TERMS OF REFERENCE

Marine Research Programme	
Research Measure:	**Industry**
Research Programme:	**Fisheries Resources**
Project Type:	**Infrastructure Supporting (Specialist Laboratories and Facilities)**
Project Title:	**Newport Research Facility – Catchment Research Cluster**

BACKGROUND

Newport Research Facility

The Marine Institute's Newport Research Facility is located in Furnace, Newport, Co. Mayo, on the Burrishoole catchment and runs from the small rivers in the Nephin Beg mountains to the marine waters of Clew Bay. The facility in Newport has been in existence since 1955, when it was established by the Salmon Research Trust of Ireland. It is comprised of a laboratory, administration block, freshwater hatchery, fish rearing facilities, fish census trapping stations, a salmonid angling fishery and a comprehensively monitored freshwater lake and river catchment. In Newport, the Marine Institute hosts a wide range of practically based fisheries and environmental research and monitoring projects, with a major focus on wild salmonid and eel research and assessment.

It is a site for integrated research into freshwater and brackish ecosystems and their interaction with climate and the environment. Work at the Newport Research Facility is facilitated by the local landowners and Coillte. The fish traps situated at installations lying between Loughs Furnace and Feeagh possess the unique advantage of being able to monitor all movements of fish to and from freshwater. The "Salmon Leap Trap" and the "Mill Race Trap" both monitor fish moving upstream and downstream. These traps enable full census to be carried out on wild salmon, released reared salmon, sea trout and eels. Upstream & downstream fish trapping facilities were installed in 1958, with full trapping in place since 1970. Data collected from the trapping facilities are used extensively by the International Council for the Exploration of the Seas (ICES) to gauge the overall status of the Irish stocks on an annual basis. The Burrishoole system is one of the key index systems for salmon, sea trout & eel in the north Atlantic and is now also well established as a centre for environmental monitoring and climate change research. The "Shrarevagh River Trap" allows the isolation of a small portion of the upper catchment for carrying out detailed studies related to juvenile fish production and fish genetics.

The Newport Research Facility also operates a comprehensive range of freshwater salmonid fish rearing facilities. These facilities comprise a broodstock holding pond, two isolated hatchery units for egg incubation and hatching and indoor and outdoor rearing tanks for on-growing in biosecure locations. The facilities are central to the ongoing salmon ranching programme which involves the release of groups of micro-tagged salmon smolts and the recovery of adults in the fish traps on their return.

Reared smolts derived from Burrishoole grilse have been released into the system since 1956, but it was not until 1964 that sufficient adults were available to establish a breeding population. Since that time adult returns from reared smolts have been used to establish the line-bred Burrishoole ranched stock.

One of the strengths of the Newport Facility is that all elements for a field and research programme are in close proximity to each other and are under the control of the one group. This allows for efficiency, reliability and accuracy – all essential elements in an R & D programme.

Fish trapping operations at Newport have the unique advantage of being able to monitor all movements of fish to and from freshwater.

The Marine Institute undertakes a programme of catchment based juvenile salmonid & eel population assessments & production biology in conjunction with high resolution habitat & environment data collection and projects. These data sets are used to support the establishment of escapement targets for spawning salmon & sea trout and are central to the conservation of the European eel. The collection of high resolution environmental data in the catchment has facilitated the research projects in the climate change field and modelling of impacts of land use and climate on in stream water flow, sedimentation and habitat.

a) *Catchment Fish Stock Assessment and environmental monitoring*
The Marine Institute is responsible for the monitoring, maintenance and the upkeep of the Burrishoole index system, laboratories and Newport facilities and lands. This includes running of the fish traps which monitor the daily movements of the key migratory species, salmon, eels and sea trout. The team are responsible for ensuring the integrity of the comprehensive 40+ year data set and the monitoring of a broad range of experimental fish releases carried out as a component of the ongoing research programmes. The catchment team undertake annual assessments of juvenile salmonid and eel stocks and invertebrate communities in the catchment and these data are combined with the fish census and environmental datasets.

