external auditor, includes meeting with the Comptroller and Auditor

General on two occasions, in advance of the commencement of the audit and following completion of the audit, to discuss the management letter.

The Committee also monitored the integrity of the financial statements prepared by the Institute.

### Areas identified for focus during 2017

In addition to completing the work related to the roles outlined above, the ARC focussed on the following areas:

- Policies and procedures to implement the Code of Practice for the Governance of State Bodies, 2016. By December, the ARC was satisfied that the Marine Institute was fully compliant with the Code.
- An external, independent consultant undertook a performance review on the work of ARC. This included an examination of the work and documentation of the committee; interviews with all the members and with other board members; attendance at a full meeting of ARC and comparison with best practice in the area. In general, the outcome of this review was satisfactory, and the findings were presented to the board. All recommendations were accepted by ARC and will be implemented.
- Kept under review the effectiveness of the Institute's internal controls (and oversaw the introduction of a framework to assess internal controls, using the COSO model) and risk management systems.
- Monitored the Risk Management System and the movement of risks on the register. In this regard, we also oversaw the implementation of the Business Continuity Plan.
- Engaged with the internal auditor to discuss the work programme and the outcomes of the internal audits, and assessed our reliance on the conclusions of the internal auditor.
- Conducted an Internal Audit Performance Review and made recommendations to the board.
- Engaged with the CFO and CEO to assure ourselves of the accounting judgements applied to the financial statements.
- Oversaw the new Policy on fraud.
- Continued monitoring work done by the senior management team on Cyber Security.
- Monitored the preparation for GDPR and the concomitant risk management.

### Terms of Reference

Terms of reference of the Audit and Risk Committee have been approved by the board and are reviewed on an annual basis and amended as appropriate. In particular during 2017, they were amended to take account of the Code of Practice for the Governance of State Bodies.

### Conflicts of Interest

At each of its meetings, ARC considers the possibility of conflicts of interest arising in relation to its agenda and such conflicts were dealt with in accordance with the board's policy.

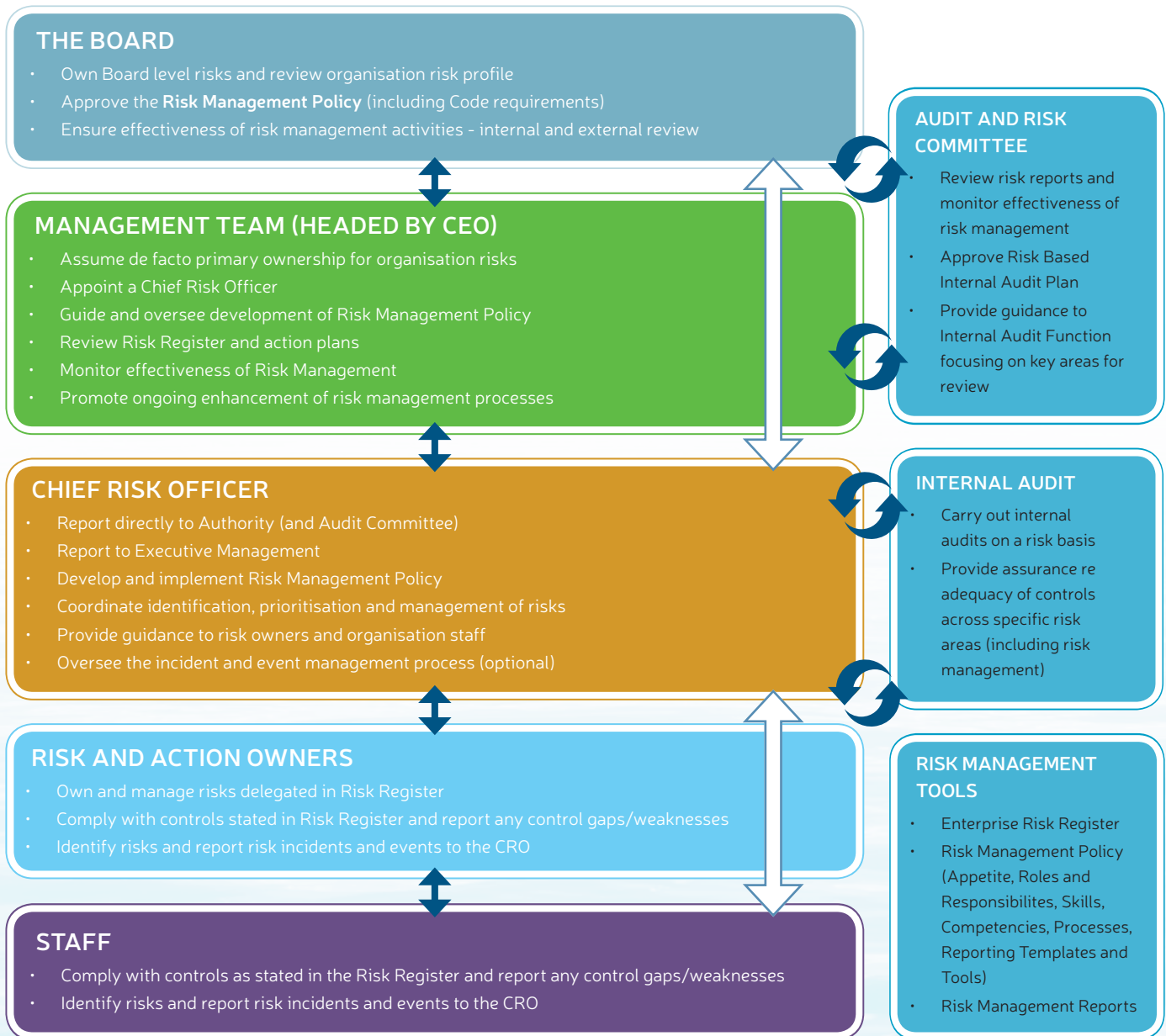
Having considered all relationships between the Marine Institute and the internal audit firm, the ARC does not consider that these relationships impair the auditor's judgement or independence.

## Risk Management Report »

The Board of the Marine Institute has established and maintains a robust risk management framework that supports the ongoing management of risk in accordance with the established risk appetite and corporate strategy. The risk framework addresses all the requirements of the Code of Practice for the Governance of State Bodies (2016) and is a practical process for the formal management of organisational risks.

The risk policy, which is reviewed annually by the Board, sets out the organisations risk management objectives; the organisations risk appetite; and the risk management framework which details the roles and responsibilities of staff and Board members, and the process for identifying, categorising and escalating risk.

### Marine Institute Risk Management Framework



A Risk Register is in place which identifies the key risks facing the Marine Institute and details the controls and actions needed to mitigate risks and assigns responsibility for operation of controls to specific risk owners. The Risk Register is reviewed and updated by the joint Risk Officers quarterly, and reported to both the Audit and Risk Committee and the Board.

The Marine Institute confirms that it has carried out an assessment of the organisation's risks and the following principal risks were identified:

Risk	Mitigations
Maintaining the trust and confidence of the Department of Agriculture, Food and the Marine (DAFM), other Government Departments and State Agencies, clients, key stakeholders, local communities, and the general public.	<p>Implementation of the Marine Institute's Strategy 2018-2022 <i>Building Ocean Knowledge. Delivering Ocean Services</i>;</p> <p>Implementation and reporting on an Oversight and Performance Delivery Agreement with DAFM;</p> <p>Service Level Agreements with State Agencies</p>
Risk of failure or loss of significant infrastructure including vessels, facilities and equipment deployed at sea.	<p>Implementation of maintenance and safety policies and procedures, adhering to ISM codes for the vessels;</p> <p>A Health, Safety, Environment, &amp; Quality plan is in place. In the event of a total loss the high value items are covered by insurance;</p> <p>Training for seafarers including sea survival training;</p> <p>Business Contingency Plans are in place to access alternate research vessels and laboratories</p>
Adequate security controls and procedures in place to protect against cyber-attacks and loss of functionality and protection of data.	<p>Implementation of ICT data and security policies and procedures;</p> <p>Investment in training for staff and continuous updating of security defences;</p> <p>Implementation of IT disaster recovery plans for the Marine Institute as part of overall business continuity planning</p>

## Board Strategy Sub-Group »

In 2017 a board sub-group comprising of Mr Lorcán Ó Cinnéide, Mr Dermot Clohessy and Prof Alan Dobson worked closely with the Executive in the development of a strategic plan for the period 2018 – 2022. This work was undertaken with the engagement of staff and key stakeholders with the intention to have a draft strategic plan submitted for ministerial approval in Quarter 1 2018.

## Liaison »

The programme of the Marine Institute covers a wide range of activities that require close liaison and cooperation with many individuals and organisations. These include the Department of Agriculture, Food and the Marine; the Department of Finance; Department of Housing, Planning, Community and Local Government; Department of Transport, Tourism and Sport, as well as other government departments and State agencies, private enterprise and the higher education sector. The Institute acknowledges the continued support and cooperation of all concerned.

## Health and Safety »

In accordance with the Health and Safety and Welfare Act (1989), the Marine Institute has up-dated all Health and Safety Statements. The Institute continues to implement appropriate measures to protect the safety and health of all employees and visitors to its premises.

## Ethics and Public Office Act »

All persons holding a designated position within the Marine Institute complied with the requirements of the Public Office Commission in accordance with sections 18 and 20 of the Ethics in Public Office Act, 1995.

## Employment Equality »

The Marine Institute is committed to a policy of equal opportunity and adopts a proactive approach to equality. The Institute operates a number of schemes that provide staff with options in relation to meeting their career and personal needs, such as job sharing, study leave and educational programmes.

## Code of Practice (Reporting) »

The Marine Institute adheres to the statutory Codes of Practice for Governance of State Bodies as laid down by the Department of Finance. The Institute can confirm that Directors and employees have adopted and are trained on:

- » Formal code of conduct on conflict of interest and customer charter
- » Properly constituted audit committees
- » Procurement procedures
- » Sensitive Issues.



## Energy Efficiency Reporting by Public Sector Bodies (S.I. 542 of 2009) »

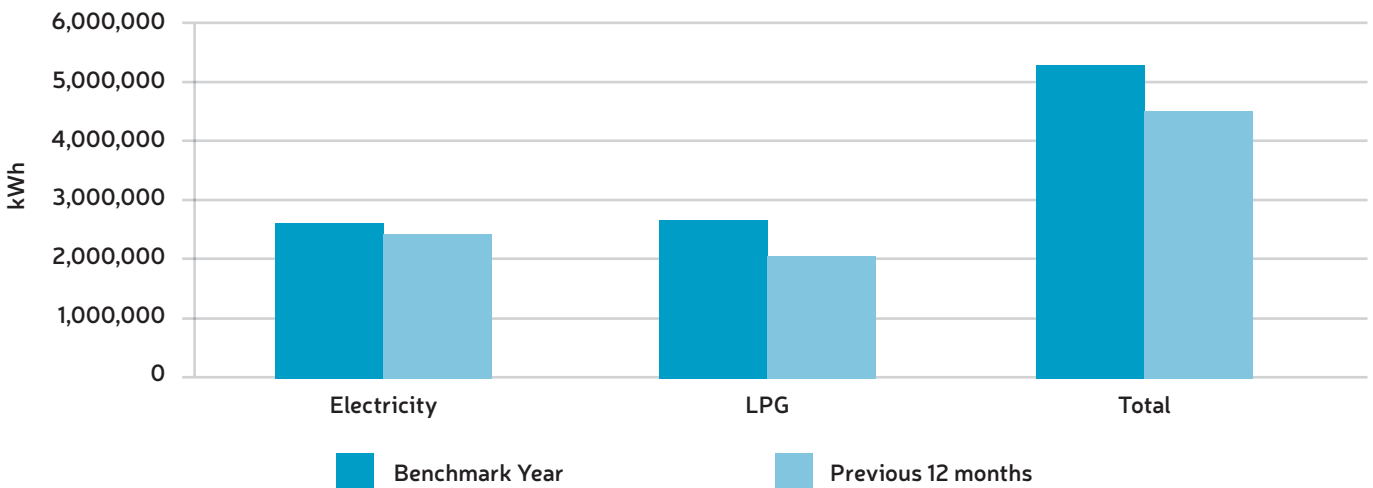
The energy consumed by the Institute can be divided into two main users: 75 per cent by the research vessels the RV *Celtic Explorer* and the RV *Celtic Voyager* and 25 per cent by buildings, primarily the headquarter office and laboratory facility in Oranmore. To date, the Institute has concentrated on reducing energy consumption within the buildings through operational and behavioural changes. Opportunities to reduce the consumption by the research vessels will be the predominant focus of 2018/19, alongside installation of retrofit projects within the plant room, IT server room and laboratories.

The Get Greener Energy team was very active in 2017. The following activities were undertaken with the assistance of the OPW Optimising Power @ Work Energy Advisor and the Institute's Scientific and Facilities:

- » Completed three-out-of-hours office audits
- » Completed detailed energy audits of all 54 laboratories

- » Installed timers on key equipment in coffee docks, main kitchen and some laboratory equipment
- » Replaced car park lighting with LEDs
- » Completed a review of Fume Cupboards (FCs) and vented chemical storage requirements in all laboratories
- » Reduced face velocity on all FCs in laboratories
- » Completed a review of temperature settings and use of air conditioning in laboratories
- » Completed a review of air flow in laboratories during FC off times
- » Ran a month long 'Switch off' campaign for monitors, PCs and laptops
- » Introduced Bank Holiday 'Switch off' in line with OPW Optimising Power @ Work Campaign
- » Set up intranet page for details on the campaign and useful links for energy saving ideas
- » Provided energy awareness content for electronic information display board within Oranmore Head Quarters.

Achievements to date have seen a reduction in the overall energy consumed in the buildings by 14.2 per cent (December 2017).



Description	Electricity	LPG	Total
Benchmark Year	2,599,985	2,675,075	5,275,060
Previous 12 Months	2,455,911	2,069,656	4,525,647
% Difference	-5.5%	-22.6%	-14.2%

In 2017 the Marine Institute consumed:

- » 2,678,307 kWh of electricity
- » 20,000 litres of Kerosene
- » 294,068 litres of bulk propane gas for heating
- » 6,795 litres of road diesel
- » 1,786,942 litres of Marine gasoil for Marine Institute-funded research surveys.

Energy Performance Indicator is 7.6 per cent better than 2016 and 26.8 per cent better than baseline of 2009. A full audit and overview of the operational strategies and procedures of the vessels will be undertaken and in turn will provide a Register of Opportunities.

## Update of Scéim Gaeilge 2017 »

Grúpa Gaeilge was established to prepare the Marine Institute's Irish Language Scheme/Scéim Foras na Mara under Section 11 of the Official Languages Act 2003. The second phase of the scheme was overseen by the Grúpa Gaeilge and remains in force until the end of 2017. This builds on the extensive efforts to implement the requirements under the Act that were brought about under the first period following identification of areas for enhancement of Irish language services by the Institute.

The Irish Language Commissioners carried out monitoring of year one of the second period of the scheme (2015-2016) which included a visit by the Commissioners to the Marine Institute in Oranmore. The Commissioners' evaluation of the process to date was that the scheme was being implemented satisfactorily, and provided a series of recommendations. Grúpa Gaeilge reviewed the implementation of these recommendations, updated the Institute web pages and made arrangements to celebrate Seachtain na Gaeilge. This included Irish-speaking coffee mornings, the presentation of Irish language themed videos, the organisation of Irish language and the production of an Irish language handbook for staff as well as other web-based activities.

The second period maintained the Marine Institute's commitment to continually assess, the level of demand for services through Irish, and to ensure that the Institute continues to meet this demand in a planned, coherent and accessible way. Under the third scheme which is due to start in 2018, the Marine Institute will continue to gauge the level of demand for its services in the Irish language by carrying out regular audits. This will include a system of tabulating the level of queries and requests for services through Irish in a given period, documenting and promoting awareness among staff and clients as to which services the Institute should provide in Irish.

