



Interreg
Atlantic Area
European Regional Development Fund



Stakeholders meeting

Passive Sampling – A Role in Compliance Monitoring?

Brendan McHugh, Marine Institute

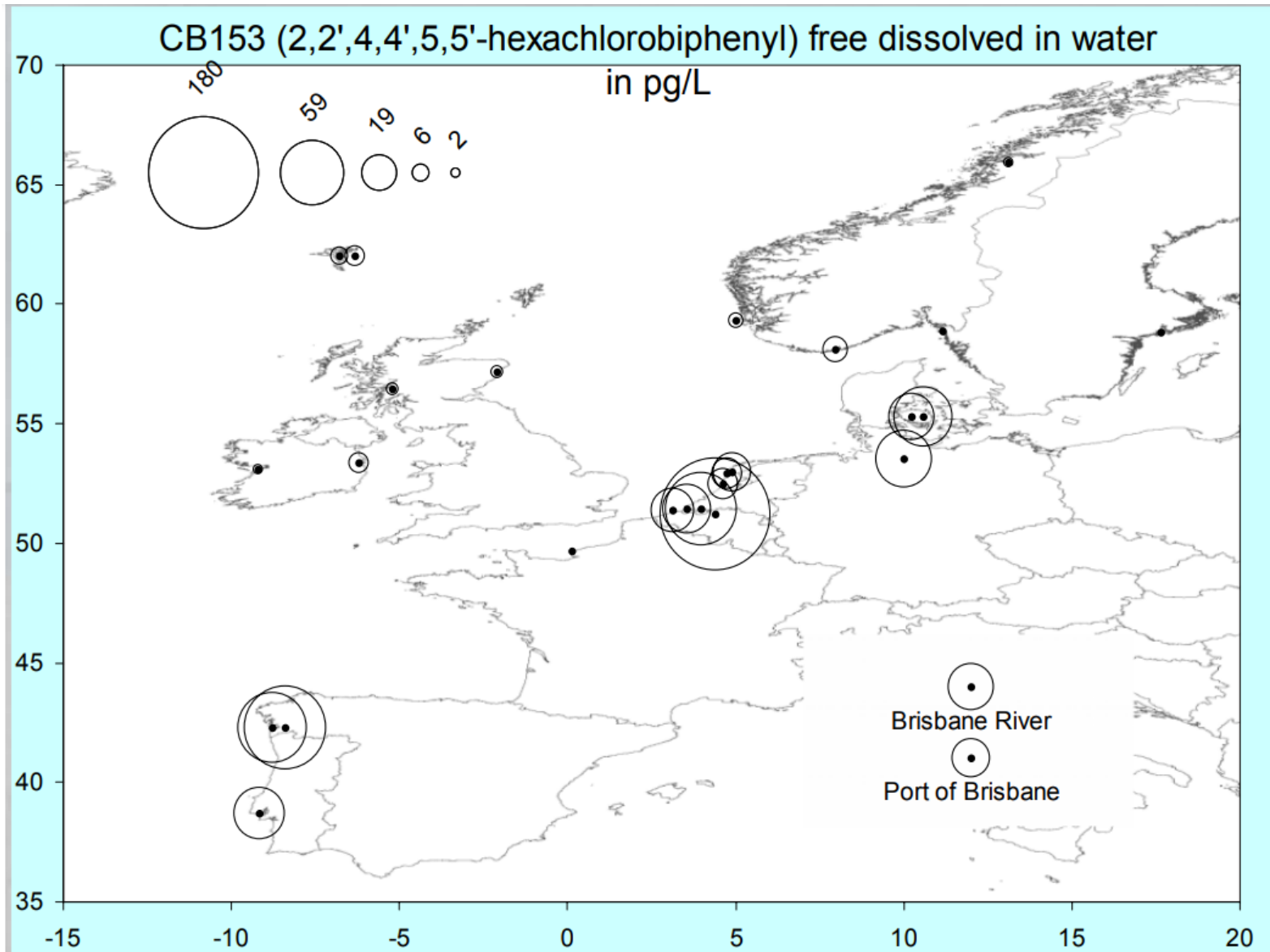
Cagliari, 19 May 2023

MONITOOL
new tools for water quality monitoring

Overview

- A brief history in time: a road well travelled
- Towards compliance monitoring
- Future direction
 - The bigger picture
 - NORMAN network initiatives
- Summary conclusions