The Marine Institute is also responsible for the monitoring, maintenance and the upkeep of equipment in the Burrishoole experimental catchment, including instrumentation located in Loughs Furnace (tidal), Lough Feeagh and throughout the upper catchment. These instruments collect a wide range of water quality, hydrological and meteorological parameters. The team also maintain on a daily basis the manual and automatic Met Eireann synoptic weather stations located adjacent to the laboratories at Furnace. The manual station has been in operation since the late-1950s. The environmental data sets collected over the past 55+ years have been reviewed, quality checked and analysed as part of the SSTI Climate Change Programme (RESCALE) and are available to support catchment scale climate change and environmental research projects.

b) *Water Quality monitoring*
Over the past fifteen years Loughs Furnace and Feeagh have been established as sentinel lakes, and the Glenamong, Black and Shrarevagh rivers, as sentinel rivers, for long-term environmental monitoring. In combination with the unique biological data sets available from the Burrishoole traps and regular water chemistry, fish, plankton and invertebrate monitoring studies in the catchment, the system represents one of the most closely monitored catchments in Europe.

As a result the Marine Institute was successful in seeking funding to participate in a series of major programmes including: LIFE, REFLECT, CLIME, RESCALE, ILLUMINATE and EU COST Action NETLAKE. Loughs Feeagh and Furnace have been part of the Global Lake Ecological Observatory Network (www.gleon.org) since 2006. GLEON is a grassroots network of limnologists, engineers and data scientists, the aim of which is to understand, predict and communicate the role and response of lakes in a changing global environment.

In a national and European context it is vitally important that the integrity of the Burrishoole index site is maintained as it represents one of the most extensive long-term high resolution monitoring environmental and biological datasets available to climate and ecosystem modellers. The REFLECT study has demonstrated the links between changes in freshwater lakes, which are relatively easy to monitor, and equivalent changes in the ocean which are far more difficult to accurately monitor and assess.

The Marine Institute is currently hosting a number of PhD studies in Newport on establishing carbon budgets and measuring carbon fluxes in a freshwater system, investigating the influence of freshwater and tidal inputs to L. Furnace and their influence on its ecology, and on freshwater and coastal survival and behaviour of salmonids.

Appendix 1 provides additional details on the various data sources available from the Catchment.

Fisheries Ecosystems Advisory Services (FEAS), Marine Institute
The [FEAS](#) mission is "to assess research and advise on the sustainable exploitation of marine fisheries resources". Currently, FEAS consists of over 70 scientists, technical, post graduate and administrative staff under the directorship of Dr. Paul Connolly. The Service Group operates a significant part of their services from the headquarters in Oranmore, Co Galway with additional port based facilities and major research facilities in Newport, Co Mayo. FEAS staff spend a considerable amount of time at sea on commercial fishing vessels and on research vessel surveys carried out on the *RV Celtic Explorer* and *RV Celtic Voyager*.

Key outputs of FEAS are the annual Stock Book, the annual Shellfisheries Stock Book, the Newport Annual Statistics Report and a commitment to producing peer-reviewed publications. These provide the latest assessments and scientific advice for the resources exploited by Irish fisheries and are key references for the Governments sustainability assessment presented annually to the Oireachtas.

A key element of FEAS work is the provision of scientific support for the Irish government (principally the Department of Agriculture, Food and the Marine – DAFM) on marine fisheries ecosystems related issues and salmonids and eels (Department of Communications, Energy and Natural Resources – DCENR). FEAS also publish much of its work in peer-reviewed scientific journals.

The 9 goals of FEAS are:

1) To maximise the benefits of the new EU Data Collection Framework (DCF);
2) To build a strong working relationship with the fishing industry and the environmental NGO's;
3) To build an effective working relationship with key Government Departments (principally DAFM) and other partner agencies;
4) To use ICES, NASCO, ICCAT, OSPAR and the EU system to support the delivery of excellence in our fisheries and ecosystems science and advisory services;
5) To engage in a suite of research activity that supports the evolution of scientific advice that is in line with MI/FEAS mission, HOOW, FH2020, Horizon 2020, the new RTDI strategy and the objectives of the CFP;
6) To progress and incorporate the ecosystem approach to Fisheries Management (EAFM) into all aspects of our work;
7) To increase public awareness of the importance of the Ocean;
8) To ensure a common understanding of the "value chain" within the FEAS team and the MI; and
9) To ensure FEAS is a rewarding place to work.

