Foras na Mara
Marine Institute

Passive sampling: A role in the integrated monitoring of Irish marine waters?

(MSc Award initially – with potential extension to PhD Award)

Background

Passive sampling (PS) techniques have for a number of years been recognised as cost-effective state-of-the-art tools for identifying and measuring ultra-trace levels of pollutants in the water column. While time integrated sampling and improved compound detectability and sensitivity can be achieved relative to more "traditional" spot water sampling and analysis, at an operational level passive sampling is still infrequently utilised in supporting legislative compliance monitoring.

Within the context of the WFD and the Marine Strategy Framework Directive (MSFD), a recent publication[1] proposes that PS offers the potential of providing well-defined risk-based standardised monitoring approaches that can help overcome the natural variability (especially in a changing climate) and ethical concerns associated with more traditional measurements in biota. Additional to this a *pending* review of WFD monitoring guidance specifically now recognises PS techniques within an integrated role for in the determination long-term trends and average concentrations, particularly for hydrophobic substances in the aquatic environment.

Within Ireland, passive sampling for has been undertaken at selected WFD and other project sites for a number of years. Additional to this, in the last two years the newly developed technique of dynamic passive sampling (whereby sampling physically takes place on board research vessels) has been integrated into, Rockall, Winter Environmental and autumn Phytoplankton near and offshore surveys. Ireland additionally supports a global passive sampling network (AQUAGAPS) designed to track the source and fate of pollutants on a global scale. As a result of these initiatives a comprehensive passive dataset now exists for coastal, transitional and offshore Irish waters.

Recognising the potential role of PS the feasibility of the development of guidance and recommendations for PS within integrated monitoring frameworks to support pollutant monitoring in Irish waters will the primary focus of the proposal.

Proposal

It is proposed that this primarily desk-based scholarship would initially be based on **a structured two-year Master's programme.** On a full-time basis the scholar will identify, consolidate and report existing (primarily hydrophobic) passive sampling information from Irish waters to Marine Institute and international databases. With a background of recent literature and newly derived pollutant screening information (OSPAR CONnECT), extension to a four-year PhD programme would at an early stage identify the potential to incorporate additional risk-focussed chemicals (e.g. pharmaceuticals and the

[1] Passive sampling in support of biota monitoring under the WFD

now so-called “forever”, perfluorinated chemicals) and their associated PS techniques into inshore and open water surveillance and operational monitoring. Within both the MSc or extended PhD programmes, the potential impact of a changing climate the longer-term applicability of biota-based monitoring programmes will be assessed via initiatives such as parallel PS and mesocosm deployments will be evaluated.

Aligned with current reporting and monitoring programme deliverables (e.g. new monitoring programmes for WFD and MSFD), key aims of the MSc (and/or PHD) will be towards informing the development of recommendations in respect of a potential future role for PS in an integrated environmental framework in support of Irelands, spatial planning, OSPAR, WFD and MSFD environmental monitoring commitments.

Location of Scholar and Training Provided at the Marine Institute

It is anticipated that the majority of this scholarship will be desk-based, with the scholar located for circa 50% of their time over the two years at the Marine Institute HQ, Rinville, Galway with the remaining time based at the scholars HEI.

The scholar will be trained in becoming familiar with legislative and operational aspects of conducting marine environmental monitoring under WFD, MSFD (particularly under WFD and MSFD descriptor 8). Training and support will be provided on the management, collation and reporting of existing passive sampling data (via existing WFD programme) with that from other research initiatives (e.g. dynamic passive sampling and AQUAGAPS) to Marine Institute databases and onward to ICES and NORMAN repositories. As pollutant levels in the water column potentially influence marine biodiversity (Descriptor 1) and consumer food safety (Descriptor 9) and/or for example, the development of marine protection or planning zones (e.g. ORE, aquaculture) the researcher will be trained on the development of skills on the integration of quality assured pollutant data with other marine datasets. It Is expected that participation and collaboration within wider research networks (NORMAN: a bridge between research and policy) and the ICES Working Group on Marine Chemistry be included in training. The completion of MI ethics and research integrity modules with the aim to ensure a climate exists in which research is conducted in accordance with the MI research integrity policy and in line with good research practice[2] will be an integral part of training.

Outcome

Example expected outcomes from the MSc project will include;

- Consolidation and quality assurance of existing and new PS data into a single reporting format suitable for reporting to Marine Institute databases and onwards to ICES/OSPAR and/or NORMAN repositories,
- It is proposed within this programme to.

[2] MI research Integrity policy.