A brief history in time



- Guidance on “how to”...
- complete sampling
 - Partition Coefficients
 - Protocols on reporting

STAMPS: Standardised Aquatic Monitoring of Priority Pollutants by Passive Sampling

SWIFT-WFD:

Function:	Quantification and identification of organic and inorganic pollutants. They are able to measure time-weighted average concentrations of priority pollutants and they are suitable for long-term monitoring.
Principle and Design:	In various design and based various principles. See examples below
Sampling method	In situ (SWIFT used 7 and 14 days)
Detection limits	Provide contamination detection where sometimes spot sampling is below limit of detection (SPMD). When deployed in water DGT measures labile species. Above a low threshold value, the measurement is independent of solution flow.
Market	Commercially available or near-to-market Cost of the passive sampler: 15€ (DGT), Chemcatcher not sold yet Cost of extraction + analysis in the lab must be added
Passive Samplers:	<div><div>DGT </div><div>Chemcatcher </div><div>POCIS </div><div>LPDE </div><div>SPMD </div><div>ECOSCOP </div></div>



7. COMPLEMENTARY METHODS^{28,21}

7.1. Introduction

While checking compliance with the WFD provisions is currently based on chemical analysis of spot samples taken in a defined frequency, it is desirable to introduce other techniques for improving the quality of the assessment and to benefit from resource saving developments, as they become available. Currently advanced methods for environmental assessment (referred to as 'complementary methods in this chapter') are under development and evaluation.

²⁸ This chapter was elaborated in close cooperation with the EU-project SWIFT (www.swift-wfd.com).
²¹ Allan, I. J., Vrana, B., Greenwood, R., Mills, G. A., Ruiz, B., Gonzalez, C. (2006) A 'toolbox' for biological and chemical monitoring requirements for the European Union's Water Framework Directive. *Talanta* 69, 302-322.

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Examples of techniques are:

- In-situ probes for measuring physico-chemical characteristics (e.g., Dissolved Organic Carbon (DOC), pH, temperature, dissolved oxygen)
- Biological assessment techniques (e.g., biomarker analyses, bioassays/biosensors and biological early warning systems, immunosensors, etc.)
- Sampling and chemical analytical methods (e.g., sensors, passive sampling devices, test kits (see e.g., ISO 17381:2003 Water quality - Selection and application of ready-to-use test kit methods in water analysis), GC-MS or LC-MS screening methodologies)

Guidance Document No. 19 2009
GUIDANCE ON SURFACE WATER CHEMICAL MONITORING
UNDER THE WATER FRAMEWORK DIRECTIVE

Evaluation of passive samplers for the monitoring of contaminants in sediment and water: NORDIC Countries

<https://norden.diva-portal.org/smash/get/diva2:702813/FULLTEXT01.pdf>

AQUAREF: <https://archimer.ifremer.fr/doc/00167/27873/26118.pdf>

SOLUTIONS: https://www.solutions-project.eu/wp-content/uploads/2017/01/SOLUTIONS_Guidelines_Passive_Sampling.pdf

AQUAGAPS: <http://www.aqua-gaps.passivesampling.net/>

Last update: March 2022

Aquatic Global Passive Sampling Network

[March 2021 IMPORTANT Click for Meeting INVITATION and information](#)

[AGENDA of Meeting 30 March 1100 CET](#)

What	Aqua-gaps/MONET is a network of scientists active in passive sampling monitoring
Aims	The aim is to obtain insight of the global distribution of POPs without discrepancies caused by individual or local approaches. More aims are to follow concentrations change over time and detect new pollutants
Activities	Application of passive sampling for the monitoring of spatial and temporal trend in levels of POPs on a global scale

Analyses will initially be performed in a single laboratory but will include multiple labs when quality assurance is further advanced

Info documents	The aqua-gaps/MONET	Deployment protocols
What is Aqua-gaps Feature EST paper	Stations overview Participant institutes Substances of interest	Action photos Protocol Shrouds Protocol Open cages Cage Assembly instruction Vidoe for: Prepare fixing rod and secure holder Sampling Info Form

[You want to participate?](#)