# APPENDIX 1:

## MARINE RESEARCH PROGRAMME 2014 – 2020

### SHIP-TIME PROGRAMME AWARDS 2017

Research Theme	Project Type	Project Reference	Project Title	Grantee / Lead	Total Grant-Aid
Ocean Literacy and Education	Dedicated Training Programme	CV17002/ CV17006/ CV15028 CV17009	National Maritime College of Ireland Training	National Maritime College of Ireland	€32,000
Ocean Literacy and Education	Dedicated Training Programme	CV17028	SMART NUI Galway BSc Marine Science and BSc Earth and Ocean Science	Galway-Mayo Institute of Technology	€80,000
Ocean Literacy and Education	Dedicated Training Programme	CV17004	SMART UCC Ocean Energy	Galway-Mayo Institute of Technology	€8,000
Ocean Literacy and Education	Dedicated Training Programme	CV17032	SMART Science at Sea: Multidisciplinary Ship-Based Training for Students of Marine-Related Sciences	Galway-Mayo Institute of Technology	€32,000
Ocean Literacy and Education	Dedicated Training Programme	CV17010	Undergraduate Shipboard Training in Methods of Oceanographic, Benthic, Megafauna and Fisheries Research	Galway-Mayo Institute of Technology	€64,000
Ocean Literacy and Education	Dedicated Training Programme	CV17030	UCC MSc Marine Biology Training	University College Cork	€24,000
Ocean Literacy and Education	Dedicated Training Programme	CV17025	NUI Galway Bay Postgraduate Training	University of Ireland, Galway	€32,000
Ocean Literacy and Education	Dedicated Training Programme	CV17003	SMART NUI Galway SEMRU	Galway-Mayo Institute of Technology	€8,000
Ocean Literacy and Education	Dedicated Training Programme	CV17012	SMART UU BSc Marine Science	Galway-Mayo Institute of Technology	€16,000
Ocean Literacy and Education	Dedicated Training Programme	CV17031	SMART Blue Energy Skills Training	Galway-Mayo Institute of Technology	€48,000
Ocean Literacy and Education	Dedicated Training Programme	CV17005/ CV17029	SMART UCC BSc Geoscience	Galway-Mayo Institute of Technology	€32,000
Ocean Literacy and Education	Dedicated Training Programme	CV17007	SMART UCC MSc Exploration Field Geology	Galway-Mayo Institute of Technology	€16,000
Ocean Literacy and Education	Dedicated Training Programme	CV17026	Multidisciplinary Survey Planning - A Peer Assisted Learning Exercise Led by Postgraduate Students	Galway-Mayo Institute of Technology	€64,000

Climate Change	Policy Support Survey	CE17002	Ocean Climate Section: West of Ireland	Marine Institute	€216,000
Bioresources: Wild Resources	Policy Support Survey	CE17003/ CE17005	Anglerfish, Monkfish and Megrin Survey	Marine Institute	€302,400
Bioresources: Wild Resources	Policy Support Survey	CE17009	Boarfish Acoustic Survey	Marine Institute	€151,200
Climate Change	Policy Support Survey	CE17006/ CE17007	Global Ocean Ship-based Hydrographic Investigations Program (GO-SHIP) Transatlantic Basin and AORA Westbound Transect	Marine Institute	€630,000
Ocean Literacy and Education	Policy Support Survey	CE17010	SeaFest 2017: Vessel Tours Galway	Marine Institute	€96,000
Climate Change	Policy Support Survey	CV17001	Winter Environmental Survey of Irish Coastal Waters	Marine Institute	€64,000
Biodiversity, Ecosystems and Food-webs	Integrated Research Survey	CV17022	Biological Distribution of Azadinium in Irish Waters	Marine Institute	€88,000
Ocean Observation and Seabed Mapping	Integrated Research Survey	RH17002 (ROV only)	Controls of Cold-water coral Habitats in submarine Canyons (CoCoHaCa)	University College Cork	€135,000
Subsea Resources	Integrated Research Survey	CV17020	Quantifying Irish Marine Placer Resources (QuIMPeR)	University College Cork	€128,000
Subsea Resources	Integrated Research Survey	CV17013	Geophysical Exploration of the Shallow Sub-Sea	University College Cork	€96,000
Ocean Observation and Seabed Mapping	Integrated Research Survey	CV17011	<i>MARA: MAlin shelf sediment ReseArch</i>	National University of Ireland, Maynooth	€80,000
Climate Change	Integrated Research Survey	CV17038	iCRAG Biogeochemical Survey	National University of Ireland, Galway	€64,000
Pollution and Litter	Integrated Research Survey	CV17039	Microplastics in Galway Bay: an ecosystem approach to seafloor integrity	Galway-Mayo Institute of Technology	€56,000
Biodiversity, Ecosystems and Food-webs	Integrated Research Survey	CV17041	A multidisciplinary approach to studying deep diving whales and their habitat	University College Cork	€72,000
Ocean Observation and Seabed Mapping	Integrated Research Survey	CV17040	Irish Sea Palaeolandscape Investigation	Institute of Technology Sligo	€48,000
<b>TOTAL</b>					<b>€2,682,600</b>

# APPENDIX 2:

## MARINE RESEARCH PROGRAMME 2014 – 2020

### FUNDED RESEARCH PROJECTS 2017

Research Measure	Project Type	Project Reference	Project Title	Grantee / Lead	Total Grant-Aid
Climate Change	Postgraduate Fellowship	CF/17/01/01	Cullen Fellowship (PhD): Coupled wave-ocean models	University College Dublin	€70,500
Climate Change	Postgraduate Fellowship	CF/17/03/01	Cullen Fellowship (PhD): Space based observations of marine phytoplankton	National University of Ireland, Galway	€70,500
Bioresources: Wild Resources	Postgraduate Fellowship	CF/17/04/01	Cullen Fellowship (PhD): Investigating the prevalence of PMCV in farmed Atlantic salmon	University College Dublin	€73,500
Information & Spatial Technologies, Analytics and Modelling	Postgraduate Fellowship	CF/17/05/01	Cullen Fellowship (PhD): Fisheries Data Integration and Analytics	National University of Ireland, Galway	€72,000
Integrated Policy & Governance: Law	Project-Based Award	PBA/IPG/17/01	Ocean Law and Marine Governance	University College Cork	€799,522
Bioresources: High Value Products	Project-Based Award	PBA/MB/16/02	BlueShell: Exploring Shellfish By-products as sources of Blue Bioactivities	Dublin Institute of Galway	*€150,000
Bioresources: High Value Products	Project-Based Award	PBA/ME/16/03	BlueShell: Exploring Shellfish By-products as sources of Blue Bioactivities	Irish Fish Cannery	*€150,000
Climate Change	EPA Research Investigators Programme (managed by EPA)	2017-CCRP-MS.48	A Structured Evaluation of Ireland's Climate Policy Response	University College Cork	~€66,656
Ocean Observation and Seabed Mapping	SFI Investigators Programme (managed by SFI)	16/IA/4528 MI (N)	Mapping, Modelling and Monitoring Key Processes and Controls on Cold-water Coral Habitats in Submarine Canyons	University College Cork	#€348,961
Ocean Observation and Seabed Mapping	SFI Investigators Programme (managed by SFI)	16/IA/4598 MI (N)	Structure, evolution and seismic hazard of the Irish offshore: An investigation using the first broadband, ocean-bottom seismometer deployment offshore Ireland	Dublin Institute for Advanced Studies	#€533,029
Climate Change	Policy Support	N/A	Global Ocean Ship-based Hydrographic Investigations Program (GO-SHIP) Transatlantic Basin Transect	Marine Institute	€181,024
Climate Change	Tenders (for Equipment and Hardware)	Various	Ocean Observations in a Changing Climate	Marine Institute	€631,002
Bioresources: High Value Products	Tenders (for Services)	ITT17-043	Desk study on the establishment Of a National Marine Bio-Repository in the Marine Institute	Turnstone Consultants Ltd	€36,900
Various	Networking Travel Grants	NT/17/01 to NT/17/127	Hosting/Attending Marine Conferences, Workshops and Events	Various (86 awards granted in 2017)	€97,213
To be confirmed	Capacity Building (Ireland/ USA Programme)	2018/19 (managed by Fulbright Commission)	Marine Institute Fulbright Fellowship(s)	To be confirmed	€22,000

Bioresources: High Value Products	Equipment/Infrastructure Grants	INF/17/001	Continuous Flow Chemistry Equipment for Sugar Research	National University of Ireland, Galway	€38,857
Climate Change	Equipment/Infrastructure Grants	INF/17/003	Next generation of Autonomous Upper Ocean Profiling Platform	National University of Ireland, Galway	€199,599
Climate Change	Equipment/Infrastructure Grants	INF/17/005	Analysis of climate relevant gases in seawater	National University of Ireland, Galway	€48,569
Climate Change	Equipment/Infrastructure Grants	INF/17/006	Analysis of Trace Metals in Seawater for Marine Research	National University of Ireland, Galway	€58,970
Climate Change	Equipment/Infrastructure Grants	INF/17/008	Quantifying the Impacts of Multiple Stressors on marine benthic resources (QIMS)	Trinity College Dublin	€194,654
Renewable Energy	Equipment/Infrastructure Grants	INF/17/009	Test Bed for Hybrid System for Auxiliary Power Production on Marine Vessels	DARE Technology Ltd	€141,698
Bioresources: Aquaculture	Equipment/Infrastructure Grants	INF/17/013	Smart Aquaculture Feeding Trials Research Infrastructure	National University of Ireland, Galway	€171,778
Renewable Energy	Equipment/Infrastructure Grants	INF/17/014	CNC Equipment for the Manufacture of Tidal Blade Moulds	ÉireComposites Ltd	€200,000
Advanced Technologies	Equipment/Infrastructure Grants	INF/17/016	Flexible environment monitoring platforms (FlexiMon)	University College Cork	€178,980
Climate Change	Equipment/Infrastructure Grants	INF/17/018	Particle Size Analyser for Transdisciplinary Research in Marine Sciences	National University of Ireland, Galway	€65,333
Bioresources: High Value Products	Equipment/Infrastructure Grants	INF/17/020	Marine Chiroptics	National University of Ireland, Galway	€199,936
Ocean Observation and Seabed Mapping	Equipment/Infrastructure Grants	INF/17/025	2GROBOTICS - Underwater Laser Scanner	Ulster University	€183,196
Bioresources: High Value Products	Equipment/Infrastructure Grants	INF/17/026	Upgrading of the macro- and microalgal research facilities at Bantry Marine Research Station	Bantry Marine Research Station Ltd	€95,935
Renewable Energy	Equipment/Infrastructure Grants	INF/17/027	The purchase of a Dynamic Mechanical Analysis machine	ÉireComposites Ltd	€51,203
Advanced Technologies	Equipment/Infrastructure Grants	INF/17/028	Expansion and Consolidation of Satellite Ocean Colour Validation Activities	TechWorks Marine Ltd	€85,040
Bioresources: Wild Resources	Equipment/Infrastructure Grants	INF/17/031	High Throughput SNP Analysis in the Marine Environment (HTSAME)	Queen's University	€125,555
Renewable Energy	Equipment/Infrastructure Grants	INF/17/033	Hybrid Fixed Wing Vertical Take-off and Landing UAV for the Marine Sector	University of Limerick	€197,925
Bioresources: Aquaculture	Equipment/Infrastructure Grants	INF/17/038	MACSQuant® Analyzer 10 and complementary accessory systems	Athlone Institute of Technology	€136,719
Renewable Energy	Equipment/Infrastructure Grants	INF/17/039	Lir National Ocean Test Facility – Enhancement Project 2017	University College Cork	€169,255
<b>TOTAL</b>					<b>€5,846,009</b>

\* Funded under the Second Call for Transnational Research Projects within the Marine Biotechnology ERA-NET.

~ This represents the Marine Institute contribution to the project (one third), which is also funded by the Environmental Protection Agency and Met Éireann.

# This represents the Marine Institute contribution to the project (one third), which is also funded by Science Foundation Ireland and Geological Survey Ireland.

All the infrastructure awards are co-funded, with grantees proving own contribution to costs of 10 per cent by Higher Education Institutes and 25 per cent by Companies.

# APPENDIX 3:

## IRISH PARTICIPATION IN EU HORIZON 2020 BLUE GROWTH AND RELATED CALLS in 2017

The Marine Institute supports Irish researchers and Small & Medium Enterprise (SME) participation in a variety of EU competitive funding programmes, in particular Horizon 2020. The Institute provides a National Delegate (Fiona Grant) for the Horizon 2020 Programme Committee for the Societal Challenge on 'Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research, and the Bioeconomy' (SC2). Ms Grant also acts as National Contact Point (NCP) for this societal challenge and works with NCPs in other programmes to maximise Irish participation in the programme as part of Ireland's NCP network. SC2 includes the Blue Growth topic area which is dedicated to marine topics, and also parts of the Sustainable Food Security topic area. Marine research opportunities are also available in SC3 (Energy), SC4 (transport), SC5 (Climate Action), the SME instrument and Research Infrastructures work programmes.

Ireland performed well in the results of those calls launched in 2017 in relation to SC2. Irish performance is summarised below. Under the Blue Growth calls, SOPHIE (Seas, Oceans and Public Health in Europe) involving NUI Galway received €293,463. AquaTT were successful in an Innovation Action entitled SEAFOODTOMORROW - Nutritious, safe and sustainable seafood for consumers of tomorrow with a funding award of €329,919.

In the 2017 Sustainable Food Security topics, Irish researchers were very successful in the highly competitive 2-stage call on aquaculture (Promoting and supporting the eco-intensification of aquaculture production systems). The top ranked project, GAIN (Green Aquaculture Intensification in Europe), has participants from IBM Ireland (€599,000) and Longline Environmental (€580,000). The Marine Institute and Tyndall are participating in the second ranked project (IMPAQT - Intelligent management system for integrated multi-trophic aquaculture) with EU contributions of €460,390 and €412,925 respectively.

	Retained Budget 2017	IE € 2017	IE % 2017	MI € 2017	MI % 2017
Blue Growth - All Marine Topics	43,623,748	623,381	1.5%	0	0%
Sust. Food Security - 1 Marine Topic	11,881,975	2,052,315	17.27%	460,390	3.9%
<b>2017 SC2 IRISH PERFORMANCE</b>	<b>55,505,723</b>	<b>2,675,696</b>	<b>4.82%</b>	<b>460,390</b>	<b>0.83%</b>

These represent a 15.4 per cent success rate in the Blue Growth part of the programme, with Ireland taking 1.5 per cent of the total EC contribution available. While this figure is lower than in previous Blue Growth calls, the figure still exceeds the just retour target of 1.2 per cent of the allocated H2020 budget nationally. In Sustainable Food Security, Ireland taking 17.27 per cent of the total budget for the single marine topic is exceptional and shows great promise for future calls around smart aquaculture.

Some very strong results for the marine were evident across other societal challenges and H2020 pillars. Based on this assessment, the total awards for all Irish marine-related H2020 funded projects in 2017 was €6,996,364.

Under the Research Infrastructures starter communities call, both University of Limerick and the Marine Institute were successful in EU Marine Robots with awards of €252,345 and €339,911 respectively. The MI and SmartBay Ireland participated in MARITEC-X - Marine and Maritime Research, Innovation, Technology Centre of Excellence which has been funded under the Spreading excellence and widening participation programme. Awards of €65,346 and €28,408 respectively were won.

In the SME Instrument, Resolute Marine Limited were awarded a Phase 1 project (€50,000) to demonstrate the economic feasibility of a wave-powered desalination system. A significant Phase 2 project for Design Pro in County Limerick has been funded to look at a range of economically viable, innovative and proven HydroKinetic turbines that will enable users to exploit the huge potential of clean, predictable energy in the world's rivers, canals and estuaries. The total award made was €1,934,657. In December 2017, ÉireComposites & w1Da announced the award of a €1,650,000 Phase 2 SME Instrument Project for advanced composites for use on recreational and commercial sailing and powerboats. The outcomes will include stronger and lighter composites that will result in environmental-friendly "zero emissions" energy regeneration and silent electric propulsion systems for boats.

This is in line with the trend started in FP7 and continued in the 2017 H2020 results which saw strong performance by the Marine Institute and the wider marine research community in Ireland.

The successful marine projects with Irish partners in 2017 are listed as follows:

## Project Title: Seas, Oceans and Public Health in Europe: a Strategic Research Agenda for Europe and Beyond (SOPHIE)

University of Exeter (Coordinator)

NUI, Galway (Irish Partner)

Value to Irish Partner: €293,463

### Project Abstract

A Growing body of evidence indicates that the marine environment and human health are inextricably linked. These linkages encompass both risks to health and wellbeing, and a range of potential benefits and opportunities. However, much of this early evidence has been established in the US, under the rubric of the integrative meta-discipline of Oceans and Human Health (OHH). Far less is known about these issues in other parts of the world, including the European context which faces its own set of unique challenges and opportunities. Building on the early leadership shown by members of the consortium mapping these issues in Europe, the Seas, Oceans and Public Health in Europe (SOPHIE) consortium brings together an international multidisciplinary European team of marine, health, social and economic science experts and practitioners to explore these relationships in the European context.

By including a broad range of interdisciplinary partners from both marine and health sectors, SOPHIE can demonstrate reach across disciplines and communities in Europe and internationally. Responding directly to the BG-06-2017 call, SOPHIE's primary aims are to: a) deliver a clear, evidence-informed Oceans and Human Health Strategic Research Agenda (SRA) within the European context, based on extensive involvement by diverse stakeholders; and b) ensure that the structures needed to develop and implement this SRA are in place and will exist as a legacy beyond the life of the project.

These aims will be achieved by:

- (i) Systematic synthesis of the current evidence base
- (ii) Developing and coordinating a European community of OHH stakeholders
- (iii) Identification of innovative solutions to sustainably reduce risks and promote benefits
- (iv) Scenario modelling and horizon scanning
- (v) Knowledge exchange through bespoke training and skills programmes; and
- (vi) A global OHH Conference to present SOPHIE's findings and enhance European leadership and global cooperation in OHH research.