PROJECT RATIONALE:

Catchment Research Cluster

The Marine Institute is seeking applications to establish a research cluster at the [Newport Research Facility](). The cluster will utilise the facilities and long-term datasets of the Burrishoole catchment to address research questions relevant to both Irish and global marine policy objectives.

Possible areas that the research cluster might address include; climate change impacts on salmon, sea trout and eel; fish demographics in salmonid catchments – relationships with climate and environmental change; networked science (GLEON, observatory data, big data); carbon dynamics. Other topics that the research cluster might address are encouraged in the proposal, but they must utilise the facilities and long term data sets of the Newport Research Facility.

The work of the research cluster will contribute to ensuring our ecosystems continue to provide essential monetary and non-monetary goods and services such as food, climate, health and wellbeing (*Harnessing Our Ocean Wealth*). In addition work at the Newport Research Facility has the opportunity to contribute to implementing other policies such as the EU biodiversity strategy, and the Marine Strategy Framework Directive.

As outlined in the Guidelines for Applicants, Project-Based Awards funded by the Marine Institute will provide assistance for appropriate research activities that support the goals of *Harnessing Our Ocean Wealth*. This call for proposals will address Goal 2: Healthy Ecosystems as set out in the Plan.

PROJECT AIMS:

There is considerable scope for the successful applicant(s) to access grants, to expand on existing research themes, and/or open up new avenues of research in related fields.

While the aim would be to let the cluster grow itself and develop its own lines of research, in the initial stages it would be strategic to address some specific areas using existing datasets,

Research areas/topics could include:

- Review the RESCALE report, update the data time series where necessary and support publications.
- Undertake analysis of the fish stock dynamics in the catchment and investigate relationships between climate/environment and the stock recruit survival/growth relationships in salmon, trout and eel.
- Networked science (sensors, GLEON, observatory data, big data).
- Carbon dynamics in upland peats.
- Forestry/water interactions and greenhouse gas (GHG) emissions balances.
- Impacts of changing climate on north Atlantic coastal areas (salmon, trout eel).
- Fish genetics/demography/environmental drivers.
- Link with telemetry work in Clew Bay – influence of freshwater environment and migrations of salmon, trout and eel. Interactions between the freshwater and marine environments (e.g. temperature, freshwater discharge, tidal heights, plankton abundance).
- Juvenile and resident fish stocks in the lakes (standing stock, stability, food chain, interaction with the migratory stocks, interchange between lake and river environments).

RESEARCH OBJECTIVES:

The Marine Institute wishes to invite research proposals to address the following objectives:

- Build research capacity in the Newport Research Facility in the areas of climate and environmental change impacts on aquaculture and fisheries and/or any other area as outlined above;

- Build on existing long-term data sets and time series for the Burrishoole catchment and maximise their use by researchers;

- Increase the research profile of the Newport Research Facility through peer-reviewed publications and leveraging of further research funding;

- Add value to the total research output from the Newport Research Facility; and

- Provide post-graduate training for research Masters and PhD students.

It is envisaged that personnel on the project will also work closely with the existing staff in the Newport Research Facility, Marine Institute in applying for research funding particularly under the EU Horizon 2020 Programme.

PROJECT DELIVERABLES:

- The target for the research cluster is 20 (five per annum) peer-reviewed publications over the four-year period.

- The target for the research cluster is €4 million from externally sourced competitive research grants over the four-year period.

It is expected that the research cluster will also result in a number of other outputs, such as articles, conference posters, presentations, etc.

ADDITIONAL SPECIFIC REQUIREMENTS FOR THIS PROJECT:

- The successful applicant(s) will work closely with the Marine Institute. It is envisaged that personnel from the research cluster will spend a significant amount of time interacting and collaborating with staff at the Newport Research Facility. Proposals should outline how the applicant(s) propose to maximise this cooperation for new staff recruited as part of the research cluster, who will be based in Newport.