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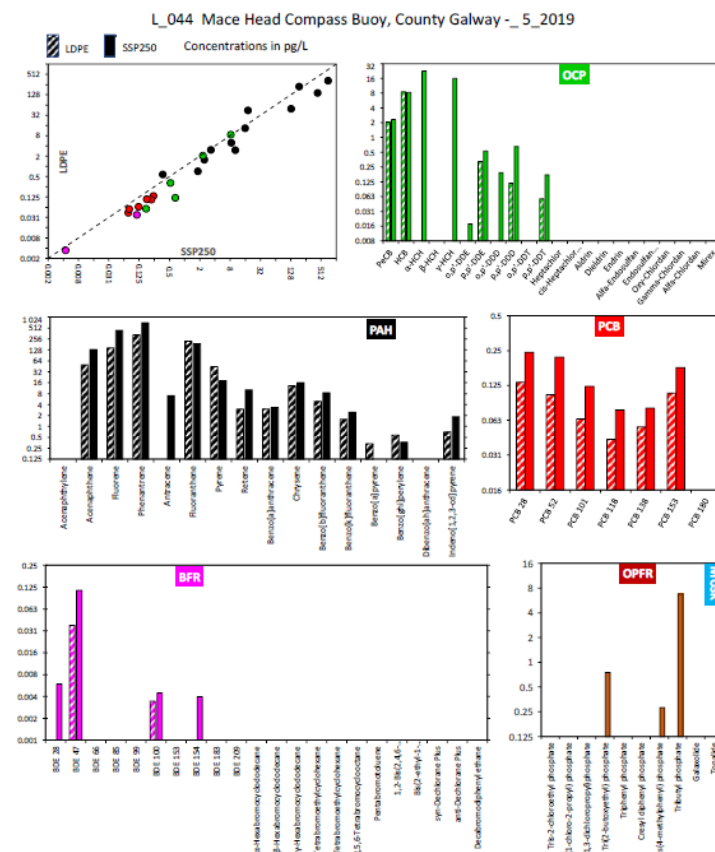


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What	Aqua-gaps/MONET is a network of scientists active in passive sampling monitoring
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Activities	Application of passive sampling for the monitoring of spatial and temporal trend in levels of POPs on a global scale
How	Passive samplers and deployment cages are centrally prepared and exposed annually in representative fresh and marine water bodies.
Who	Network partners like agencies or institutes, active in the area of interest. Analyses will initially be performed in a single laboratory but will include multiple labs when quality assurance is further advanced

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Feature EST paper	Participant institutes	Protocol Shrouds
	Substances of interest	Protocol Open cages
		Cage Assembly instruction
You want to participate?		Videos for: Prepare fixing rod and secure holder
		Sampling Info Form



Passive Sampling in Regulatory Chemical Monitoring of Nonpolar Organic Compounds in the Aquatic Environment

Kees Booij^{*a}, Craig D. Robinson^b, Robert M. Burgess^c, Philipp Mayer^d, Cindy A. Roberts^e, Lutz Ahrens^f, Ian J. Allan^g, Jan Brant^h, Lisa Jonesⁱ, Uta R. Kraus^j, Martin M. Larsen^k, Peter Lepom^l, Jördis Petersen^m, Daniel Pröfrock^m, Patrick Rooseⁿ, Sabine Schäfer^o, Foppe Smedes^{pq}, Céline Tixier^r, Katrin Vorkamp^s, and Paul Whitehouse^t

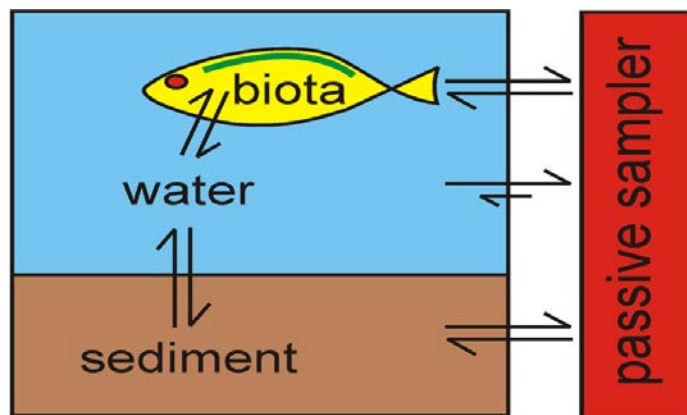
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✓ Cite this: *Environ. Sci. Technol.* 2016, 50, 1, 3–17