## Project Title: Nutritious, safe and sustainable seafood for consumers of tomorrow (SEAFOODTOMORROW)

Instituto Português do Mar e da Atmosfera - IPMA (Coordinator)

AquaTT UETP Ltd (Irish Partner)

Value to Irish Partner: €329,919

### Project Abstract

SEAFOODTOMORROW aims to validate and optimize commercial

solutions for improving the socioeconomic and environmental sustainability of the seafood production and processing industry, while contributing to product quality and safety. Activities will focus on the sustainable production and processing of nutritious and safe seafood products through the demonstration and first application in the market of eco-innovative, sustainable solutions of marine and aquaculture-derived food products and nutrients. The proposal will take into account impacts across different regions and population segments, as well as the specificities of different types of seafood. Activities will include among others: utilisation of agro and seafood by-products to develop sustainable feeds for aquaculture enabling the production of tailor made products fortified with specific essential nutrients for consumers, assess the feasibility of salt replacers in seafood, validate digestible, attractive, functional and nutritionally adapted seafood for senior people and youths, validate strategies to prevent/ remove contaminants from seafood, and optimise sensors and biosensors for the assessment of safety, among others. The consortium expects strengthening the wider utilisation of eco innovative solutions, as a result of greater user acceptance, higher visibility of these innovative solutions and creation of scalable markets, and increasing the availability of healthier seafood to improve consumers' diet and health. The consortium is built on interdisciplinary research teams of 19 RTDs involved, renowned by its top quality applied technological development and with strong and cohesive links gathered in previous funded activities (e.g. FP7 ECsafeSEAFOOD), thus anticipating successful outcomes. In addition, four IAGs and 13 SMEs with diverse and complementary interests in the solutions under validation and optimisation will also integrate the consortium.

## Project Title: Marine and Maritime Research, Innovation, Technology Centre of Excellence (MARITEC-X)

Larnaca Municipality (Coordinator)

Marine Institute (Irish Partner)

Value to Irish Partner: €65,346

SmartBay Ireland (Irish Partner)

Value to Irish Partner: €28,408

### Project Abstract

The MARITEC-X consortium aims to create a Marine and Maritime Research Innovation and Technology Centre of Excellence based in Cyprus to act as an enabler of scientific and business excellence in Marine and Maritime issues in the Eastern and broader South-eastern Mediterranean. The Centre will be aligned to the overall Smart Specialization Strategy for Cyprus (S3CY) and the European priorities on specific pillars with competitive advantages to the Cypriot economy. Focusing on key priority sectors identified within the Smart Specialization Strategy for Cyprus such as energy, tourism, transport and shipping, MARITEC-X Centre of Excellence will seek partnering relationships with well-known European institutions that will assist to the transfer of knowledge, co-develop sustainability and research programs, handover best practices and consult towards the creation of a critical mass of infrastructure and human capital in the region.



## Project Title: Marine robotics research infrastructure network (EUMarineRobots)

Universidade do Porto (Coordinator)  
University of Limerick (Irish Partner)  
Value to Irish Partner: €339,911  
Marine Institute (Irish Partner)  
Value to Irish Partner: €252,345

### Project Abstract

Our oceans are the least-explored region of planet Earth. Protection and sustainable development of ocean resources presents formidable challenges. Robots will play an increasingly key role in the near future and this role will expand and become more challenging as we extend into deeper, remote and hostile marine environments. Europe leads in many aspects of maritime, but lacks well integrated and coordinated oceanic robotic infrastructure or presence.

The marine-robotics industry is growing rapidly. It is a crucial high-value/high-cost sector with considerable entry-barriers to R&D. The full growth potential of this industry will be greatly enhanced with access to shared robotic research infrastructure.

EUMarineRobots (EUMR) proposes an access-infrastructure for the deployment of a full-range of aerial, surface and sub-surface marine robotic assets, the combined value of which is far greater than the sum of their parts. EUMR will open transnational access to significant national marine robotics R&D assets across Europe.

The EUMR consortium comprises 15 partners from 10 countries who, collectively, can deploy a comprehensive portfolio of marine robotic assets with required associated support assets and expertise. The network is a strong and balanced grouping of globally distinguished key players with diverse, track-record of excellence across marine / robotic sectors. Partners are members of a wide variety of existing networks, and research infrastructure collaborations both formal and informal across Europe and the world. EUMR is a first stage in aggregating these networks and assets as world-leading for support and growth of a strong community of practice in marine robotics and marine.

## SME Phase 1 Project Title: Demonstration of the economic feasibility of a wave-powered desalination system (W2O)

Resolute Marine Limited (Coordinator)  
Value to Irish Partner: €50,000

### Project Abstract

Over one billion people suffer from the effects of water scarcity with the vast majority being poor residents of developing countries. Desalting seawater is an excellent potential solution but traditional reverse osmosis (R/O) desalination systems require a connection to a strong electrical grid. However, because developing countries typically lack sufficient electrical grid capacity and cannot afford the capital or time required to build and deploy traditional R/O systems, Resolute Marine Limited is proposing an innovative solution to this problem - the world's first wave-driven desalination system (called Wave20™) that can be deployed quickly, operate completely "off-grid" and supply large quantities of fresh water at competitive cost. As a

medium-scale, grid-independent, renewable energy driven water production system, Wave20™ will have wide-ranging utility in developing countries and island nations outside Europe. Inside Europe, potential markets include the overseas Departments and Territories linked to EU member states (e.g. Canary Islands, New Caledonia, etc.). Resolute Marine Limited has already been active in several countries and has obtained commitments for pilot-scale Wave20™ plants in Cape Verde, South Africa and Mauritius. Cape Verde represents the shortest path to commercialization. The pilot location has been already secured and the site assessment studies are expected to start in Q3 2017 financed by the African Development Bank through a \$1.0M SEFA (Sustainable Energy Fund for Africa) grant. The purpose of the W2O project will be to build upon the SEFA-funded site assessment studies to determine the economic feasibility of Wave20™ in Cape Verde and to pave the way for the commercial pilot in 2019. The eventual global deployment of Wave20™ plants will help create a very competitive European export industry.

## SME Phase 2 Project Title: A range of economically viable, innovative and proven HydroKinetic turbines that will enable users to exploit the huge potential of clean, predictable energy in the world's rivers, canals and estuaries (DP Renewables)

DP DESIGNPRO LIMITED (Coordinator)  
Value to Irish Partner: €1,934,657

### Project Abstract

The DP Renewables project aims to commercialise a range of innovative, hydrokinetic turbines that will offer a reliable solution for generating zero-carbon energy from rivers, estuaries and canals. The range of products to be launched on the market in June 2019 comprises of two different sized turbine devices, 25Kw and 60Kw respectively, which are specifically designed to cater to a niche, 'low-power', small-scale energy generation market. DP Renewables stems from the success of 'HydroKinetic-25', the SME Instrument Phase 1 project implemented by DesignPro in March-September 2016 that served to prove this innovative idea's economic viability and define a business plan to bring it to market. Phase 2 will see this strategic and validated business plan implemented and the realisation of a project that will have significant positive impact on societal, economic and environmental issues. The project will cater to those with a suitable deployment site, meeting their need for energy security and independence, reducing reliance on imported fossil fuels and lowering carbon emissions. The project is fully aligned with the growth strategy of the SME and is regarded as a major stepping-stone towards consolidating its international presence while becoming a recognised contributor to the renewable energy spectrum. Despite its large resource potential, hydrokinetic energy is still largely untapped with only 5 per cent exploited to date. Europe, as well as many countries around the world, is rich of small and medium-sized rivers and straits between islands. Existing technologies require very fast flow speeds and large deployment spaces in order to make turbine outputs viable. This cuts off a large majority of the available market from having a feasible solution to use. Our project, DP Renewables, offers this solution, enabling Europe and the world to utilise an abundant, highly accessible resource by harnessing cost-efficient, clean and reliable energy for users.

## **SME Phase 2 Project Title: Sustainable Environmentally-friendly Advanced-Composite Zero-Emission Boats (SEABOAT)**

EireComposites Teoranta (Coordinator)

W1dA Experience Ltd (Partner)

Value to Irish Partners: €1,650,000.

### **Project Abstract**

The SEABOAT concept will tackle inherent issues in the recreational boat manufacturing industry, with a particular focus on addressing outdated, inefficient, costly and environmentally inferior hull-manufacturing processes that will not meet new legislation. SEABOAT will deliver significant positive impacts in terms of industry/EU competitiveness, scalable company growth in revenue & jobs, and a wide array of performance & environmental benefits. This will be achieved by

- Commercialisation of the Composite Powder Epoxy Technology (C-PET) manufacturing process within the recreational boat manufacturing segment and by introducing a revolutionary E-Boat design incorporating the CPET manufactured hull into the market,
- Enabling the partners ÉireComposites and W1Da to achieve in excess of €45m combined cumulative revenue and 260 jobs from 2021-2023.

### **Project Objectives:**

- Reduce the cost of boat hull manufacturing by 30%.
- Reduce the weight of boat hulls by 45%.
- Manufacture 8m boat hull using manufacturing technology that avoids the emission of harmful VOC's.
- Demonstrate that boats can be powered from clean, renewable electricity instead of fuel-powered internal combustion engines thereby eliminating the use of hydrocarbon-based fuels, which will massively reduce the carbon footprint and pollution from boat operations.

# APPENDIX 4:

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(Authors highlighted in bold indicate Marine Institute contributors)

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## INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES) PUBLICATIONS

### Key to ICES abbreviations:

CM	-	Conference and Meeting Document
ACOM	-	Advisory Committee
FTC	-	Fisheries Technology Committee
LRC	-	Living Resources Committee
RMC	-	Resource Management Committee
DFC	-	Diadromous Fish Committee
WKROUND	-	A Benchmark Workshop on Roundfish
SCICOM	-	Science Committee
SSGEF	-	Steering Group on Ecosystem Function
WGNAS	-	Working Group North Atlantic Salmon
WGECO	-	Working Group on Ecosystem Effects of Fishing Activities
WGMHM	-	Working Group on Marine Habitat Mapping
SSGSUE	-	Steering Group on Sustainable Use of Ecosystems
WGOH	-	Working Group on Oceanic Hydrography
CRR	-	Cooperative Research Report

Alfjorden, A., Areskog, M., Bruno, D., Carnegie, R., **Cheslett, D.**, Feist, S., Ford, S.,...**Ruane, N.** ... (2017). *New Trends in Important Diseases Affecting the Culture of Fish and Molluscs in the ICES Area 2002 – 2015*. ICES Cooperative Research Report No. 337. 50 pp. <http://doi.org/10.17895/ices.pub.2800>

AORA. (2017). *Working Group on the Ecosystem Approach to Ocean Health and Stressors*, January 2017, Reykjavik, Iceland. 53 pp. (Contributing author: **Margaret Rae**)

ICES. (2017). *Interim Report of the Working Group with the Aim to Develop Assessment Models and Establish Biological Reference Points for Sea Trout (Anadromous Salmo trutta) Populations (WGTRUTTA)*, 24–26 April 2017, Gothenburg, Sweden. ICES CM 2017/SSGEPD:21. 8 pp. (Contributing authors: **Ross Finlay and Russel Poole**)

ICES. (2017). *Interim Report of the Working Group on Ecosystem Assessment of Western European Shelf Seas*. ICES WGEAWESS REPORT 2017 24–28 April 2017. Lisbon, Portugal. ICES CM 2017/IEASG:02. 23 pp. (Contributing authors: **Dave Reid and Debbi Pedreschi**)

ICES. (2017). *Workshop on Age estimation of Blue Whiting (Micromesistius poutassou) WKARBLUE2*, 6–9 June 2017, Lisbon, Portugal. ICES CM 2017/SSGIEOM:22. 60 pp. (Contributing authors: **Eugene Mullins, Ross Fitzgerald and Susan Galligan**)

ICES. (2017). *Interim Report of the Working Group on Ecosystem Assessment of Western European Shelf Seas*. ICES WGEAWESS REPORT 2017 24–28 April 2017. Lisbon, Portugal. ICES CM 2017/IEASG:02. 23 pp. (Contributing authors: **Dave Reid and Debbi Pedreschi**)

ICES. (2017). *Workshop on Age estimation of Blue Whiting (Micromesistius poutassou) WKARBLUE2*, 6–9 June 2017, Lisbon, Portugal. ICES CM 2017/SSGIEOM:22. 60 pp. (Contributing authors: **Eugene Mullins, Ross Fitzgerald and Susan Galligan**)

ICES. (2017). *Report of the Benchmark Workshop on the Irish Sea Ecosystem (WKIrish3)*, 30 January–3 February 2017, Galway, Ireland. ICES CM 2017/BSG:01. 165 pp. (Contributing authors: **ICES Chair Hans Gerritsen, Colm Lordan, Claire Moore, Sara Jane Moore and Jonathan White**)

ICES. (2017). *Report of the Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS)*, 19 September 2017, Fort Lauderdale, USA. ICES CM 2017/SSGEPD:17. 45 pp. (Contributing authors: **ICES Chair Russell Poole and Niall Ó Maoiléidigh**)

ICES. (2017). *Interim Report of the Working Group on Pathology and Diseases of Marine Organisms (WGPDMO)*, 14–18 February 2017, Gdynia, Poland. ICES CM 2017/SSGEPI:05. 18 pp. (Contributing author: **Neil Ruane**)

ICES. (2017). *Interim Report of the Scallop Assessment Working Group (WGSCALLOP)*, 10–12 October 2017, Belfast, Northern Ireland, UK. ICES CM 2017/SSGEPD:25. 18 pp. (Contributing author: **Ollie Tully**)

ICES. (2017). *Interim Report of the Working Group on Fisheries, Acoustics, Science and Technology. WGFASST 2017 Report 4-7* April 2017. Nelson, New Zealand. ICES CM 2017/SSGIEOM:12. 40 pp (Contributing author: **Ciaran O'Donnell**)

ICES. (2017). *Report of the Joint Workshop of the ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTEFB) and the Working Group on Fisheries Acoustics Science and Technology (WGFASST)*. 3 April 2017. Nelson, New Zealand. ICES CM 2017/SSGIEOM:02. 19 pp. (Contributing author: **Ciaran O'Donnell**)

ICES. (2017). *ICES Compilation of Microtags, Finclip and External Tag Releases 2016 by the Working Group on North Atlantic Salmon*, 29 March–7 April 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:20. 26 pp. (Contributing author: **Niall Ó Maoiléidigh**)

ICES. (2017). *Report of the Working Group on Celtic Seas Ecoregion (WGCSE)*, 9–18 May 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:13. 1464 pp. (Contributing authors: **Colm Lordan, Claire Moore, Jennifer Doyle, Sara-Jane Moore, David Stokes, Katie Thomas and Jonathan White**)

ICES. (2017). *Interim Report of the Working Group on Marine Benthic and Renewable Energy Developments (WGMBRED)*, 6–10 March 2017, Gdynia, Poland. ICES CM 2017/SSGEPI:01. 55 pp. (Contributing author: **Francis O'Beirn**)

ICES. (2017). *Interim Report of the Working Group on Spatial Fisheries Data (WGSFD)*, 29 May – 2 June 2017, Hamburg, Germany. ICES CM 2017/SSGEPI:16. 42 pp. (Contributing author: **Yves Reecht**)

ICES. (2017). *Workshop to scope the ICES framework for ecosystem advice (WKECOFRAME)*, 9–11 May 2017, ICES Headquarters, Copenhagen, Denmark. ICES CM 2017/ACOM:44. 46 pp. (Contributing author: **Jeffrey Fisher**)

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ICES. (2017). *Minutes from the Meeting of the ICES Science Committee (SCICOM)*, 13–15 March 2017. ICES CM 2017/SCICOM:01. 22 pp. (Contributing author: **Niall Ó Maoiléidigh**)

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ICES. (2017). *Report of the Workshop to evaluate trade-offs between the impact on seafloor habitats and provisions of catch/value (WKTRADE)*, 28–31 March 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:42. 109 pp. (Contributing authors: **Imelda Hehir and Jonathan White**)

ICES. (2017). *Report of the ICES - IOC Working Group on Harmful Algal Bloom Dynamics (WGHABD)*, 25–28 April 2017, Helsinki, Finland. ICES CM 2017/SSGEPD:11. 115 pp. (Contributing author: **Joe Silke**)

ICES. (2017). *Report of the Working Group on Oceanic Hydrography (WGOH)*, 4–6 April 2017, Torshavn, Faroe Islands. ICES CM 2017/SSGEPD:08. 104 pp. (Contributing author: **Kieran Lyons**)

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ICES. (2017). *Final Report of the Working Group on Mackerel and Horse Mackerel Egg Surveys. WGMEGS Report 2017 24–28 April 2017. Vigo, Spain. ICES CM 2017/SSGIEOM:18. 134 pp. (Contributing author: **Brendan O’Hea**)*

ICES. (2017). *Report of the Workshop on Designing an Eel Data Call (WKEELDATA)*, 28 February–2 March 2017, Rennes, France. ICES CM 2017/SSGIEOM:30. 38 pp. (Contributing author: **Russell Poole**)

ICES. (2017). *Report of the Working Group on Mixed Fisheries Advice (WGMIXFISHADVICE)*, 22–26 May 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:18. 128 pp. (Contributing author: **Claire Moore**)

ICES. (2017) *Report of the Data and Information Group (DIG)*. ICES DIG REPORT 2017 22–24 May 2017. ICES Headquarters, Denmark. . 33 pp. (Contributing author: **David Currie**)

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ICES. (2017). *Interim Report of the International Bottom Trawl Survey Working Group. IBTSWG Report 2017 27–31 March 2017. ICES CM 2017/SSGIEOM:01. 337 pp. (Contributing author: **David Stokes**)*

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ICES. (2017). *Report of the Benchmark Workshop on Widely Distributed Stocks (WKWIDE)*, 30 January–3 February 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:36. 196 pp. (Contributing authors: **ICES Chair Andrew Campbell, Brendan O’Hea and Afra Egan**)

ICES. (2017). *Interim Report of the Working Group of International Pelagic Surveys (WGIPS)*, 16–20 January 2017, Reykjavik, Iceland. ICES CM 2017/SSGIEOM:15. 572 pp. (Contributing authors: **Ciaran Ó Donnell and Michael O’Malley**)

ICES. (2017). *Herring Assessment Working Group for the Area South of 62 deg N (HAWG)*, 14–22 March 2017, ICES HQ, Copenhagen, Denmark. ICES CM 2017/ACOM:07. 856 pp. (Contributing authors: **Maurice Clarke and Michael O’Malley**)

ICES. (2017). *Report of the Working Group on Elasmobranch Fishes (WGEF)*, 31 May–7 June 2017, Lisbon, Portugal. ICES CM 2017/ACOM:16, 1018pp. (Contributing author: **Graham Johnston**).