- Throughout the lifetime of the research cluster, it is also anticipated that the researcher(s) will actively seek additional sources of other funding (national and international), continuing to build links with other research groups and organisations, strengthen Ireland's research capacity and capability in the area climate and environmental change impacts on aquaculture and fisheries and/or any other area as outlined above.

- It is expected that the researcher(s) will collaborate with other national and international research groups.

INTENDED IMPACT:

The establishment of this research cluster is intended to strengthen the reputation of the Newport Research Facility nationally and internationally as a centre of excellence in multidisciplinary research, which will also provide high quality post-graduate training for research students.

The research cluster outputs will feed into a number of national and EU strategic initiatives by stakeholders and policy advisors.

More broadly, the knowledge generated will inform and facilitate the delivery of the Government's integrated plan for the marine, as set out in *Harnessing Our Ocean Wealth*.

PROJECT FUNDING:

The amount of funding available to the research cluster will be up to a maximum of €2 million over the four-year period (2017-2021). Applications are invited for projects under three instruments:

1) Larger team project €2 million maximum grant-aid available over four years intended to support a team of at least six people including senior post-doctoral researchers, technician/laboratory analyst, PhD student, or equivalents.
2) Larger team project €1.4 million maximum grant-aid available over four years intended to support a team of at least four people including senior post-doctoral researcher, technician/laboratory analyst, PhD student, or equivalents
3) Standard team project €600,000 maximum grant-aid available over four years intended to support a team of at least two people including post-doctoral researcher, research assistant, PhD student, or equivalents.

APPLICATION PROCESS AND KEY DATES:

Initial application must be made through the Marine Institute's online research grant management system RIMS (please refer to the Guidelines for Applicants).

Those developing a proposal for submission are invited to an open day at the Newport Research Facility on Tuesday, 2nd August 2016 to see the facility and have an opportunity to ask questions of the existing researchers there. This is to ensure that submitted proposals are appraised of the facilities, long-term datasets and existing work at the facility. A document containing the written replies from the Q&A session from the open day will be published on the Marine Institute's website.

The application closing date will be Tuesday, 6th September 2016. Applications will be reviewed by international/national experts and scored on the criteria as stated in the Guidelines for Applicants, particularly scientific excellence, impact and strength of the proposed team.

The highest ranked proposals will be invited to interview on Thursday, 6th October 2016. The lead applicant must make themselves available for this interview. The successful applicant(s) will be awarded a grant in January 2017 and will be expected to establish the research cluster at Newport Research Facility and have it operational by April 2017, if possible.

Important Dates:

Call opening:	Friday, 8th July 2016
Open day at Newport Research Facility:	Tuesday, 2nd August 2016 10:00 – 17:00 (option for potential applicants will be to attend either morning session 10:00 to 13:00 or afternoon session 14:00 to 17:00)
Closing date for applications:	Tuesday, 6th September 2016 (16:00)
Dates for interviews with successful candidates:	Thursday, 6th October 2016

Any queries or clarifications should be submitted by email to: funding@marine.ie

ADDITIONAL INFORMATION/REFERENCE MATERIAL:

Reports:

Government of Ireland. (2012). Harnessing Our Ocean Wealth - An Integrated Marine Plan for Ireland.

RESCALE Review and Simulate Climate and Catchment Responses at Burrishoole (2010).

Web-links

- Harnessing Our Ocean Wealth: www.ouroceanwealth.ie

- Common Fisheries Policy: http://ec.europa.eu/fisheries/cfp/index_en.htm

- EU Biodiversity Strategy: http://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm

- RESCALE: http://oar.marine.ie/handle/10793/31

Long term datasets currently maintained by core staff in Burrishoole (2015) and available as the foundation for the Catchment Research Cluster (see also RESCALE Report 2010).