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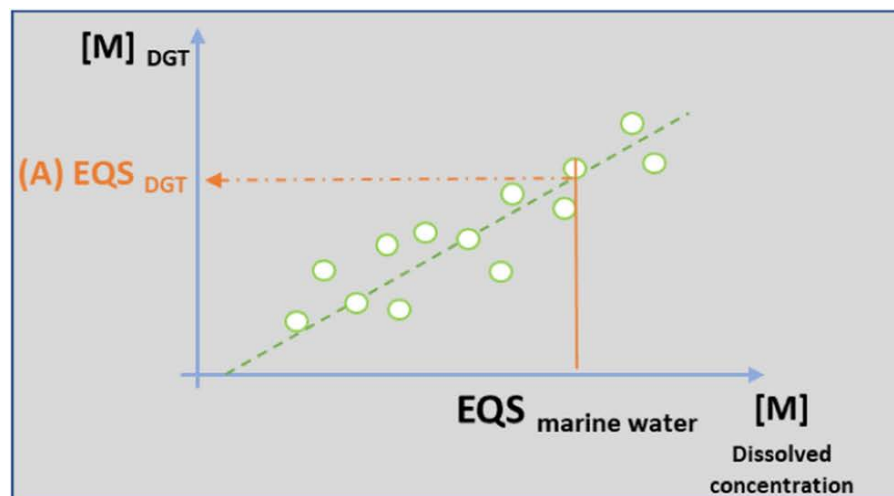
... accuracy Insufficient quality control ... a dominant weakness of passive sampling, ... laboratory performance studies ... sources of variability in the reported results.... Inaccuracies in the K_{sw} of target analytes (in the case of equilibrium passive sampling) and PRCs (kinetic sampling) are a major source of concern.More research is needed to assess how passive sampling measurements can best be linked to concentrations at higher levels of the aquatic food web.....

RESEARCH

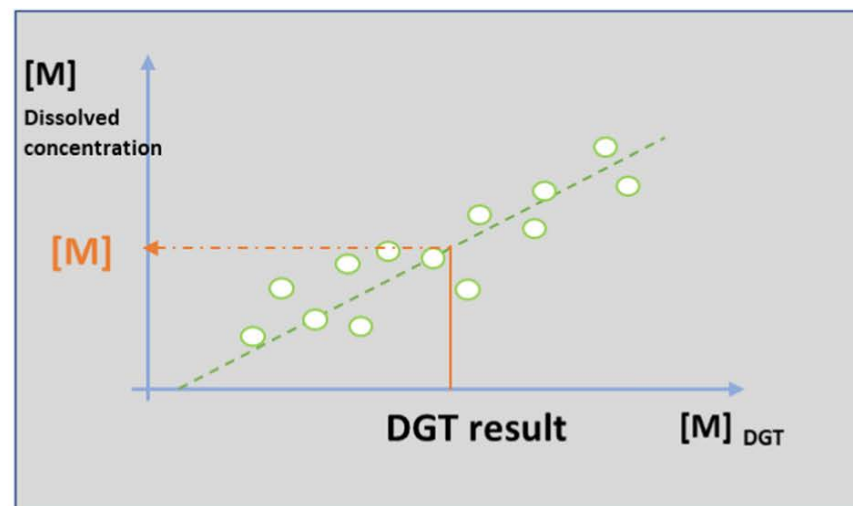
Open Access

A new approach to using Diffusive Gradient in Thin-films (DGT) labile concentration for Water Framework Directive chemical status assessment: adaptation of Environmental Quality Standard to DGT for cadmium, nickel and lead

Isabelle Amouroux^{1*}, Jean-Louis Gonzalez², Stéphane Guesdon³, María Jesús Belzunce-Segarra⁴, Philippe Bersuder⁵, Thi Bolam⁶, Miguel Caetano⁶, Margarida Correia Dos Santos⁷, Joana Lameta⁸, Luc Lebrun¹, Barbara Marnai⁹, Vanessa Millán Gabet¹⁰, Brendan McHugh¹¹, Iratxe Menchaca⁴, Florence Menet-Nédélec¹², Natalia Montero⁴, Olivier Perceval¹³, Olivier Pierre-Duplessix¹⁴, Fiona Regan¹⁵, José Germán Rodríguez⁴, Marta Rodrigo Sanz¹⁰, Marco Schintu⁹, Blánda White¹⁵ and Hao Zhang¹⁶