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ICES. (2017). *Report of the ICES Workshop on the Development of Quantitative Assessment Methodologies based on Life-history traits, exploitation characteristics, and other relevant parameters for stocks in categories 3–6 (WKLIFEVI)*, 3–7 October 2016, Lisbon, Portugal. ICES CM 2016/ACOM:59. 106 pp. (Contributing authors: **Yves Reecht**).

ICES. (2017). *Interim Report of the Working Group on Data Poor Diadromous Fish (WGDAM)*, By correspondence. ICES CM 2016/SSGEPD:19. 10 pp. (Contributing author: **Niall Ó Maoiléidigh and Russell Poole**)



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Scientific, Technical and Economic Committee for Fisheries (STECF) (2017). *Evaluation of DCF National Work Plan amendments for 2018/19 (STECF-17-19)*. Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-67492-1, doi:10.2760/217016, JRC109714. (Contributing author: **Helen McCormick**)

Scientific, Technical and Economic Committee for Fisheries (STECF) (2017). *Evaluation of DCF 2016 Annual Reports & Data Transmission to end users in 2016 & preparation for the new assessment of Annual Reports and Data transmission (STECF-17-10)*. Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-67482-2, doi:10.2760/036445, JRC107592. (Contributing author: **Grainne Ni Chonchuir**)

## CONFERENCES AND SEMINARS

**Bréchon, A., Cheslett, D., & O'Toole, C.** (2017). VIVALDI: Understanding and mitigating farmed *Crassostrea gigas* diseases. Presented at the *18th International Conference on Diseases of Fish and Shellfish*, Belfast, UK.

**Calderwood, J. & Reid, D.** (2017). Modelling fishing behaviour in the Irish demersal fleet to determine how changes in the response to poor catch composition may extend fishing opportunities under the Landing Obligation. Presented at the *Social Simulation Conference*, Dublin, Ireland.

**Calderwood, J., Robert, M. & Reid, D.** (2017). Modelling fishing behaviour to determine how changes in fishing tactics may assist Irish vessels operating under the Landing Obligation. Presented at the *ICES Annual Science Conference*, Fort Lauderdale, USA.

**Calderwood, J., Reid, D.**, (2017). DiscardLess: Assessment of some impacts of the landing obligation and the development of tools and strategies to achieve its goals within the Irish fishing fleet. Presented at *ENVIRON: 'Putting 'eco' in the economy'*, Athlone, Ireland.

Cortinas Abrahantes, J., Richardson, J., O'Mahony, M., Pare, A., Bruckers, L., Johne, R., **Keaveney, S.**, ... Lees, D. (2017). European baseline survey of norovirus in oysters. Presented at the *11th International Conference on Molluscan Shellfish Safety*, Galway, Ireland.

Doogan, A. (2017). Investigation into the causes of early migration mortality and return rates of Atlantic salmon (*Salmo salar*). Presented at the *Marine and Freshwater Research Centre (MFRC) Seminar Series*, Galway, Ireland. (Supervisors: Brophy, D., **Cotter, D.** and **Ó'Maoiléidigh, N.**)

Doogan, A. (2017). Investigation into the causes of early migration mortality in Atlantic salmon (*Salmo salar*) from the Burrishoole National Index River using acoustic telemetry in freshwater and coastal areas. Presented at the *Cullen Fellowship Open Day*, Galway, Ireland. (Supervisors: Brophy, D., **Cotter, D.** and **Ó'Maoiléidigh, N.**)

**Dore, B.** (2017). The quality of our shellfish waters and the challenges ahead. Presented at the *Environmental Protection Agency National Water Event*, Galway, Ireland.

**Dore, B.** (2017). Issues related to the restoration and future prospects for native oyster stocks - Water quality (*E. coli*) and Norovirus. Presented at the *Native Oyster Workshop*, Galway, Ireland.

**Downes, J.K. & Ruane, N. M.** (2017). Investigation of co-infections with pathogens associated with gill disease in Atlantic salmon during an amoebic gill disease outbreak in Ireland. Presented at the *18th International Conference on Diseases of Fish and Shellfish*, Belfast, UK.

**Fahy, J., Keaveney, S., Dore, B., & Butler, F.** (2017). Storage and transport conditions for oyster samples intended for norovirus analysis. Presented at the *11th International Conference on Molluscan Shellfish Safety*, Galway, Ireland.

**Fitzhenry, D. & Ó Conchubhair, D.** (2017). European Multidisciplinary Seafloor and water-column Observatory (EMSO) Generic Instrument Module. Presented at the *EMSOdev Technology workshop: EGIM implementation and operation*, Southampton, UK.

**Fitzpatrick, A., Keaveney, S., Dore, B., Butler, F., Coughlan, S., O'Gorman, J. & Ryan, E.** (2017). Foodborne viruses in Ireland – Identifying risk and mitigation approaches for hepatitis E virus, hepatitis A virus, norovirus and sapovirus – A project overview. Presented at the *11th International Conference on Molluscan Shellfish Safety*, Galway, Ireland.

**Leadbetter, A.** (2017). Marine Science IoT: Where Big Data meeting Linked Data. Presented at the *HEAnet National Conference*, Galway, Ireland.

**Leadbetter, A., & O'Grady, E.** (2017). Using Erddap as a building block in Ireland's Integrated Digital Ocean. Presented at *NOAA's Environmental Data Workshop*, Bethesda, MD, USA.

Mamoutos, I., **Dabrowski, D., Lyons, K., & McCoy, G.** (2017). A two way nested high resolution coastal simulation in a tidally dominated area: Preliminary results. Presented at the *8th EuroGOOS Conference*, Bergen, Norway.

**Moore, C., Davie, S., Robert, M., Lionel, Pawlowski. & Lordan, C.** (2017). Improving demersal mixed fisheries model and advice: Celtic Sea. Presented at the *ICES Annual Science Conference*, Fort Lauderdale, USA.

**Ó Conchubhair, D.** (2017). Large scale circulation. Session Chair at *6th European-Argo Users Workshop*, Paris, France.

**Ó Conchubhair, D.**, (2017). European Multidisciplinary Seafloor and water column Observatory: A European Marine Science and Technology Innovation Platform. Presented at *ENVRiplus*, Grenoble, France.

**Hegarty, A., Omerdic, E., Westbrook, G. & Toal, D.** (2017). Lagrangian waverider and wave filtering system for use in ROV control. Presented at the *Oceans '17 MTS/IEEE Conference*, Aberdeen, Scotland.

**Hegarty, A.** (2017). Ocean Observation Technologies. Presented at the *Cullen Fellowship Open Day*, Galway, Ireland.

**Hegarty, A.** (2017). Expanding the Effective Operational Footprint of a Cabled Observatory Node using an Interconnected Surface Buoy. Presented at the *Cullen Fellowship Open Day*, Galway, Ireland.

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- Höfle, H., **Pedreschi, D.**, Farnsworth, K.D., Kraak, S.B.M., & **Reid, D.G.** (2017). Is a single dimension enough to explain fishers' decision-making? Presented at *ICES Annual Science Conference*, Florida, USA.
- Hoffle, H., **Pedreschi, D.**, Farnsworth, K.D., Kraak, S.B.M., & **Reid, D.G.** (2017). Fish size composition in space – A spatially explicit size spectrum model of the Celtic Sea fish community for testing novel management approaches Presented at *ICES Annual Science Conference*, Florida, USA.
- Hunt, K., **Dore, B.**, **Keaveney, S.**, **Rupnik, A.** & Butler, F. (2017) A quantitative method for estimating the likely intake of norovirus copies through consumption of Irish oysters. Presented at the *11th International Conference on Molluscan Shellfish Safety*, Galway, Ireland.
- Kane F, Jackson D & Casserly J.** (2017). A critical review of the existing aquaculture licensing and regulatory frameworks in the EU. Presented at *Aquaculture Europe 2017*, Dubrovnik, Croatia.
- Keaveney, S & Doré, B.** (2017). An update on norovirus in Irish Oysters. Presented at the *Food Safety Authority of Ireland Information days*. Various locations, Ireland.
- Kelly, S., de Eyto, E., Dillane, M., Poole, R.** & White, M., (2017). High-resolution monitoring of a coastal, brackish lagoon reveals long-term stratification dynamics, deep anoxia and irregular mixing events. Presented at the *IGRM 60 conference*, Dublin, Ireland.
- Kelly, S., de Eyto, E., Dillane, M., Poole, R.** & White, M., (2017). Hydrographic maintenance of deep anoxia in a tidally-influenced saline lagoon Presented at the *GLEON 19 conference*, New York, USA.
- Kilcoyne, J., Burrell, S., Salas, R., Silke, J.**, Delgado, F., Albert, I., Canga, M., McCarron, P., ... O. Miles, C. (2017). Enhanced biorefining methods for the production of marine biotoxins and microalgae fish feed (MARBioFEED). Presented at the *ICMSS conference*, Galway, Ireland.
- Kilcoyne, J., Burrell, S., Salas, R., Silke, J.**, Delgado, F., Albert, I., Canga, M., McCarron, P., ... O. Miles, C. (2017). Enhanced biorefining methods for the production of marine biotoxins and microalgae fish feed (MARBioFEED). Presented at the *ERA-MBT final conference*, Oslo, Norway.
- Ingunn A. Samdal, Morten Sandvik, Kjersti L. E. Løvberg, Lyn R. Briggs, Craig J. Forsyth, Jianyan Xu, **Jane Kilcoyne**, Pearse McCarron and Christopher O. Miles. (2017). Development of immunoaffinity columns for purification of the marine toxins azaspiracids. Presented at the *AOAC conference*, Spain
- Lorente, P., Sotillo, M. G., Gutknecht, E., **Dabrowski, T.**, Aouf, L., Toledano, C., ... Levier, B. (2017). The CMEMS IBI-MFC Forecasting Service in 2017: Evolution and Novelties associated to the CMEMS service release. In *EGU General Assembly Conference Abstracts* held 23-28 April, 2017 in Vienna, Austria (Vol. 19, p. 9366).
- Lorente P., Sotillo M.G., **Dabrowski T.**, ... Alvarez-Fanjul, E. (2017). Intercomparison of different operational oceanographic forecast products in the CMEMS IBI area. In *EGU General Assembly Conference Abstracts* held 23-28 April, 2017 in Vienna, Austria (Vol. 19, p. 9423).
- M. Pelin, **J. Kilcoyne**, M. Ardizzone, **C. Nulty**, P. Hess, A. Tubaro, S. Sosa. (2017). Toxic equivalency factors (TEFs) of azaspiracid 1, -2 and -3 after acute oral exposure in mice. Presented at the *AOAC conference*, Spain.
- Reid, D.G., Pedreschi, D.**, & Beggs, S. (2017). Linking Ecosystem Service Assessments and Fisheries Management – tridirectional question. Presented at the *MARE Conference 2017, People & the Sea IX: Dealing with Maritime Mobilities*. Amsterdam, Netherlands.
- Reid, D.G.** (2017). Ways to reduce the discarding problem- Lessons from DiscardLess. Presented at the *MARE Conference 2017, People & the Sea IX: Dealing with Maritime Mobilities*. Amsterdam, Netherlands.
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# APPENDIX 6:

## CENSUS DATA FOR THE BURRISHOOLE SYSTEM, 2017

### Fish Census

The Burrishoole fish (salmon, trout, eel) census programme, which includes the upstream and downstream trap census and the juvenile stock monitoring in the streams and lakes using electrofishing and beach seine, forms the basis for much of the stock assessment and provision of stock and catch advice for salmon and eel. Research includes stock-recruitment and linking S-R with juvenile abundances, run timing, fish production analysis, fecundity, fish behaviour and genetics. Special emphasis is now also being placed on evaluation of marine survival and growth, especially in relation to changes in the environment, and on the development of eel survey techniques to support the EU Regulation on the Recovery of the Eel Stock.

The fish census programme operated normally in 2017. A spring drought delayed the downstream migration of smolts. Relatively high water levels from July onwards, without any major floods, facilitated fish passage and smooth operation of the traps. Repairs carried out to the Mill Race River in 2016 were successful and restored full passage for migrating fish migrants in the 2016 and 2017 seasons. The salmon migration in 2017 was similar to that of 2016 and was again below the conservation limit for the catchment. The sea trout stock in 2017 was particularly poor.

### Upstream census data for the Burrishoole system, 2017

Species	Salmon Leap Upstream 2017	Mill Race Upstream 2017	Totals Upstream 2017	Totals Upstream 2016	Totals Upstream 2015	Totals Upstream 2014	Totals Upstream 2013
Wild Grilse	481	46	527	530	635	271	710
Wild Spring Salmon	7	2	9	16	11	26	23
Reared Grilse	1064	91	1155	1195	1774	1205	1301
Wild Sea Trout	3	0	3	15	16	16	20
Wild Finnock	6	1	7	66	43	126	50
Wild Brown Trout	26	21	47	94	79	91	101

### Downstream census data for the Burrishoole system, 2017

Species	Salmon Leap Downstream 2017	Mill Race Downstream 2017	Totals Downstream 2017	Totals Downstream 2016	Totals Downstream 2015	Totals Downstream 2014	Totals Downstream 2013
Wild Salmon Smolt	6363	999	7362	7034	8150	6357	6357
Wild Sea Trout Smolt	340	16	356	426	427	485	485
Silver Eel	2189	539	2728	1074	3122	3633	3633

# APPENDIX 7:

## RESEARCH VESSEL PROGRAMME 2017

### Fleet Activity Summary 2017

Science Days at sea from 01/01/2017 - 31/12/2017	Days	Surveys	Scientist Days	Student Days
RV Celtic Voyager	275	41	1288	490
RV Celtic Explorer	311	17	3673	-
<b>Total Marine Institute vessels</b>	<b>586</b>	<b>58</b>	<b>4961</b>	<b>490</b>
Charter vessels	36	2	216	
<b>Overall Total</b>	<b>622</b>	<b>60</b>	<b>5,177</b>	<b>490</b>

### Research Fleet Fuel Usage 2017

Vessel	Distance Sailed	Fuel Consumption	EEOI (Efficiency measurement Metric Tonnes fuel/Nautical Mile)
RV Celtic Explorer	41,586 Nm	1,909,804 Litres	0.045924 M3/NM
RV Celtic Voyager	22,678 Nm	314,130 Litres	0.013852 M3/NM

### RV Celtic Voyager Activity 2017

Survey Code	Survey Name	Start Date	End Date	Survey Days	No. of Scientists	Scientist Days	No. of Students	Student Days	Student Days & Scientist Days
CV17001	Winter Environmental Survey	12/02/2017	19/02/2017	8	2	16	0	0	16
CV17002	NMCI - Shipboard familiarisation and training	20/02/2017	20/02/2017	1	2	2	10	10	12
CV17003	SMART NUIGalway SEMRU 2017	21/02/2017	21/02/2017	1	3	3	10	10	13
CV17004	SMART MaREI Ocean Energy 2017	22/02/2017	22/02/2017	1	4	4	12	12	16
CV17007	SMART UCC Practical Offshore Geological Exploration	23/02/2017	24/02/2017	2	4	8	12	24	32
CV17005	SMART UCC CM Spring 2016 Part 1	25/02/2017	26/02/2017	2	3	6	10	20	26
CV17006	NMCI - Shipboard familiarisation and training	27/02/2017	27/02/2017	1	2	2	10	10	12
CV17029	SMART UCC CM Spring 2016_Part 2	28/02/2017	01/03/2017	2	3	6	12	24	30
CV17033	CV Trials	02/03/2017	03/03/2017	2	4	8	0	0	8
CV17009	NMCI - Shipboard familiarisation and training	06/03/2017	06/03/2017	1	2	2	10	10	12
CV17010	Undergraduate shipboard training in methods of oceanographic, benthic, megafauna and fisheries research	08/03/2017	15/03/2017	8	6	48	9	72	120
CV17011	MARA: MAin shelf sediment ReseArch	16/03/2017	25/03/2017	10	4	40	0	0	40
CV17013	Geophysical Exploration of the Shallow Sub-seabed (GESS)	27/03/2017	13/04/2017	18	5	90	0	0	90
CV17035	PSE SURVEY	14/04/2017	16/04/2017	3	4	12	0	0	12
CV17014	INFOMAR	17/04/2017	01/05/2017	15	5	75	0	0	75