- ***The Automatic Water Quality Monitoring Station (AWQMS) on Lough Feeagh*** is fitted with a series of water quality and meteorological instruments which record data at 2 minute intervals. Data is available from 2004 to present.
  - Twelve temperature probes ranging between the surface and 42m depth.
  - Chl fluorescence, turbidity and DOM proxies (1m)
  - pH, conductivity and DO (1m)
  - Wind speed and direction
  - Air temperature
  - Relative humidity
  - Barometric pressure
  - Solar radiation (measured using a pyranometer),
  - Photosynthetically Active Radiation

- ***The Automatic Water Quality Monitoring Station (AWQMS) on Lough Furnace*** is fitted with a series of water quality and meteorological instruments which record data at 2 minute intervals. Data is available from 2009 to present. A profiling winch measure 4 vertical profiles per 24 hours.
  - Chl fluorescence and turbidity (1m)
  - pH, conductivity, chl fluorescence, temperature and DO at surface and vertical profiles
  - Wind speed and direction
  - Air temperature
  - Relative humidity
  - Barometric pressure
  - Solar radiation (measured using a pyranometer),
  - Photosynthetically Active Radiation

- ***Three Automatic River Monitors (ARMS)*** are installed on the Glenamong river, Black river and the Rough River. They measure Dissolved Oxygen, temperature, pH, conductivity, turbidity and the station on the Glenamong also measures Coloured Dissolved Organic Matter (DOC proxy). This data is collected every two minutes.

- High-resolution water temperature data: 1960 to present

- Annual juvenile fish stock assessment (salmon, trout and eel at multiple sites)

- Annual macroinvertebrate monitoring program at 16 sites in catchment

- Monthly monitoring programme of Lough Feeagh: 2004 to present
  - Zooplankton and phytoplankton
  - Colour
  - Secchi depth
  - TP/TN

- Monthly monitoring programme of Lough Furnace: 2009 to present
  - Zooplankton and phytoplankton
  - Colour
  - Sechi depth
  - TP/TN
- Weekly or monthly spot samples of TP/TN, colour and FTU from three river stations (Black, Glenamong and Rough)

- Meteorological data (max/min temp, ground temp, humidity, wind speed, wind direction, rainfall, sunshine hours, evaporation): 1960 to present

- Network of 17 rain gauges and 11 water level recorders: 2000 to present

- digital spatial information on land use, sub-catchment boundaries, geology, soils, lakes and rivers, DEM

Fish Stock Census in Main Fish Traps in Furnace
- Salmon, trout eel (Upstream & Downstream), fish moving into and out of the freshwater catchment
  - Numbers (juveniles and adults)
  - Size, sex
  - Run timing
  - Survival (freshwater & marine)
  - Genetics
  - Growth
  - Production
  - Freshwater and marine performance, growth & survival

Please see below biographies for principal researchers currently based at the Marine Institute's Newport Research Facility, reference publications and projects.

Dr. Deirdre Cotter is responsible for the development and management of a number of scientific monitoring and research programmes in the wild salmon section of FEAS. Primary areas of expertise include salmonid biology, ecology, genetics, fish health and husbandry. Recent programmes include experimental salmon ranching, acoustic tracking of juvenile and adult salmon and, in collaboration with University partners, managing the production of experimental stocks for funded projects. Deirdre is a designated compliance officer for the Institute's HPRA Breeder/Supplier/User authorisation under Scientific Animal Protection legislation.

Dr. Elvira de Eyto is a scientific technical officer at the Marine Institute's facility in Newport. The focus of her current job is the collection and analysis of LTER (Long Term Ecological Research) in Burrishoole, including high frequency monitoring of lakes and rivers, juvenile fish stock assessment and biological monitoring in the catchment. Elvira is a member of the Standing Scientific Committee on Salmon, and the Standing Scientific Committee on Eel in Ireland, and represents the MI in GLEON (Global Lake Ecological Observatory Network www.gleon.org) and NETLAKE (www.dkit.ie/netlake).

Mr. Alan Drumm is a Senior Laboratory Analyst based at the Marine Institute's facility at Newport. He is responsible for the undertaking and delivery of technical support and management of the laboratory analysts and field staff to ensure service delivery. He has over 30 years' experience of working in the field and coordination and administration of several EU projects.

Mrs. Mary Dillane is a laboratory Analyst based in the Marine Institute Newport Co Mayo. She has responsibility for the operation and development of the environmental monitoring stations in the Burrishoole catchment and is responsible for the recoveries associated with the Coded wire salmon tagging programme in Ireland. Her 28 year experience covers juvenile fish stock assessment surveys and aquaculture.