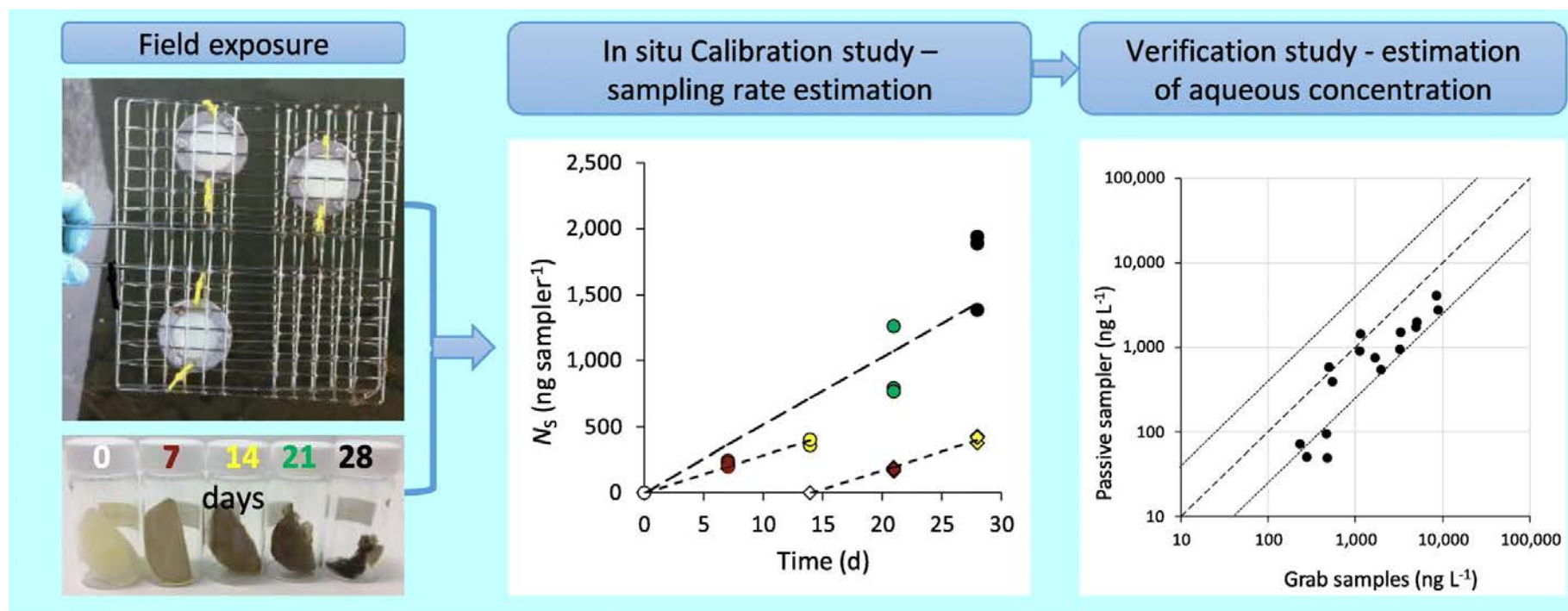
$$A) [M]_{DGT} = \text{slope} \times [M]_{\text{Dissolved concentration}} + \text{intercept}$$