CV17012	SMART UU CM Spring 2017	02/05/2017	03/05/2017	2	3	6	10	20	26
CV17037	LANGOLF-TV 2017	06/05/2017	19/05/2017	14	6	84	0	0	84
CV17015	BLUEfish 1	22/05/2017	31/05/2017	10	7	70	0	0	70
CV17016	INFOMAR	01/06/2017	16/06/2017	16	4	64	0	0	64
CV17017	Aran/Porcupine 2017	18/06/2017	29/06/2017	12	6	72	0	0	72
CV17018	Celtic Sea UWTV Survey 2017 Leg 1	03/07/2017	13/07/2017	11	5	55	0	0	55
CV17019	INFOMAR	14/07/2017	22/07/2017	9	4	36	0	0	36
CV17020	Quantifying Irish Marine Placer Resources (QuMPeR)	24/07/2017	06/08/2017	14	4	56	0	0	56
CV17021	Celtic Sea UWTV Survey 2017 Leg 2	09/08/2017	18/08/2017	10	6	60	0	0	60
CV17022	Biological Distribution of Azadinium in IRish Waters 2017 (AZBO '17)	19/08/2017	29/08/2017	11	6	66	0	0	66
CV17023	INFOMAR	30/08/2017	22/09/2017	24	4	96	0	0	96
CV17024	BLUEfish 2	24/09/2017	02/10/2017	9	5	45	0	0	45
CV17025	NUIGalway Post-graduate training cruise	05/10/2017	08/10/2017	4	4	16	6	24	40
CV17026	Multidisciplinary Survey Planning & "A Peer Assisted Learning exercise led by postgraduates	09/10/2017	16/10/2017	8	5	40	12	96	136
CV17038	iCRAG Biogeochemical Survey	17/10/2017	24/10/2017	8	5	40	0	0	40
CV17041	A multidisciplinary approach to studying deep diving whales and their habitat	29/10/2017	06/11/2017	9	6	54	0	0	54
CV17040	Irish Sea Palaeolandscape Investigation	08/11/2017	13/11/2017	6	3	18	0	0	18
CV17030	UCC MSc Marine Biology 2017 (Annual Request)	14/11/2017	15/11/2017	2	2	4	10	20	24
CV17028	SMART NUIGalway MS & EOS Winter 2017	16/11/2017	21/11/2017	6	4	24	11	66	90
CV17032	SMART Science@Sea 2017	22/11/2017	23/11/2017	2	4	8	9	18	26
CV17031	SMART UCC MSc Offshore Geological Exploration 2017	24/11/2017	29/11/2017	6	4	24	9	54	78
CV17039	Microplastics in Galway Bay: an ecosystem approach to seafloor integrity	04/12/2017	10/12/2017	7	4	28	0	0	28
				275		1288	162	490	1778

### RV Celtic Explorer Activity 2017

Survey Code	Survey Name	Start Date	End Date	Survey Days	No. of Scientists	Scientist Days
CE17001	BSH Survey no.1	19/01/2017	31/01/2017	13	10	130
CE17002	Ocean Climate Section - west Ireland	06/02/2017	13/02/2017	8	15	120
CE17003	Anglerfish and megrim trawl survey	14/02/2017	17/03/2017	32	10	320
CE17004	Blue Whiting Acoustic Survey	18/03/2017	07/04/2017	21	11	231
CE17005	Anglerfish and Megrim Trawl Survey	08/04/2017	17/04/2017	10	9	90
CE17006	Transit Survey	19/04/2017	26/04/2017	8	8	64
CE17007	GO-SHIP TransAtlantic Section A02	27/04/2017	23/05/2017	27	18	486
CE17008	Exploiting and Conserving Deep-Sea Genetic Resources: SFI cruise I	24/05/2017	05/06/2017	13	4	52
CE17009	WESPAS	06/06/2017	29/06/2017	24	17	408

CE17010	Seafest 2017	30/06/2017	02/07/2017	3		0
CE17011	WESPAS Leg 2	04/07/2017	21/07/2017	18	18	324
CE17012	INFOMAR	22/07/2017	06/08/2017	16	6	96
CE17013	BSH 2 North Sea Survey	11/08/2017	18/09/2017	39	11	429
CE17014	INFOMAR	22/09/2017	02/10/2017	11	5	55
CE17016	IGFS 2017 Leg 1	03/10/2017	14/10/2017	12	14	168
CE17015	Celtic Sea Herring Acoustic Survey	15/10/2017	04/11/2017	21	15	315
CE17017	IGFS2017	05/11/2017	09/12/2017	35	11	385
				311		3673

*ROV Holland I*

Survey Code	Survey Name	Start Date	End Date	Survey Days	No. of Scientists	Scientist Days
RH17002	Controls of Cold-water coral Habitats in submarine Canyons (CoCoHaCa)	15/06/2017	29/06/2017	15	6	90
RH17001	Offshore Reef Survey	08/07/2017	28/07/2017	21	6	126
				36		216

# APPENDIX 8:

## FOREIGN MARINE SCIENTIFIC RESEARCH ACTIVITIES IN IRISH WATERS IN 2017

### Foreign Vessel Activity 2017

Scientist Days Ireland	Scientist Days Foreign
4128	1865

Vessel Name	Country	Survey Name / Code	Discipline	No. of Days in Irish Waters	No. of Scientists	Scientist Days
<i>Scotia</i> *	UK	Bottom Trawl survey targeting juvenile gadoid species	Fisheries	5	7	35
<i>Cefas Endeavour</i>	UK	Groundfish survey using 4m beam trawl as part of the internationally coordinated WGBEAM	Fisheries	9	9	81
<i>Tridens</i> *	Netherlands	Blue Whiting Spawning Stock Survey	Fisheries	8	6	48
<i>Kings Bay</i> *	Norway	Blue Whiting Spawning Stock Survey	Fisheries	8	6	48
<i>Scotia</i>	UK	Trawl Survey to estimate the abundance of anglerfish	Fisheries	8	10	80
<i>Pelagia</i> *	Netherlands	Cold-Water Coral Reefs and the role of Submarine canyons	Marine Biology	10	14	140
<i>Fiskebas</i> *	Norway	Tagging and Biological Sampling of Mackerel	Fisheries	10	5	50
<i>Walter Herwig II</i> *	Germany	Investigating the selective properties of T90 codends in the demersal trawl mixed fishery targeting megrim, monkfish and hake	Gear Technology	23	12	276
<i>Pelagia</i>	Netherlands	Testing the hypothesis that transparent expolymer particles are reducing the viral infection of phytoplankton	Marine Bio-chemistry	1	14	14
<i>Vizconde de Eza</i> *	Spain	Abundance estimations and distribution patterns of Demersal Benthic Species	Fisheries	13	15	195
<i>Scotia</i>	UK	Rockall Haddock Survey	Fisheries	10	12	120
<i>Cefas Endeavour</i> *	UK	Irish Sea and Bristol Channel Beam trawl	Fisheries	10	7	70
<i>Scotia</i>	UK	Bottom Trawl survey targeting commercial species on the continental slope.	Fisheries	4	12	48
<i>Cefas Endeavour</i>						
	UK	PELTIC (Pelagic ecosystem survey in the Western channel and Celtic Sea)	Fisheries	9	7	63
<i>Prince Madog</i>	UK	BLUEFISH	Fisheries	6	8	48
<i>Thalassa</i>	France	Evhoe French Bottom Trawl surveys	Fisheries	10	25	250
<i>Scotia</i> *	UK	Demersal Trawling survey assessing cod, haddock, whiting, norway pout, mackerel and herring stocks.	Fisheries	6	8	48
<i>Corystes</i>	UK	Various	Various	50	66	251
				<b>200</b>	<b>243</b>	<b>1865</b>

\* Irish observers participated in these surveys.



# Glossary of Abbreviations

<b>AMS</b>	Advanced Mapping Services	<b>IFSRP</b>	Irish Fisheries Research Science Partnership
<b>ARC</b>	Aquaculture Research Committee	<b>IHO</b>	International Health Organisation
<b>ARGO floats</b>	Temperature/salinity profiling floats	<b>IMDO</b>	Irish Maritime Development Office
<b>ASP</b>	Amnesic shellfish poisoning	<b>INFOMAR</b>	Integrated Mapping for the Sustainable Development of Ireland's Marine Resources
<b>BA</b>	Bachelor of the Arts	<b>INTERREG</b>	EU Inter-Regional Cooperation Programme
<b>BIM</b>	Bord Iascaigh Mhara (the Irish Sea Fisheries Board)	<b>MSc</b>	Master of Science
<b>BSc</b>	Bachelor of Science	<b>MSFD</b>	Marine Strategy Framework Directive
<b>CEFAS</b>	Centre for Environment, Fisheries and Aquaculture (UK)	<b>MSY</b>	Maximum Sustainable Yield
<b>CEO</b>	Chief Executive Officer	<b>NASCO</b>	North Atlantic Salmon Conservation Organisation
<b>CTD</b>	Conductivity, Temperature and Depth	<b>NDP</b>	National Development Programme
<b>DAFM</b>	Department of Agriculture, Food and Marine	<b>NMCI</b>	National Maritime College of Ireland, Cork
<b>DCCAE</b>	Department of Communications, Climate Action and Environment	<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>DCU</b>	Dublin City University	<b>NPWS</b>	National Parks and Wildlife Service
<b>DHPCLG</b>	Department of Housing, Planning, Community and Local Government	<b>NUIGalway</b>	National University of Ireland, Galway
<b>DIT</b>	Dublin Institute of Technology	<b>OIE</b>	Office International des Epizooties (World Organisation for Animal Health)
<b>DSP</b>	Diarrhetic Shellfish Poisoning	<b>OSPAR</b>	Oslo and Paris Convention (1992)
<b>EEZ</b>	European Economic Zone	<b>PhD</b>	Doctor of Philosophy
<b>EPA</b>	Environmental Protection Agency	<b>PSP</b>	Paralytic Shellfish Poisoning
<b>EU</b>	European Union	<b>QUB</b>	Queen's University of Belfast
<b>EurOcean</b>	European Centre for Information on Marine Science and Technology	<b>R&amp;D</b>	Research and Development
<b>FIRM</b>	Food Industry Research Measure	<b>ROV</b>	Remotely Operated Vehicle
<b>FP7</b>	Seventh Framework Programme	<b>RV</b>	Research Vessel
<b>FSAI</b>	Food Safety Authority of Ireland	<b>SFI</b>	Science Foundation Ireland
<b>FSS</b>	Fisheries Science Services	<b>SFPA</b>	Sea Fisheries Protection Authority
<b>GIS</b>	Geographic Information System	<b>SMEs</b>	Small to Medium Sized Enterprises
<b>GDP</b>	Gross Domestic Product	<b>UCC</b>	University College Cork
<b>GMIT</b>	Galway-Mayo Institute of Technology	<b>UCD</b>	University College Dublin
<b>GSI</b>	Geological Survey of Ireland	<b>UK</b>	United Kingdom
<b>HABS</b>	Harmful Algal Blooms Service	<b>USA</b>	United States of America
<b>HEI</b>	Higher Education Institute	<b>UU</b>	University of Ulster
<b>HR</b>	Human Resources	<b>VIVALDI</b>	Preventing and mitigating farmed bivalve diseases
<b>IBM</b>	International Business Machines Corporation		
<b>ICES</b>	International Council for the Exploration of the Seas		
<b>ICT</b>	Information Communications Technology		
<b>IDA</b>	Industrial Development Authority		
<b>IFREMER</b>	Institut français de recherche pour l'exploration de la mer (French Research Institute for the Exploration of the Sea)		



# Financial Statements

## Year Ended 31 December 2017

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# Comptroller and Auditor General

## Report for presentation to the Houses of the Oireachtas Marine Institute

### Opinion on financial statements

I have audited the financial statements of the Marine Institute for the year ending 31 December 2017 as required under the provisions of section 12 of the Marine Institute Act 1991. The financial statements comprise:

- the statement of income and expenditure and retained revenue reserves
- the statement of comprehensive income
- the statement of financial position
- the statement of cash flows and
- the related notes, including a summary of significant accounting policies.

In my opinion, the financial statements give a true and fair view of the assets, liabilities and financial position of the Marine Institute at 31 December 2017 and of its income and expenditure for 2017 in accordance with Financial Reporting Standard (FRS) 102 – The Financial Reporting Standard applicable in the UK and the Republic of Ireland.

### Basis of opinion

I conducted my audit of the financial statements in accordance with the International Standards on Auditing (ISAs) as promulgated by the International Organisation of Supreme Audit Institutions. My responsibilities under those standards are described in the appendix to this report. I am independent of the Marine Institute and have fulfilled my other ethical responsibilities in accordance with the standards.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

### Report on information other than the financial statements, and on other matters

The Marine Institute has presented certain other information together with the financial statements. This comprises the annual report, the governance statement and Board members' report and the statement on internal control. My responsibilities to report in relation to such information, and on certain other matters upon which I report by exception, are described in the appendix to this report.

I have nothing to report in that regard.

**Patricia Sheehan**

For and on behalf of the  
Comptroller and Auditor General  
Date: 17 December 2018

# Appendix to the Report

## Responsibilities of Board members

The governance statement and Board members' report sets out the Board members' responsibilities. The Board members are responsible for:

- the preparation of financial statements in the form prescribed under section 12 of the Marine Institute Act 1991
- ensuring that the financial statements give a true and fair view in accordance with FRS 102
- ensuring the regularity of transactions
- assessing whether the use of the going concern basis of accounting is appropriate, and
- such internal control as they determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

## Responsibilities of the Comptroller and Auditor General

I am required under section 12 of the Marine Institute Act 1991 to audit the financial statements of the Marine Institute and to report thereon to the Houses of the Oireachtas.

My objective in carrying out the audit is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement due to fraud or error. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with the ISAs, I exercise professional judgment and maintain professional scepticism throughout the audit. In doing so,

- I identify and assess the risks of material misstatement of the financial statements whether due to fraud or error; design and perform audit procedures responsive to those risks; and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- I obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal controls.
- I evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures.
- I conclude on the appropriateness of the use of the going concern basis of accounting and, based on the audit evidence obtained, on whether a material uncertainty

exists related to events or conditions that may cast significant doubt on the Marine Institute's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my report. However, future events or conditions may cause the Marine Institute to cease to continue as a going concern.

- I evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

I communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

## Information other than the financial statements

My opinion on the financial statements does not cover the other information presented with those statements, and I do not express any form of assurance conclusion thereon. In connection with my audit of the financial statements, I am required under the ISAs to read the other information presented and, in doing so, consider whether the other information is materially inconsistent with the financial statements or with knowledge obtained during the audit, or if it otherwise appears to be materially misstated. If, based on the work I have performed, I conclude that there is a material misstatement of this other information, I am required to report that fact.

## Reporting on other matters

My audit is conducted by reference to the special considerations which attach to State bodies in relation to their management and operation. I report if there are material matters relating to the manner in which public business has been conducted.

I seek to obtain evidence about the regularity of financial transactions in the course of audit. I report if there is any material instance where public money has not been applied for the purposes intended or where transactions did not conform to the authorities governing them.

I also report by exception if, in my opinion,

- I have not received all the information and explanations I required for my audit, or
- the accounting records were not sufficient to permit the financial statements to be readily and properly audited, or
- the financial statements are not in agreement with the accounting records.

# Governance Statement and Board Members' Report

## Governance

The Board of the Marine Institute was established under the Marine Institute Act, 1991. The functions of the Board are set out in section 3 of this Act. The Board is accountable to the Minister for Agriculture, Food and the Marine and is responsible for ensuring good governance and performs this task by setting strategic objectives and targets and taking strategic decisions on all key business issues. The regular day-to-day management, control and direction of the Marine Institute are the responsibility of the Chief Executive Officer (CEO) and the senior management team. The CEO and the senior management team must follow the broad strategic direction set by the Board, and must ensure that all Board members have a clear understanding of the key activities and decisions related to the entity, and of any significant risks likely to arise. The CEO acts as a direct liaison between the Board and management of the Marine Institute.

## Board Responsibilities

The work and responsibilities of the Board are set out in the Board Standing Orders, The Schedule of Matters for Board Decision and The Roles of the Board, Chairman, Chief Executive and Board Secretary, which also contain the matters specifically reserved for Board decision. Standing items considered by the Board include:

- » Declaration of interests
- » Reports from committees
- » Financial statements and items of expenditure in excess of €50,000
- » Implementation of strategy and
- » Reserved matters.