Dr. Niall Ó Maoiléidigh is a Section Manager in the Fisheries Ecosystems Advisory Services group in the Marine Institute. Since 1990, Dr. Ó Maoiléidigh's research interests include fish stock assessment, salmon life history modelling, and the study of salmon at sea. The stock assessment monitoring programmes which include tagging and tracking using electronic telemetry systems, are used to advise various Irish Government departments (DAFM, DCENR) and other state agencies (BIM, IFI, ESB, NPWS) on the status of Irish salmon and other fish stocks which leads to more rational management of these important resources. He chaired the Standing Scientific Committee of the National Salmon Commission of Ireland from 2001 to 2013, and was co-Chairman of the ICES Working Group on Conservation Needs of Diadromous Fish Species (WGRECORDS) from 2012 to 2014, and is a member and former Chairman of the ICES Working Group on North Atlantic Salmon (WGNAS). He is currently the Irish national delegate to ICES and Irish nominee to the ICES Science Committee (SCICOM). He is also a scientific advisor to the Loughs Agency, cross boarder agency between Ireland and the UK.

Dr. Russell Poole is a Section Manager and research co-ordinator in the FEAS Catchment Team. Dr. Poole has more than 25 years' experience of eel and salmonid population biology and fish stock assessments, has published extensively on both eel and salmonids and has a proven track record in participating in joint projects, first in the Salmon Research Agency of Ireland and now at the Marine Institute. His areas of expertise include; field surveys for salmonids and eels, fish tracking, fish age and population dynamics, investigating the interactions between climate, environment and fish in freshwaters and provision of scientific advice. He has a strong involvement with ICES, including Chairing the joint EIFAAC/ICES Working Group on Eel (2007-2013), chairing the Working Group on Diadromous Fish WGRECORDS (2015-2017) and co-chair of workshops on ageing eel. He has been the

National Delegation leader and Focal Point for the European Inland Fisheries and Aquaculture Advisory Commission of FAO since 2002. He has been involved in 19 research projects, including 11 EU funded projects, and has over 50 peer reviewed publications of which 16 are first author.

Mr. Ger Rogan, MSc., Dip Ifm, Cert Aqua., is involved in fish stock assessment based in the Marine Institute Newport. Ger received his degree of Master of Science from Trinity College Dublin examining the migration pattern and economics of ranching Atlantic salmon from a non-native system. In the past he has also worked in the shellfish and salmonid aquaculture industry. More recently Ger has been involved in the COST Action 'Conserving biodiversity; interdisciplinary initiative to reduce pan European cormorant –fishery conflicts and contributes to ICES working groups on salmon.

Five recent relevant publications:

- o de Eyto, E., Dalton, C., Dillane, M., Jennings, E., McGinnity, P., O'Dwyer, B., Poole, R., Rogan, G., and Taylor, D. in press. **The response of North Atlantic diadromous fish to multiple stressors including land use change: a multidecadal study**. Canadian Journal of Fisheries and Aquatic Sciences.

- o O'Reilly, C.M., Sharma, S., Gray, D.K., Hampton, S.E., Read, J.S., Rowley, R.J., Schneider, P., Lenters, J.D., McIntyre, P.B., Kraemer, B.M., Weyhenmeyer, G.A., Straile, D., Dong, B., Adrian, R., Allan, M.G., Anneville, O., Arvola, L., Austin, J., Bailey, J.L., Baron, J.S., Brookes, J.D., de Eyto, E., Dokulil, M.T., Hamilton, D.P., Havens, K., Hetherington, A.L., Higgins, S.N., Hook, S., Izmest'eva, L.R., Joehnk, K.D., Kangur, K., Kasprzak, P., Kumagai, M., Kuusisto, E., Leshkevich, G., Livingstone, D.M., MacIntyre, S., May, L., Melack, J.M., Mueller-Navarra, D.C., Naumenko, M., Noges, P., Noges, T., North, R.P., Plisnier, P.-D., Rigosi, A., Rimmer, A., Rogora, M., Rudstam, L.G., Rusak, J.A., Salmaso, N., Samal, N.R., Schindler, D.E., Schladow, S.G., Schmid, M., Schmidt, S.R., Silow, E., Soylu, M.E., Teubner, K., Verburg, P., Voutilainen, A., Watkinson, A., Williamson, C.E., and Zhang, G. 2015. **Rapid and highly variable warming of lake surface waters around the globe.** Geophys. Res. Lett.: 2015GL066235. doi:10.1002/2015GL066235.