  - Utilise PS data to complete an assessment of the spatial and temporal distribution of pollutants in coastal/transitional water stations,
  - Complete an evaluation of PS pollution profiles in parallel with other matrices such as shellfish and sediments,
  - Complete an evaluation of screening of contaminants samples on shelf and open ocean waters using DPS from 3 surveys.
- Provision of *baseline* pollutant information to support, Stockholm convention, OSPAR, WFD and the MSFD monitoring obligations and by extension noting the potential to support MSP, aquaculture and/or blue economy or marine food security initiatives in Irish marine waters,
- In parallel with other monitoring and research initiatives, where feasible, development of a future integrated and/or tiered approach role for PS in investigative, temporal trend and in risk-based operational pollutant monitoring in support of Ireland environmental assessment obligations (e.g. under WFD and MSFD),
- Capacity building and fostering of new marine talent in the area of environmental monitoring and policy support,
- Collaboration and networking with scientists and within a policy context will be a key aspect of this scholarship.
- To support scholar career development, contribution to peer-review literature is expected.

Marine Institute Corporate Strategy 2023-2027

This proposal is aligned to the MI corporate strategy primarily through; **Delivering Impact Through Research**[3], (*Strategic initiative 5):* Strengthening the Marine Institute's capability and capacity in strategically important research areas by enhancing our equipment and infrastructures, building our expertise in the area of passive sampling and pollution monitoring, fostering strategic partnerships (with global research networks e.g. NORMAN[4] [5], and attracting and retaining talented researchers. Additional to this, by the collation of pollution information the work programme and deliverables strongly support the MI Strategic Priority **Transforming our Knowledge, Advice and Services, particularly in** respect of Strategic initiative 4: on the Delivery on agreed commitments to the Department of Housing, Local Government and Heritage (DHLGH) related to OSPAR, the Marine Strategy Framework Directive, the Water Framework Directive and the National Marine Planning Framework. With data available from our coastal and transitional waters, there is scope to use this information to inform our future risk-based monitoring programmes. Further to this, existing and future

[3] Ocean Knowledge that Informs and Inspires,
[4] Working Group 8: Marine environment | NORMAN
[5] Cross-Working Group Activity: Passive sampling | NORMAN

PS may provide valuable support to MI marine planning commitments in respect of other arenas such as the ORE and/or aquaculture sector.

Indirectly, knowledge of the extent of ultra-trace pollutant levels in offshore and nearshore waters can provide valuable information within Strategic Priority **Meeting Climate, Biodiversity and Seafood Security Challenges (strategic initiatives 2, 3 and 4**, by underpinning assessments of the impacts of pollution on biodiversity, supporting consumer advice in respect of the risks from the consumption of shellfish and fish produce. In a changing climate scenario PS can help develop our understanding at a local and global level of pollutant sources and fate (e.g. under the global AQUA-GAPS[6] initiative).

Further to this the MI have numerous environmental monitoring and assessment commitments as mandated though national and international legislation and conventions. Contaminant occurrence data generated though such monitoring and research are central to our service delivery for a suite of clients including EU, OSPAR, EPA, DAFM, DHLGH.

Specific Requirements

The scholar should hold qualifications suitable for enrolment to an MSC (and/or PhD programme within a relevant scientific subject. While training will be provided, the scholar should have an understanding of environmental and biogeochemical processes and/or pollution issues. Confidence in organising, quality assuring and managing and statistically assessing analytical data will be a key element of this scholarship. The scholar should have an analytical approach to problem solving, be decisive and self-sufficient with a proven ability to use their own initiative while at the same time working well as a team player. Collaboration and networking with scientists and within a policy context will be a key aspect of this scholarship. As it is proposed to contribute to peer-review literature experience of preparation and contributions to technical reports and publications would be advantageous.

Financial Details

Scholarships will be up to €34,000 per annum (maximum funding PhD of €136,000 over four years or €68,000 over two years MSc). This amount comprises a maintenance award of €25,000 to the student as well as payment of fees to the host higher education institution (HEI). The maximum fees payable to the HEI will be €6,000 per annum. The scholarship award also includes a budget of up to €3,000 per annum for eligible research costs (travel & subsistence, publication costs, consumables and other costs, such as minor kit purchase e.g. camera) for the sole use of the student, and are payable on a

[6] AQUA-GAPS/MONET-Derived Concentrations and Trends of PAHs and Polycyclic Musks across Global Waters

reimbursement basis direct to the host institution where the postgraduate student (scholar) is registered. There are no overheads payable on the scholarship.

Publication costs are intended to cover publications on which the scholar is listed as first author and are published under Open Access.

Scholars can also supplement this funding by applying to the Marine Institute's Networking & Marine Research Communication Awards annual call.

In addition, the cost of a laptop will be covered by the Marine Institute (purchased via the Research Funding Office).

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