The Board of the Marine Institute provides leadership and strategic direction for the organisation, defining the mission of the Institute and developing the policies required to achieve its goals. The Board sets performance targets and measures progress against these, closely monitoring budgets and financial performance. The Board leads the organisation in behaving ethically and in a manner that accords with the core values of the organisation.

Section 12 of the Marine Institute Act, 1991 requires the Board of the Marine Institute to keep, in such form as may be approved by the Minister for Agriculture, Food and the Marine with consent of the Minister for Public Expenditure and Reform, all proper and usual accounts of money received and expended by it.

In preparing these financial statements, the Board of the Marine Institute is required to:

- » select suitable accounting policies and apply them consistently
- » make judgements and estimates that are reasonable and prudent
- » prepare the financial statements on the going concern basis unless it is inappropriate to presume that it will continue in operation
- » state whether applicable accounting standards have been followed, subject to any material departures disclosed and explained in the financial statements.

The Board is responsible for keeping adequate accounting records which disclose, with reasonable accuracy at any time, its financial position and enables it to ensure that the financial statements comply with Section 12 of the Marine Institute Act, 1991. The maintenance and integrity of the corporate and financial information on the Marine Institute's website is the responsibility of the Board.

The Board is responsible for approving the annual plan and budget. The Board is also responsible for safeguarding its assets and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

The Board considers that the financial statements of the Marine Institute give a true and fair view of the financial performance and the financial position of the Marine Institute at 31 December 2017.

## Board Structure

The Board consists of a Chairperson and eight ordinary members, all of whom are appointed by the Minister for Agriculture, Food and the Marine. The members of the Board were appointed for a period of five years and met nine times in 2017. The table below details the appointment period for current members:

Board Member	Role	Date Appointed
John Killeen	Chairperson	2nd December 2015
David Owens	Ordinary Member	5th December 2012
Patricia Barker	Ordinary Member	19th February 2013
Donal Kelly	Ordinary Member	15th April 2013
Berna Grist	Ordinary Member	2nd December 2015
Lorcán O'Conneide	Ordinary Member	2nd December 2015
Dermot Clohessy	Ordinary Member	2nd December 2015
Alan Dobson	Ordinary Member	2nd December 2015
Owen Lewis	Ordinary Member	2nd December 2015

Berna Grist's term ended on the 31st May 2017 and David Owens term ended on the 4th December 2017. They were both reappointed in February 2018 by the Minister.

The Board has established two committees, as follows:

**1. Audit and Risk Committee:** comprises four Board members, all of whom are non-executive. The role of the Audit and Risk Committee (ARC) is to support the Board in relation to its responsibilities for issues of risk, control and governance and associated assurance. The ARC is independent from the financial management of the organisation. In particular the Committee ensures that the internal control systems including audit activities are monitored actively and independently. The ARC reports to the Board after each meeting, and formally in writing annually.

The members of the Audit and Risk Committee are: Pat Barker (Chairperson), David Owens, Dermot Clohessy and Donal Kelly. There were 8 meetings of the ARC in 2017.

In 2017 the Board conducted a self-evaluation of its performance, and conducted an external evaluation of the Audit and Risk Committee.

**2. Board Strategy Sub-Group:** comprises three Board members, all of whom are non-executive. The role of the Board Strategy Sub-Group (BSSG) is to guide the development of the Marine Institute Strategy 2018-2022. The members of this committee are: Lorcán O'Conneide (Chairperson), Dermot Clohessy and Alan Dobson. There were 7 meetings of the Board Strategy Sub-Group in 2017.

## Schedule of Attendance, Fees and Expenses

A schedule of attendance at the Board and Committee meetings for 2017 is set out below including the fees and expenses received by each member:

Name	Board	Audit and Risk Committee	Board Strategy Sub-Group	Fees 2017	Expenses 2017
<b>Number of Meetings</b>	<b>9</b>	<b>8</b>	<b>7</b>		
John Killeen	9			11,970	0
Patricia Barker	8	8		7,695	1,955
David Owens	9	6		7,115	1,956
Berna Grist	5			3,206	1,032
Lorcán O'Conneide	9		7	7,695	7,730
Donal Kelly	8	7		7,695	9,716
Dermot Clohessy	9	7	7	7,695	3,710
Alan Dobson	6		7	0	4,025
Owen Lewis	8			7,695	872
<b>Total</b>				<b>60,766</b>	<b>30,996</b>

There was one director, Alan Dobson, who did not receive a Board fee under the One Person One Salary (OPOS) principle.

## Disclosures Required by Code of Practice for the Governance of State Bodies (2016)

The Board is responsible for ensuring that the Marine Institute has complied with the requirements of the Code of Practice for the Governance of State Bodies ("the Code"), as published by the Department of Public Expenditure and Reform in August 2016. The following disclosures are required by the Code:

### Consultancy Costs

Consultancy costs include the cost of external advice to management and exclude outsourced 'business-as-usual' functions.

	2017	2016
	€	€
Legal	44,226	33,790
Financial and Governance	119,345	39,104
PR/Marketing	74,426	24,885
HR & Pension	8,377	3,075
Business Planning	115,050	92,255
Evaluators	75,364	54,431
Business Development	213,097	116,996
IT	41,357	11,788
Shipping Development	161,355	122,979
Biodiscovery	19,987	76,385
Other	39,207	32,503
<b>Total</b>	<b>911,791</b>	<b>608,191</b>

### Legal Costs and Settlements

The Marine Institute had no legal costs or settlements. This does not include expenditure incurred in relation to general legal advice received by the Marine Institute which is disclosed in Consultancy costs above.

### Travel and Subsistence Expenditure

Travel and subsistence expenditure is categorised as follows:

Travel and Subsistence Expenditure		2017	2016
		€'000	€'000
<b>Domestic</b>	Board	31	20
	Employees	757	674
<b>International</b>	Board	0	0
	Employees	577	445
<b>Total</b>		<b>1,365</b>	<b>1,139</b>

## Hospitality Expenditure

The Statement of Income and Expenditure and Retained Revenue Reserves includes the following hospitality expenditure:

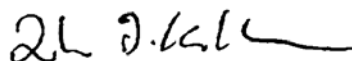
	2017	2016
	€	€
Staff Hospitality	6,747	9,435
Client Hospitality	1,362	706
<b>Total</b>	<b>8,109</b>	<b>10,141</b>

Hospitality expenditure relates to expenditure which is ancillary to carrying out the functions of the Marine Institute and includes Christmas and retirement parties, contribution to sports and social clubs, gifts or gift vouchers for staff. It also includes expenditure incurred in relation to client hospitality.

### Statement of Compliance

The Board has adopted the Code of Practice for the Governance of State Bodies (2016) and has put procedures in place to ensure compliance with the Code. The Marine Institute was in full compliance with the Code of Practice for the Governance of State Bodies at 31 December 2017.

On behalf of the Board



**Dr John Killeen**

Chairperson

4/12/2018



# Statement on Internal Control

## 1. Scope of Responsibility

On behalf of the Marine Institute I acknowledge the Board's responsibility for ensuring that an effective system of internal control is maintained and operated. This responsibility takes account of the requirements of the Code of Practice for the Governance of State Bodies (2016).

## 2. Purpose of the System of Internal Control

The system of internal control is designed to manage risk to a tolerable level rather than to eliminate it. The system can therefore only provide reasonable and not absolute assurance that assets are safeguarded, transactions authorised and properly recorded and that material errors or irregularities are either prevented or detected in a timely way.

The system of internal control, which accords with guidance issued by the Department of Public Expenditure and Reform has been in place in the Marine Institute for the year ended 31 December 2017 and up to the date of approval of the financial statements.

## 3. Key Control Procedures

The Board of the Marine Institute has established a strong and robust control environment in the Marine Institute through:

- » Holding regular Board meetings where the agenda includes strategic issues such as corporate governance, financial management and corporate strategy
- » The implementation of the Marine Institute Strategy and the development of a new strategy from 2018-2022 led by a Board Strategy sub-group
- » Clearly defined management responsibilities, authority and accountability, delegation of appropriate functions and reviewing and approving all Marine Institute policies
- » Approval of annual budgets, cash flow forecasting and capital programme expenditure with formal review of these at each Board meeting
- » The work of the Audit and Risk Committee, which met eight times in 2017
- » Five internal audits were conducted in 2017, with regular meetings between the Audit and Risk Committee and the Internal Auditors to discuss their work programme, the outcomes of their audits, their recommendations and a private meeting without members of the executive;
- » The operation of a risk management system with annual review of the risk policy and quarterly review of the risk register and report from the joint risk officers

- » Robust systems of health and safety, with monthly reports to the Board
- » Monitoring of compliance with legislation including Freedom of Information and Access to Environmental Information
- » The systems of internal control as detailed in the Marine Institute Operating Control Framework which sets out each of the key controls in place within the Institute, together with the owner of each control. To further improve the quality of the report, each of the control owners have submitted an Assurance Statement for each set of controls in respect of 2017.

## Review of Statement on Internal Control

The Statement on Internal Control was reviewed by the Audit and Risk Committee on 28 February 2018.

## Financial and Budgetary Management Systems

There is a comprehensive annual budgeting system with annual income, budget allocation process, cash flow forecasting and capital programme budgeting reviewed and approved by the Board at the start of each year, with formal review at each subsequent Board meeting. Policies and procedures are in place in relation to budgetary and financial matters, with all contracts with a value in excess of €50,000 coming to the Board for consideration and approval. There are regular reviews by the Executive of financial management reports and a Corporate Procurement Plan is in place.

## Procedures for monitoring the effectiveness of the Internal Control System

The 2017 Internal Audit Plan was implemented in full with the following audits completed:

- » Review of Internal Financial Controls
- » Procurement
- » Vessel Usage
- » Compliance with the Code of Practice for the Governance of State Bodies
- » Compliance with Freedom of Information and Access to Environmental Information

Implementation plans to address internal audit recommendations are approved by the Audit & Risk Committee. Progress on the implementation of the actions in each of the Internal Audit Implementation Plans is reviewed annually and reported to the Audit & Risk Committee and the Board.

The Internal Audit Plan for 2017 reflected the risks identified in the Marine Institute's Risk Register, the management letter of the Comptroller and Auditor General, and general developments and issues in relation to Corporate Governance. The Internal Audit Plan for 2018-2020 was approved by the Audit & Risk Committee in December 2017 and by the Marine Institute Board in March 2018.

### Capacity to Handle Risk

The Marine Institute has an Audit and Risk Committee (ARC) comprising four Board members with a broad range of experience including financial and audit expertise, one of whom is the Chair.

The Marine Institute has also established an internal audit function which is adequately resourced and conducts a programme of work agreed with the ARC. To ensure appropriate business continuity two joint Risk Officers have been appointed.

The ARC oversees the risk management policy which sets out the Marine Institute's risk appetite, the risk management processes in place and details the roles and responsibilities of staff in relation to risk. The policy has been issued to all staff who are expected to work within the Marine Institute's risk management policies, to alert management on emerging risks and control weaknesses and assume responsibility for risks and controls within their own area of work.

The financial implications of business risks have been considered through the formal business risk assessment process and in the preparation of the Marine Institute's Internal Audit Plans. A comprehensive set of Financial Procedures have been put in place to control the significant financial elements of the Marine Institute's business including authorisation limits for purchasing/expenditure.

### Risk and Control Framework

The Marine Institute has implemented a risk management system which identifies and reports key risks and the management actions being taken to address and, to the extent possible, to mitigate those risks.

The Marine Institute's Risk Management Policy and Business Continuity Policy are in compliance with the Code of Practice for the Governance of State Bodies (2016). The Marine Institute has appointed two Risk Officers. A risk register is in place which identifies the key risks facing the Marine Institute and these have been identified, evaluated and ranked according to their significance. The register is reviewed and updated by the ARC on a quarterly basis. The outcome of these assessments is used to plan and allocate resources to ensure risks are managed to an acceptable level.

The risk register details the controls and actions needed to mitigate risks and responsibility for operation of controls assigned to specific staff. I confirm that a control environment containing the following elements is in place:

- » Procedures for all key business processes have been documented
- » Financial responsibilities have been assigned at management level with corresponding accountability

- » There is an appropriate budgeting system with an annual budget which is kept under review by senior management
- » There are systems aimed at ensuring the security of the information and communication technology systems
- » There are systems in place to safeguard the assets, and
- » Control procedures over grant funding to outside agencies ensure adequate control over approval of grants and monitoring and review of grantees to ensure grant funding has been applied for the purpose intended.

### Ongoing Monitoring and Review

Formal procedures have been established for monitoring control processes and control deficiencies are communicated to those responsible for taking corrective action and to management and the Board, where relevant, in a timely way. I confirm that the following ongoing monitoring systems are in place:

- » Key risks and related controls have been identified and processes have been put in place to monitor the operation of those key controls and report any identified deficiencies
- » Reporting arrangements have been established at all levels where responsibility for financial management has been assigned, and
- » There are regular reviews by senior management of periodic and annual performance and financial reports which indicate performance against budgets/forecasts

### Procurement

I confirm that the Marine Institute has procedures in place to ensure compliance with current procurement rules and guidelines and that during 2017 the Marine Institute complied with those procedures.

### Review of Effectiveness

I confirm that the Marine Institute has procedures in place to monitor the effectiveness of its risk management and control procedures, including review of the performance of the Board and its sub-committees. The Marine Institute's monitoring and review of the effectiveness of the system on internal financial control is informed by the work of the internal and external auditors, the Audit and Risk Committee which oversees their work, and the senior management within the Marine Institute responsible for the development and maintenance of the internal control framework.

### Annual Review of the Effectiveness on Internal Control

The annual review of the effectiveness on internal controls was conducted between November 2017 and January 2018 and was approved by the Board on 28 February 2018. In undertaking this review, the Board considered the following:

- » Risk management policies, systems and procedures
- » Five internal audits which were conducted in 2017. All audits provided substantial assurance and all recommendations are being implemented
- » External audit by the Comptroller and Auditor General
- » The work of the Audit and Risk Committee

### Internal Control Issues

There were no material losses, frauds or breaches in control in 2017.

The audit of the 2016 financial statements and an internal audit review conducted in 2016 drew attention to weaknesses in control over fixed assets. This included an inability to reconcile the fixed asset register with the value included in the financial statements, assets included on the asset register that were no longer in use and the location of some assets not correctly recorded in the asset register.

The Institute had planned to complete a full review of assets during 2017 to include a full stocktake of assets. However, this review could not be completed until all the assets and the relevant depreciation on those assets from manual systems were uploaded to the fixed asset register on our financial system. The Institute plans to conduct a full review during 2018 and to recognise any required adjustments in the 2018 financial statements. The Institute does not expect the required adjustments will have any material effect on the net book value in the financial statements at 31/12/2018.

The Marine Institute pays grants to various third parties (i.e. third level institutions, companies involved in marine research) under the Marine Research programme. In accordance with the provisions of Department of Public Expenditure and Reform (DPER) Circular 13/2014 (Management of and Accountability for Grants from Exchequer Funds) the Institute applied in February 2017, via the Department of Agriculture, Food and the Marine, for sanction from DPER to continue pre-funding these grants. At the date of approving the financial statements the Institute had not received formal sanction from DPER. The audit reviewed 13 grant payments totalling €1.3m and found that seven of the grant payments totalling €673k were prefunded for which DPER sanction had not been received. The payments represented advance payments, primarily to third level institutions.

On behalf of the Board



**Dr John Killeen**

Chairperson

4/12/2018

# Statement of Income and Expenditure and Retained Revenue Reserves

Year Ended 31 December 2017

	Note	2017 €'000	2016 €'000
<b>Income</b>			
Oireachtas Grants	2	31,363	29,775
Other State Grants	3	6,557	5,329
EU and Other Income	4	5,564	4,608
Net Deferred Funding For Retirement Benefits	17	3,836	2,970
		<b>47,320</b>	<b>42,682</b>
<b>Expenditure</b>			
Remuneration and Pension Costs	5	12,682	11,814
Retirement Benefit Costs	17	3,702	2,863
Vessel Operating Costs	6	7,709	7,532
Travelling Expenses	7	1,365	1,139
Grants and External Service Providers	8	9,130	9,375
Facilities Costs	9	1,958	2,010
IT, Telephone & Communications		1,412	1,315
Laboratory & Field Costs		1,153	1,044
Other Administration and Equipment Hire Costs	10	3,617	2,624
Depreciation	14	5,244	4,820
<b>Total Expenditure</b>		<b>47,972</b>	<b>44,536</b>
Transfer (to)/from Capital Account	13	602	1,882
(Deficit) \ Surplus for the year		(50)	28
Balance brought forward at 1 January		2,043	2,015
<b>Balance carried forward at 31 December</b>		<b>1,993</b>	<b>2,043</b>

The Statement of Cashflow and Notes 1 – 22 form part of these financial statements.

On Behalf of the Board



**Dr John Killeen**

Chairperson

4/12/2018.