- o Ravinet, M., Hynes, R., Poole, R., Cross, T.F., McGinnity, P., Harrod, C., and Prodöhl, P.A. 2015. **Where the Lake Meets the Sea: Strong Reproductive Isolation Is Associated with Adaptive Divergence between Lake Resident and Anadromous Three-Spined Sticklebacks.** PLOS ONE 10(4): e0122825. doi:10.1371/journal.pone.0122825.

- o Ryder, E., de Eyto, E., Dillane, M., Poole, R., and Jennings, E. 2014. **Identifying the role of environmental drivers in organic carbon export from a forested peat catchment.** Science of The Total Environment 490: 28–36.

- o Sparber, K., Dalton, C., de Eyto, E., Jennings, E., Lenihan, D., and Cassina, F. 2015. **Contrasting pelagic plankton in temperate Irish lakes: the relative contribution of heterotrophic, mixotrophic, and autotrophic components, and the effects of extreme rainfall events.** Inland Waters 5(3): 295–310.

Five recent projects relevant to this call:

NETLAKE (Networking Lake Observatories in Europe) is an EU COST Action (ES 1201) that aims to build a network of sites and individuals to support the development and deployment of sensor-based systems in lakes and reservoirs, and promote their use to address both current and future water quality issues in Europe. Loughs Feeagh and Furnace (in the Burrishoole catchment) are NETLAKE sites, and the MI personnel involved in running the AWQMS's (automatic water quality stations) (EdeE, MD, RP) have been heavily involved in the NETLAKE project. Elvira de Eyto is on the management committee of NETLAKE www.dkit.ie/netlake.

MANTEL (Management of climatic extreme events in lakes & reservoirs for the protection of ecosystem services) is a H2020 Marie-Curie-ITN (Innovative Training Network) which has recently been approved for funding, and will start in January 2017. It allows 12 PhD students to use high-frequency monitoring stations, including the MI's stations in Burrishoole to capture episodic climatic events and monitor their effects on lake ecosystem resilience. The MI will host one PhD student, in co-operation with Dr Eleanor Jennings (Dundalk IT) and Dr Hans-Peter Grossart (IGB and University of Potsdam). Dr. Elvira de Eyto will co-supervise this student, as well as participate in the management and running of the MANTEL project.

PROGNOS (Predicting in-lake responses to change using near real time models) is a three year EU project funded under the 2015 WaterJPI call, which started in May 2016. The aim of the project is to develop an integrated approach that couples high frequency (HF) lake monitoring data to dynamic water quality models to forecast short-term changes in lake water quality. The Burrishoole catchment is being used as a case study for DOC flux, and EdeE co-supervises a PhD student with Dr. Eleanor Jennings in Dundalk Institute of Technology www.prognoswater.org.

DETECT (Disentangling the impacts of multiple stressors on the ecology of waterbodies) is a five year funded by the EPA, and lead by AFBI. The overarching aim of this project is the development of an Assessment Framework to support the identification of the principal stressors constraining ecological recovery in water bodies. The project also seeks to identify the synergistic and antagonistic effects of stressors to inform on the practicality and cost-effectiveness of targeted mitigation measures. The Marine Institute is involved as data providers of LTER data from Burrishoole and EdeE is providing expertise to all the work packages www.afbini.gov.uk/articles/detect-project/.

ILLUMINATE (Past, current and future interactions between pressures, chemical status and biological quality elements for lakes in contrasting catchments in Ireland) was an EPA funded project seeking to exploring past reference conditions through a combination of palaeolimnological investigations and hindcast modelling. The project ran for three years (2006-2009). Much of the Burrishoole catchment work depends on the outputs from this project, which established the timeline of land use change in a typical upland peat catchments over the past century www.palaeolim.ie/research-projects/.