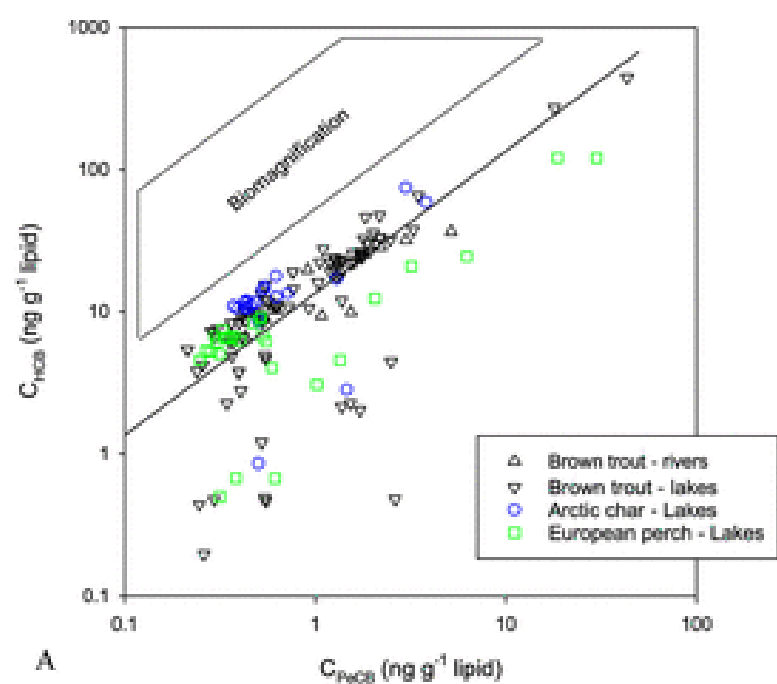


$$B) [M]_{\text{Dissolved concentration}} = \text{slope} \times [M]_{DGT} + \text{intercept}$$

Performance evaluation of a diffusive hydrogel-based passive sampler for monitoring of polar organic compounds in wastewater

Pavla Fialová^a, Roman Grabic^b, Kateřina Grabicová^b, Petra Nováková^b, Helena Švecová^b, Sarit Kaserzon^c, Kristie Thompson^c, Branislav Vrana^a  







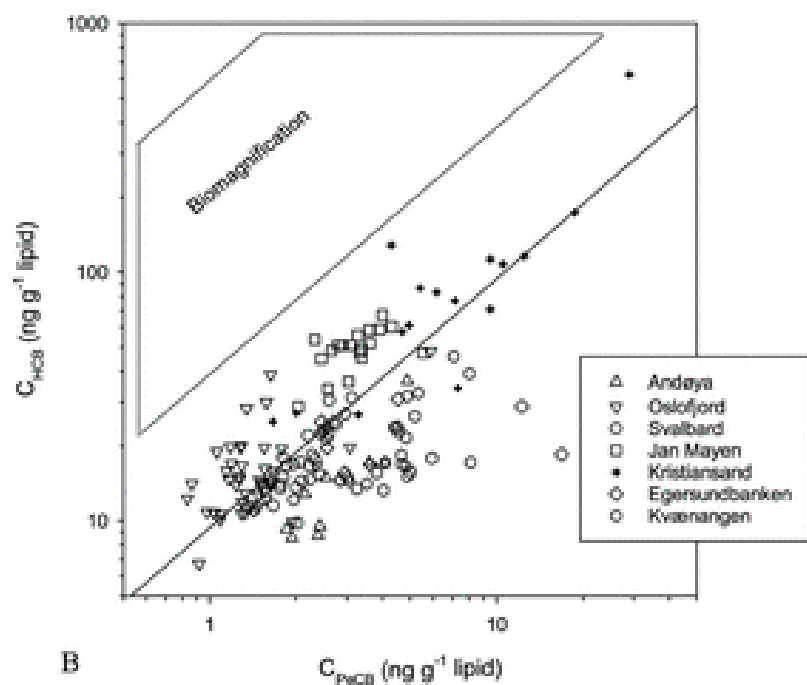
Science of The Total Environment

Volume 864, 15 March 2023, 161071



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Unraveling the Relationship between the Concentrations of Hydrophobic Organic Contaminants in Freshwater Fish of Different Trophic Levels and Water Using Passive Sampling

Foppe Smedes*, Jaromír Sobotka, Tatsiana P. Rusina, Pavla Fialová, Pernilla Carlsson, Radovan Kopp, and Branislav Vrana