On Behalf of the Board



**Prof Patricia Barker**

Board Member

4. XII 2018

# Statement of Comprehensive Income

Year Ended 31 December 2017

	Note	2017 €'000	2016 €'000
Surplus/(Deficit) for the year after Appropriations		(50)	28
Experience (Losses) Gains on Retirement Benefits Scheme Obligation	17	(3,754)	1,251
Changes in assumptions underlying the present value of the Retirement Benefit Obligation	17	(139)	(10,101)
Adjustment to Deferred Benefits Scheme Funding		3,893	8,850
<b>Total of Comprehensive Income for the year</b>		<b>(50)</b>	<b>28</b>

The Statement of Cashflow and Notes 1 – 22 form part of these financial statements.

On Behalf of the Board

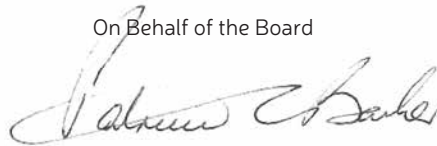


**Dr John Killeen**

Chairperson

4/12/2018

On Behalf of the Board



**Prof Patricia Barker**

Board Member

4. XII. 2018

# Statement of Financial Position

Year Ended 31 December 2017

		2017	2017	2016	2016
	Note	€'000	€'000	€'000	€'000
<b>Property, Plant and Equipment</b>	14		18,228		18,830
<b>Current Assets</b>					
Receivables	15	6,981		5,129	
Cash and cash equivalents		137		892	
		7,118		6,021	
<b>Current Liabilities (amounts falling due within one year)</b>					
Payables	16	5,125		3,978	
<b>Net Current Assets</b>			1,993		2,043
<b>Total Assets Less Current Liabilities before Retirements Obligation</b>			20,221		20,873
Deferred Retirement Benefits Obligations	17	(59,599)		(51,870)	
Deferred Retirement Benefits Funding	17	59,599		51,870	
<b>Total Net Assets</b>			20,221		20,873
<b>Representing:</b>					
Capital Account	13	18,228		18,830	
Income and Expenditure Account		1,993		2,043	
			20,221		20,873

The Statement of Cashflow and Notes 1 – 22 form part of these financial statements.

On Behalf of the Board

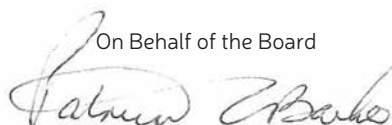


**Dr John Killeen**

Chairperson

24/12/2018

On Behalf of the Board



**Prof Patricia Barker**

Board Member

4. XII. 2018

# Statement of Cash Flows

Year Ended 31 December 2017

	2017	2016
	€'000	€'000
<b>Net Cash flows from operating activities</b>		
(Deficit) \ Surplus for the financial year	(50)	28
Adjustments for:		
Depreciation of tangible Property, Plant and Equipment	5,244	4,820
Transfer to Capital Account	(602)	(1,882)
Decrease/(Increase) in Receivables	(1,852)	(678)
(Decrease)/Increase in Payables	1,147	961
<b>Net cash flows from operating activities</b>	<b>3,887</b>	<b>3,249</b>
<b>Cash flows from investing activities</b>		
Payments for tangible Property, Plant and Equipment	(4,642)	(2,938)
<b>Net cash flows from investing activities</b>	<b>(4,642)</b>	<b>(2,938)</b>
<b>Net (decrease)/increase in cash and cash equivalents</b>	<b>(755)</b>	<b>311</b>
Cash and cash equivalents at beginning of financial year	892	581
<b>Cash and cash equivalents at end of financial year</b>	<b>137</b>	<b>892</b>

# Notes to the Financial Statements

## Year Ended 31 December 2017

### 1. Accounting Policies

The basis of accounting and significant accounting policies adopted by the Marine Institute are set out below. They have all been applied consistently throughout the year and for the preceding year. The Institute has analysed its expenditure based on the nature of the expense as opposed to a programme basis.

#### a) General Information

The Marine Institute was established on 30 October 1992 under the provisions of the Marine Institute Act 1991. The Institute headquarters is located in Rinville, Oranmore, County Galway, H91 R673.

The Marine Institute's primary objectives as set out in section 4 of the Act are

"to undertake, to co-ordinate, to promote and to assist in marine research and development and to provide such services related to marine research and development, that in the opinion of the Institute will promote economic development and create employment and protect the marine environment".

The Marine Institute is a Public Benefit Entity (PBE).

#### b) Statement of Compliance

The financial statements of The Marine Institute for the year ended 31 December 2017 have been prepared in accordance with FRS 102, the financial reporting standard applicable in the UK and Ireland issued by the Financial Reporting Council (FRC), as promulgated by Chartered Accountants Ireland.

#### c) Currency

The financial statements have been presented in Euro (€) which is also the functional currency of the Institute. In instances where amounts have been rounded to the nearest thousand Euro, this is indicated by the symbol €'000.

#### d) Basis of Preparation

The financial statements are prepared under the accruals method of accounting and under the historical cost convention in the form approved by the Minister for Food, Agriculture and the Marine with the concurrence of the Minister for Public Expenditure and Reform, in accordance with Section 12(1) of the Marine Institute Act 1991.

The following accounting policies have been applied consistently in dealing with items which are considered material in relation to The Marine Institute's financial statements.

#### e) Income

Income arising from Oireachtas Grants is recognised on a cash receipts basis, except for the Oireachtas income in relation to the European Maritime and Fisheries Fund (EMFF) expenditure. This is recognised on an accruals basis as the Oireachtas income for the direct related expenditure is funded in the year after occurrence of the expenditure.

Income received in relation to EU and other contract research projects is recognised on an accruals basis whereby the income is recognised in the accounting period in which the related expenditure is charged. Income received in advance is treated as deferred income and included within Payables in the Statement of Financial Position. Expenditure incurred where the related income has not been received is treated as accrued income and shown as a Receivable in the Statement of Financial Position.

#### f) Property, Plant and Equipment and Depreciation

Property, Plant and Equipment are stated at cost less accumulated depreciation, except land, which is carried at cost. Depreciation is provided on a straight line basis at rates estimated to reduce the assets to their realisable value by the end of their expected lives. The rates in use are as follows:

Buildings	2%
Fixtures and Fittings	25%
Computers	33%
Research Vessel	4%
Research Vessel Equipment	20 - 25%
Motor Vehicles	20%

The carrying values of the tangible assets are reviewed for impairment when events or changes in circumstances indicate that the carrying value may not be recoverable. If there is objective evidence of impairment of the value of the asset, an impairment loss is recognised in the Statement of Income and Expenditure and Retained Revenue Reserves in the year.

#### g) Leased Assets

Rental expenditure under operating leases is recognised in the Statement of Income and Expenditure and Retained Revenue Reserves over the life of the lease. Expenditure is recognised on a straight-line basis over the lease period, except where there are rental increases linked to the expected rate of inflation, in which case these increases are recognised when incurred. Any lease incentives received are recognised over the life of the lease.



**h) Capital Account**

The Institute recognises funding received for capital purposes under the Accruals Model specified in FRS102. The amount received is recognised in income on a systematic basis over the expected useful life of the asset.

**i) Foreign Currencies**

Transactions denominated in a foreign currency are translated into the functional currency using the spot exchange rates at the date of the transactions. At the end of each financial year, foreign currency monetary items are translated to Euro using the closing rate. Non-monetary items measured at historical cost are translated using the exchange rate at the date of the transaction and non-monetary items measured at fair value are measured using the exchange rate when fair value was determined.

**j) Marine Research Programme**

The Marine Institute enters into commitments in respect of contracts awarded for Marine Research Programme projects. Expenditure is charged in the financial statements on the basis of initial payments made on the signing of the project contract, an interim payment may be made subject to satisfactory performance and further payments are charged on receipt and verification of claims in respect of work completed. Costs incurred by the Institute in the administration of Marine Research Programme projects are funded by the capital vote of the Marine Institute and charged to the financial statements as they are incurred.

**k) Employee Benefits****Short term benefits**

Short term benefits such as holiday pay are recognised as an expense in the year, and benefits that are accrued at year-end are included in the payables figures in the Statement of Financial Position.

**l) Retirement Benefits**

The Marine Institute previously established its own defined benefit pension scheme, funded annually on a pay-as-you-go basis from monies provided by the Department of Agriculture, Food and the Marine and from contributions deducted from staff and members' salaries. The Marine Institute also operates the Single Public Service Pension Scheme ("Single Scheme"), which is a defined benefit scheme for pensionable public

servants appointed on or after 1 January 2013. Single Scheme members' contributions are paid over to the Department of Public Expenditure and Reform (DPER).

Pension costs reflect pension benefits earned by employees, and are shown net of staff pension contributions which are remitted to the Department of Agriculture, Food and the Marine. An amount corresponding to the pension charge is recognised as income to the extent that it is recoverable, and offset by grants received in the year to discharge pension payments.

Actuarial gains or losses arising on scheme liabilities are reflected in the Statement of Comprehensive Income, and a corresponding adjustment is recognised in the amount recoverable from the Department of Agriculture, Food and the Marine.

The financial statements reflect, at fair value, the assets and liabilities arising from The Marine Institute's pension obligations and any related funding, and recognises the costs of providing pension benefits in the accounting periods in which they are earned by employees. Retirement benefit scheme liabilities are measured on an actuarial basis using the projected unit credit method.

**Receivables**

Receivables are recognised at fair value, less a provision for doubtful debts. The provision for doubtful debts is a specific provision, and is established when there is objective evidence that the Marine Institute will not be able to collect all amounts owed to it. All movements in the provision for doubtful debts are recognised in the Statement of Income and Expenditure and Retained Revenue Reserves.

**Contingencies**

Contingent liabilities, arising as a result of past events, are not recognised when (i) it is not probable that there will be an outflow of resources or that the amount cannot be reliably measured at the reporting date or (ii) when the existence will be confirmed by the occurrence or non-occurrence of uncertain future events not wholly within the Institute's control. Contingent liabilities are disclosed in the financial statements unless the probability of an outflow of resources is remote.

Contingent assets are not recognised. Contingent assets are disclosed in the financial statements when an inflow of economic benefits is probable.

## **Related Parties**

Related party transactions have been disclosed in the notes to the financial statements in accordance with FRS 102. See note 19 for disclosure of the related party transactions during 2017.

## **Critical Accounting Estimates and Judgements**

The preparation of the financial statements requires management to make judgements, estimates and assumptions that affect the amounts reported for assets and liabilities as at the reporting date and the amounts reported for revenues and expenses during the year. However, the nature of estimation means that actual outcomes could differ from those estimates. The following judgements have had the most significant effect on amounts recognised in the financial statements.

### **Impairment of Property, Plant and Equipment**

Assets that are subject to amortisation are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment loss is recognised for the amount by which the asset's carrying amount exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less cost to sell and value in use. For the purpose of assessing impairment, assets are grouped at the lowest levels for which there are separately identifiable cash flows (cash generating units). Non-financial assets that suffered impairment are reviewed for possible reversal of the impairment at each reporting date.

### **Depreciation and Residual Values**

The Board has reviewed the asset lives and associated residual values of all fixed asset classes, and in particular, the useful economic life and residual values of fixtures and fittings, and have concluded that asset lives and residual values are appropriate.

### **Retirement Benefit Obligation**

The assumptions underlying the actuarial valuations for which the amounts recognised in the financial statements are determined (including discount rates, rates of increase in future compensation levels, mortality rates and healthcare cost trend rates) are updated annually based on current economic conditions, and for any relevant changes to the terms and conditions of the pension and post-retirement plans.

The assumptions can be affected by:

- » the discount rate, changes in the rate of return on high-quality corporate bonds
- » future compensation levels, future labour market conditions
- » Health care cost trend rates, the rate of medical cost inflation in the relevant regions.

## 2. Oireachtas Grants From the Department of Agriculture, Food and Marine

	2017	2017	2016	2016
	€'000	€'000	€'000	€'000
<b>Current Purposes</b>				
Marine Institute - Vote 30, Subhead A.7	17,047		15,943	
EMFF Income (Note 15)	4,808		4,285	
Less Superannuation contributions repayable	(492)		(453)	
		21,363		19,775
<b>Capital purposes</b>				
Marine Research Programme Vote 30, Subhead A.7 (Note 12)	10,000		10,000	
		10,000		10,000
		31,363		29,775

Since 2014, the EMFF Income has been accounted for on an accruals basis as the direct related expenditure is funded in the year after occurrence. The EMFF is the EU's maritime and fisheries policies fund which is co-funded by the EU and the Department of Agriculture, Food and the Marine and supports Ireland's operational programme.

By agreement with the Department of Agriculture, Food and the Marine, employee pension contributions are refunded directly to the Department and are shown as a reduction in grant levels. Single service pension contributions are remitted to the Department of Public Expenditure and Reform.

## 3. Other State Grants

	2017	2017	2016	2016
	€'000	€'000	€'000	€'000
National Seabed Survey – Department of Communications, Energy and Natural Resources Vote 29, Subhead D.7	2,000		1,751	
Databuoy – Department of Transport, Tourism and Sport Vote 31, Subhead C.3	413		413	
Marine Strategy Framework Directive (DECLG)	0		260	
Natura – Department of Agriculture, Food & Marine Vote 30 Subhead C.7	0		370	
Water Framework Directive funded by EPA	1,224		1,261	
FIRM projects funded by Department of Agriculture, Food & Marine Vote	342		154	
Wave Energy Test Sites Funded by SEAI	1,010		1,120	
EMFF projects funded by Department of Agriculture, Food & Marine Vote	1,568		0	
<b>TOTAL</b>		6,557		5,329

## 4. EU and Other Income

	2017	2017	2016	2016
	€'000	€'000	€'000	€'000
<b>EU Contract Research</b>		2,545		1,414
<b>Other Income</b>				
Research Vessel Charterage	1,652		1,803	
Insurance Refund	0		316	
Sundry and Other Contract Income	1,367		1,075	
		3,019		3,194
<b>TOTAL</b>		5,564		4,608

Prior year figures have been amended to reflect a reclassification of income of €0.089m which was netted against remuneration and costs in 2016.

## 5. Remuneration and Pension Costs

Aggregate Employee Benefits	2017	2016
	€'000	€'000
<b>Staff Short term benefits</b>	11,118	10,446
<b>Termination Payments</b>	0	0
*Pension Contribution	387	251
Board Fees	61	68
Holiday Accrual Cost	58	69
Employers Contribution to Social Welfare	1,058	980
	<b>12,682</b>	<b>11,814</b>

Total salary costs include an accumulated accrual of €0.324m (2016: €0.265m) in respect of accumulated staff annual leave entitlements.

Pension related deductions of €0.390m (2016 €0.387m) were made from salaries and were remitted to the Department of Agriculture, Food and the Marine. Single pension related deductions of €0.090m (2016 €0.063m) were made from salaries and were remitted to the Department of Public Expenditure and Reform.

Pension contribution (20% of Gross Pay) is to cover the deferred cost to the Exchequer of future pension entitlements for employees on contract research and other externally funded posts. This amount was refunded to the Department of Agriculture, Food and the Marine.

Income received in 2016 of €0.089m for staff on EU secondment was netted off against the remuneration cost in 2016. The 2016 cost of these seconded staff is included under remuneration and pension costs and has been re-stated for 2017. Prior year figures have been amended to reflect a reclassification of income of €0.089m which was netted against remuneration and costs in 2016.

Staff Short term Benefits	2017	2016
	€'000	€'000
<b>Basic Pay</b>	10,559	9,916
<b>Overtime</b>	0	0
Allowances	559	530
	<b>11,118</b>	<b>10,446</b>

The average number of employees by location at year end is as follows:

Employees	2017	2016
	No.	No.
Rinville Galway	179	170
Newport	16	14
Wilton Terrace, Dublin	11	12
Ports	10	8
	<b>216</b>	<b>204</b>
<b>The whole time equivalents at each year end</b>	<b>207.50</b>	<b>199.9</b>

Key Management and Personnel	2017	2016
	€'000	€'000
Salary	750	715

Key Management personnel in the Marine Institute include the members of the Board, the Chief Executive Officer and the Executive directors of the Marine Institute. The total value of employee benefits for key personnel is set out above. No payments in respect of termination payments, allowances and health insurance were made. This does not include the value of retirement benefits earned in the period. The Executive directors and CEO are members of the Marine Institute Staff Superannuation Scheme 1998 and their entitlements in that regard do not extend beyond the terms of the model public service pension scheme.

	2017	2016
Chief Executive Officer Salary and Expenses	€'000	€'000
Basic Pay	138	136

The total expenses for business purposes paid to the CEO for 2017 was €17,449 (2016: €15,708) which includes foreign travel expenses of €3,079. The total expenses paid to key executive management in 2017 was €67,192 (2016: €65,633).

## Employee Short-Term Benefits Breakdown

Employees' short-term benefits in excess of €60,000 are categorised into the following bands:

Wages and Salaries breakdown of Employees	2017	2016
	No.	No.
€60,000 - €69,999	42	45
€70,000 - €79,999	26	21
€80,000 - €89,999	5	2
€90,000 - €99,999	4	5
€100,000 - €109,999	1	1
€110,000 - €119,999	0	0
€120,000 - €129,999	0	0
€130,000 - €139,999	1	1

## 6. Vessel Operating Costs

	2017	2016
	€'000	€'000
Payroll and Associated Costs	4,321	4,173
Fuel	976	843
Insurance	230	236
Victualling	167	179
Management Fee	216	232
Port Fees and Safety	92	89
Leases	133	133
Engineering and Maintenance Costs	835	863
Operating and Administration Costs	739	784
	<b>7,709</b>	<b>7,532</b>

The vessel operating costs exclude the cost of vessel equipment and refits which are capitalised per note 14. The vessels are owned by the Marine Institute and the operations of the vessels are subcontracted to a vessel management company.

Prior year figures have been amended to reflect a reclassification of expenditure of €24k which was under operating and administration costs in 2016. This has been reclassified under travelling expenses for 2016.

## 7. Travelling Expenses

Travel & Subsistence	2017	2016
	€'000	€'000
Domestic	788	694
Foreign	577	445
	<b>1,365</b>	<b>1,139</b>

Prior year figures have been amended to reflect a reclassification of expenditure of €24k which was under operating and administration costs in 2016. This has been reclassified under travelling expenses for 2016.

## 8. Grants and External Service Providers

	2017	2016
	€'000	€'000
Marine Research Programme Grants and support costs (Note 12)	3,216	3,828
Seafarer Training & Education	185	184
Contractors, External Service Providers, Professional Fees and Other Research Funding	5,233	4,748
Sample Analysis	496	615
	<b>9,130</b>	<b>9,375</b>

## 9. Facilities Costs

	2017	2016
	€'000	€'000
Maintenance	1,074	855
Light & Heat	437	450
Replacements	162	468
Other	285	237
	<b>1,958</b>	<b>2,010</b>

## 10. Other Administration and Equipment Hire Costs

	2017	2016
	€'000	€'000
Rent, Rates & Other Property Costs	237	237
Journal Subscriptions, Memberships and Library Costs	218	138
Training	183	181
Stationery & Consumables	115	127
Publications, Promotional Materials and Design	503	436
Insurance	134	123
Audit fee	18	17
Hire of Equipment & Vessels	1,299	764
Sundry Equipment	26	136
Other Admin Costs	884	465
	<b>3,617</b>	<b>2,624</b>

The provisions of the European Communities (Late Payment in Commercial Transactions) Regulations 2012 (S.I. No. 580 of 2012 ) apply to the Marine Institute. Interest and compensation paid during 2017 was €11,809 (2016: €3,238).

## 11. Taxation

The Marine Institute is specifically exempted under the provisions of Section 32 and Schedule 2 of the Finance Act 1994. Accordingly, no taxation charge has been included in the financial statements.

## 12. Beaufort and Marine Research Programme 2014 - 2020 (NDP 2007-2013)

	2017	2016
	€'000	€'000
Oireachtas Income (Note 2)	10,000	10,000
Other income	322	61
<b>Total Income on Marine Research</b>	<b>10,322</b>	<b>10,061</b>
Expenditure on Marine Research Programme projects		
Shiptime Award Payments	2,685	2,997
Marine Research Programme Grants (Note 8)	3,216	3,828
Marine Research Policy Support Payments	1,645	1,346
Marine Institute Capital, IT and Oceanographic Equipment	1,676	1,690
Marine Institute Vessel Equipment and Refit	1,100	200
<b>Total Expenditure on Marine Research</b>	<b>10,322</b>	<b>10,061</b>

### Marine NDP 2007- 2013

The investment in marine research under the NDP Marine Research Sub-Programme 2007-2013 was targeted at (i) meeting objectives, (ii) research activities and (iii) outputs of Sea Change, the national marine knowledge, research and innovation strategy and Harnessing Our Ocean Wealth – An Integrated Marine Plan for Ireland (July 2012). Funding was targeted at the Research Measures and Programmes of the strategy via a range of mechanisms, including competitive calls for research proposals (e.g. project-based awards, desk studies, PhD/Post-Doctoral Fellowships, access to research vessels) and tendering for the provision of infrastructure/services.

A total of 142 projects have been supported under the Marine Research Sub-Programme of the NDP 2007-2013 with only one of these projects still ongoing at the start of 2017 and this was completed in February 2017.

### Marine Research Programme 2014-2020

In 2014, the Marine Institute launched the Cullen Fellowship Programme, an annual programme call to provide post-graduate research training opportunities for students in marine science and related disciplines. Investment in this programme has continued annually, since then 22 Cullen Fellows have now commenced.

The National Marine Research & Innovation Strategy 2017-2021 was published in June 2017, which identified 15 research themes under the three goals of Harnessing Our Ocean Wealth, and this strategy will set the research priorities for the next number of years. Two research calls were launched by the Marine Institute in 2017 with a total of €3.3m in new investment made for 19 equipment and infrastructure awards to the higher education sector and marine enterprises plus a research project on ocean law and governance, which will focus on the likely consequences of Brexit for the marine sector and will support three new researcher posts over four years. In addition a further €1.3m was invested in five co-funded projects with national and international funding agencies (SFI, GSI, EPA, Met Éireann, EU and the Fulbright Commission) that will carry out research on ocean observation and seabed mapping, climate change and marine bioresources.

Research Projects awarded are subject to contract which specifies that an initial payment will be made on signing of the contract; an interim payment(s) may be made subject to satisfactory performance with final payment made on receipt of and verification of claims. Expenditure is charged in the financial statements in accordance with the Marine Research Programme accounting policy. At 31 December 2017 payments in the amount of €446,767 (2016: €526,180) were outstanding on amounts charged to the financial statements and are included within payables.

A total of 189 projects have been supported under the Marine Research Programme 2014-2020 with 85 of these projects still ongoing at the end of 2017.

Contractual commitments at 31 December 2017, which have not yet been charged to the financial statements, were €13.1 m, analysed as follows:

	Total
	€'000
Commitments as at 1 January 2017	11,230
Committed in 2017	9,758
Paid in 2017	(7,839)
<b>Commitments as at 31 December 2017</b>	<b>13,149</b>

### 13. Capital Account

	2017	2017	2016	2016
	€'000	€'000	€'000	€'000
Balance at 1 January		18,830		20,712
<b>Transfer (to) /from Income and Expenditure Account</b>				
Income allocated for Capital funding	4,642		2,938	
Depreciation charge for the year	(5,244)		(4,820)	
Net Transfer (to)/from Income & Expenditure Account		(602)		(1,882)
Balance at 31 December		18,228		18,830

### 14. Property, Plant and Equipment

	Land & Buildings	Research Vessels	Vessel Equipment	Fixtures & Fittings	Computers	Motor Vehicles	TOTAL
	€'000	€'000	€'000	€'000	€'000	€'000	€'000
<b>Cost or Valuation</b>							
Balance at 1 January 2017	3,743	33,603	7,176	27,497	9,929	405	82,353
Additions	-	1,178	208	2,116	999	141	4,642
Disposals	-	-	-	(97)	-	(107)	(204)
<b>Cost at 31 December 2017</b>	<b>3,743</b>	<b>34,781</b>	<b>7,384</b>	<b>29,516</b>	<b>10,928</b>	<b>439</b>	<b>86,791</b>
<b>Depreciation</b>							
Balance at 1 January 2017	1,226	21,826	5,944	24,921	9,318	288	63,523
Charge for the financial year	75	1,639	786	1,957	722	65	5,244
Disposal	-	-	-	(97)	-	(107)	(204)
Balance at 31 December 2017	1,301	23,465	6,730	26,781	10,040	246	68,563
<b>Net Book Value</b>							
At 31 December 2017	2,442	11,316	654	2,736	889	193	18,228
At 31 December 2016	2,517	11,777	1,232	2,576	611	117	18,830

The Marine Institute's headquarters are at Rinville, Oranmore, County Galway. This building, which is owned by the OPW, is provided rent free. The facility and land in Newport was transferred to the Institute by the Guinness Trust and Salmon Research Agency of Ireland for a nominal amount. All land and buildings are valued at historic cost and a revaluation will be carried out on land and buildings during 2018 after a professional valuation has been carried out. The other various premises used by the Institute in Dublin and at the ports are held under either operating leases or rental agreements as set out in Note 18.

### 15. Receivables

	2017	2016
	€'000	€'000
Trade Receivables	305	74
Contract Income	1,081	191
EMFF Accrued Income (Note 2)	4,808	4,285
Prepayments	787	579
	<b>6,981</b>	<b>5,129</b>

All receivables are due within one year. Trade receivables are shown net of impairment in respect of doubtful debts.



## 16. Payables

	2017	2016
	€'000	€'000
<b>Amounts falling due within one year</b>		
Trade Payables	2,679	1,783
Deferred Income	1,176	841
Marine Research Programme Accrual (Note 12)	447	526
Accruals	167	218
Payroll and Revenue Accruals	332	345
Holiday Pay Accrual (Note 5)	324	265
	5,125	3,978

Included in payables above are the following amounts due to the Revenue Commissioners:

	2017	2016
	€'000	€'000
Professional Service Withholding Tax	161	124
PAYE/PRSI/USC	332	341
VAT	135	118
Relevant Contract Tax	1	0
	629	583

## 17. Superannuation Scheme and Spouse & Children's Contributory Retirement Benefits Scheme

### a. General Description of the Scheme

The Marine Institute is a statutory State agency, established under section 3(1) of the Marine Institute Act, 1991 (No. 2 of 1991). Section 9(1) of the Act provides that the Institute shall make schemes for the granting of superannuation benefits to and in respect of staff members, subject to Ministerial approval. Two such approved schemes – the Marine Institute Staff Superannuation Scheme 1998 and the Marine Institute Spouses' and Children's Contributory Pension Scheme 1998 are being operated by the Institute. The former scheme provides retirement benefits (lump sum and pension) to staff members and death gratuity benefits in respect of death in service. The latter scheme provides pension benefits for the surviving spouses and dependent children of deceased members. Normal retirement age is a member's 65th birthday. Both schemes are defined benefit superannuation schemes. Staff Superannuation contributions are paid to the Department of Agriculture, Food and the Marine.

For the purposes of reporting in accordance with FRS102, the Institute has been advised by a qualified actuary who has prepared a full valuation in order to assess the liabilities of the superannuation schemes at 31 December 2017.

The principal actuarial assumptions, per annum, are as follows:

	2017	2016	2015
Inflation rate increase	1.95%	1.90%	1.65%
Salary rate increase	2.95%	2.90%	2.65%
Pension rate increase	2.45%	2.40%	2.15%
Scheme liabilities discount rate	2.00%	1.96%	2.55%

As pension increases under the Marine Institute schemes are based on salary increases rather than on price increases, a price inflation assumption is not necessary for the purposes of this valuation. However, since FRS 102 requires reference to an assumed rate of inflation, the above rate would be appropriate for this purpose.

The average remaining future life expectancy according to the mortality tables used to determine pension liabilities, is as follows:

	2017	2016
Male aged 65	21.2	21.1
Female aged 65	23.7	23.6

On the basis of these and other assumptions and applying the projected unit method prescribed in FRS 102, the deferred funding asset and retirement benefits liability are as follows:

	2017	2016
Total accrued retirement benefits liability	€59.60m	€51.80m

## b. Analysis of the Total Pension Costs charged to Expenditure

	2017	2016
	€'000	€'000
Current Service Cost	3,181	2,299
Interest on pension scheme liabilities	1,013	1,017
Employee Contributions	(492)	(453)
	3,702	2,863

## c. Analysis of the amount recognised in the Statement of Comprehensive Income

	2017	2016
	€'000	€'000
Experience gains/(Losses)	(3,754)	1,251
Changes in assumptions underlying the present value of scheme	(139)	(10,101)
<b>Actuarial gain and (loss) recognised in the Statement of Comprehensive Income</b>	<b>(3,893)</b>	<b>(8,850)</b>

## d. Net Deferred Funding for Pensions Recognised in the year

	2017	2016
	€'000	€'000
Current Service and Interest Cost	4,194	3,316
Less benefits paid in the year	(358)	(346)
	3,836	2,970

The Marine Institute recognises amounts owing from the State as an asset corresponding to the unfunded deferred liability for pensions on the basis of the set of assumptions described above and a number of past events. These events include the statutory basis for the establishment of the superannuation scheme and the policy and practice in relation to funding public service pensions, including contributions from employees and the annual estimates process. In common with the generality of public service superannuation schemes, no separate fund is maintained, or assets held, to finance the payment of pensions and gratuities.

In line with the custom and practice as adopted by the Department of Agriculture, Food and the Marine to date, the Marine Institute has no evidence that this funding policy will not continue to meet such sums in accordance with current practice. The deferred funding asset for pensions as at 31 December 2017 amounted to €59.6million (2016: €51.87million). The quantification of the liability is based on the financial assumptions set out in this note. The assumptions used, which are based on professional actuarial advice, are advised to the Department of Agriculture, Food and the Marine but are not formally agreed with the Department.

## e. Analysis of movement in net pension liability during the year

	2017	2016	2015	2014	2013	2012
	€'000	€'000	€'000	€'000	€'000	€'000
Liability at the beginning of the year	51,870	40,050	30,200	28,200	27,501	26,004
Current Service Cost	3,181	2,299	1,772	1,800	1,900	1,900
Interest on Scheme Liabilities	1,013	1,017	1,652	1,500	1,500	1,400
Actuarial (Gain)Loss recognised in the Statement of Comprehensive Income	3,893	8,850	6,772	(816)	(2,339)	(1,360)
Benefits paid in the year	(358)	(346)	(346)	(484)	(362)	(443)
<b>Liability at the end of the year</b>	<b>59,599</b>	<b>51,870</b>	<b>40,050</b>	<b>30,200</b>	<b>28,200</b>	<b>27,501</b>

## f. History of Defined Benefit Obligations

	2017	2016	2015	2014	2013
	€'000	€'000	€'000	€'000	€'000
Deficit benefit obligations	59,599	51,870	40,050	30,200	28,200
Experience Gains/(Losses) on Scheme Liabilities	(3,754)	1,251	1,694	816	2,339
Percentage of Scheme Liabilities	6.3%	2.4%	4.2%	2.7%	8.3%
Assumption Gains/(Losses) on Scheme Liabilities	(139)	(10,101)	(8,466)	-	-
Percentage of Scheme Liabilities	0%	19.4%	21.1%	0%	0%

The cumulative actuarial loss recognised in the Statement of Comprehensive Income amounts to €12,263,000.

## 18. Operating Lease commitments

The Marine Institute occupies leased and rented premises at the following locations:

- Lease 1: Wilton Park House, Dublin 2, commenced in 2015 for a period of 4 years and 3 months and is due to terminate on 31st October 2019.
- Lease 2: Parkmore Office Park, Galway, commenced in 1999 for a period of 25 years with five yearly rent reviews.
- Lease 3: Red Sail Warehouse, Galway Harbour, commenced in 2013 for a period of 11 years with a rent review in 2018.
- Lease 4: Industrial Land, Galway Harbour, commenced in 2014 for a period of 5 years with the option to extend to August 2024.
- Lease 5: Industrial Land, Galway Technology Park, commenced in 1988 for a period of 999 years, with five yearly rent reviews.
- Lease 6: Foreshore lease in Spiddal, granted for 35 years with effect from 15th Dec 2017.
- Rental Agreements: The Institute has a number of rental agreements relating to piers, labs and sheds, all of which are renewable on an annual basis.

The total future minimum lease payments under non-cancellable operating leases, all of which relate to Land & Buildings, are as follows:

Relating to leases:	2017	2016
	€'000	€'000
Payable within 1 year	308	308
Payable between 2 and 5 years	849	900
Payable thereafter	227	342
	<b>1,384</b>	<b>1,550</b>

Operating lease payments recognised as an expense in 2017 amounted to €308,737 (2016: €308,750).

## 19. Related Party Transactions

Smartbay (Ireland) Ltd, was established to implement the Programme for Research in Third-Level Institutions (PRTLII) Smartbay project to develop a Marine Research, Test and Demonstration Platform consisting of a communications and sensing infrastructure deployed in Galway Bay. The company was established as a company limited by guarantee by PRTLII project partners Dublin City University (DCU) and National University of Galway in Feb 2012.

The Institute's CEO was a Board member until May 2016 and the Head of Corporate Services of the Institute is the Secretary. During 2017, the Institute advanced funding of €365,550 to Smartbay Ltd (2016: €350,585). This expenditure is included within research expenditure in Note 8 to these financial statements. The payment is in respect of a contract to provide operational support in respect of the development of the Ocean Energy Test Site in Galway and the Atlantic Test Site at Belmullet and the balance outstanding to Smartbay Ltd at 31st Dec 2017 was €0 (2016: €0).

## 20. Register of interests

The Institute has adopted procedures in accordance with the guidelines issued by the Department of Public Expenditure and Reform in relation to the disclosure of interest by the Board and the Institute has adhered to these procedures. There were no transactions in the year in relation to the Institute's activities in which members of the Board had a beneficial interest.

## 21. Events after the end of the financial year

The Board is not aware of any events occurring after 31 December 2017 which affect these financial statements.

## 22. Board Approval

The financial statements were approved by the Board on 4 Dec 2018.











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*Marine Institute*

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