✓ Cite this: *Environ. Sci. Technol.* 2020, 54, 13, 7942–

Article Views

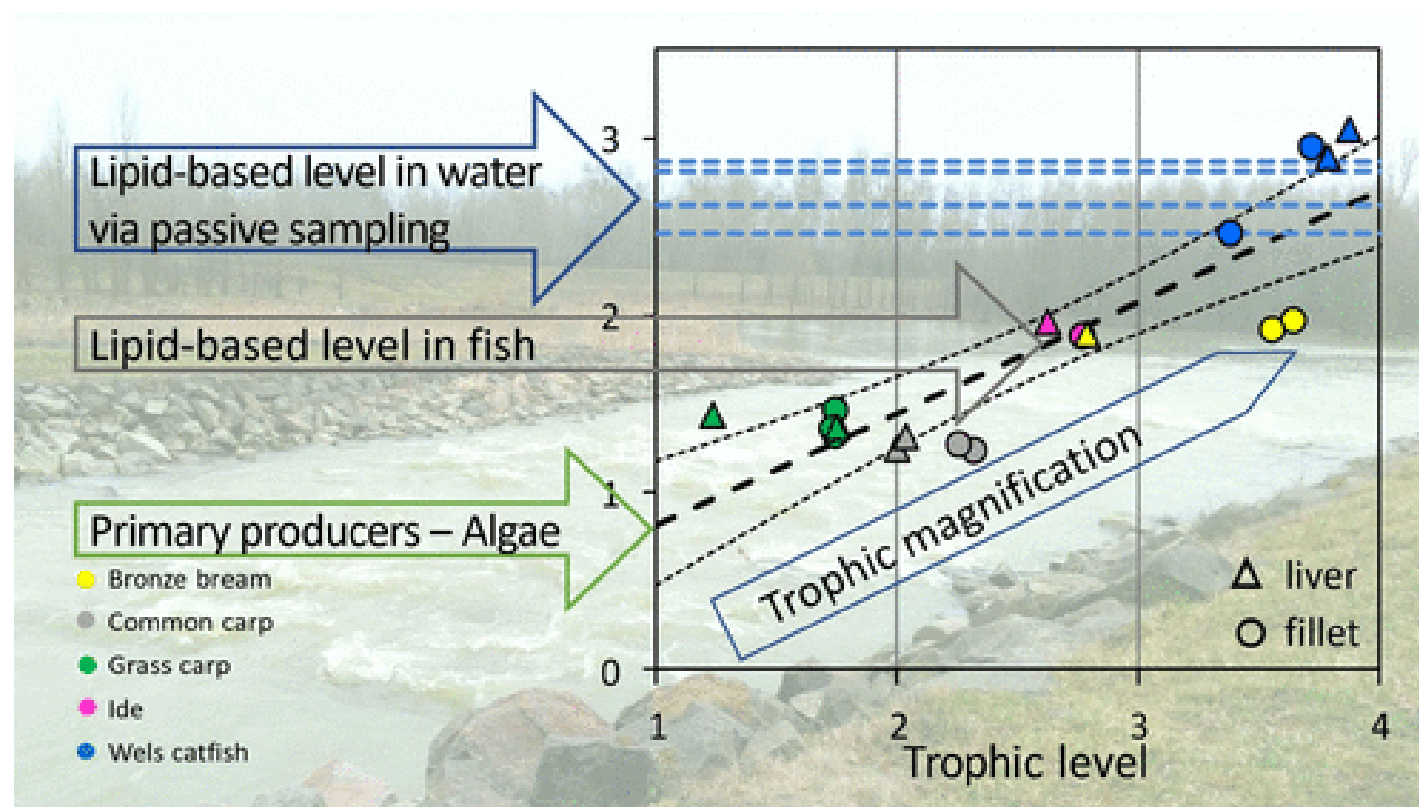
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NORMAN JPA

Initiatives on Passive sampling

Aims to **COLLATE KEY** examples on Passive samplers, in **ONE LOCATION**

Information to include,

- Sampling and Field considerations. Ease, frequency...
 - PASSIVE SAMPLING TEMPLATE EXISTS
- Analytical: Sample handling, LOD/LOQs...
- Modelling and reporting key information
- Identifying Research Gaps
- Increase the visibility of PS
- Create synergies with Regional Seas and other activities
- CASE STUDIES > Application of Passive samples in real life

Passive Sampling: Application in France

11 mai 2022

JOURNAL OFFICIEL DE LA RÉPUBLIQUE FRANÇAISE

Texte 3 sur 113

Décrets, arrêtés, circulaires

TEXTES GÉNÉRAUX

MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE

Arrêté du 26 avril 2022 modifiant l'arrêté du 25 janvier 2010 établissant le programme de surveillance de l'état des eaux en application de l'article R. 212-22 du code de l'environnement

NOR : TREL2200737A



*Opérations d'échantillonnage
par échantillonneurs intégratifs passifs (EIP)
en cours d'eau et eau littorale
dans le cadre des programmes
de surveillance DCE*

Recommandations techniques



*Opérations d'analyse physico-chimique
sur échantillonneurs intégratifs passifs (EIP)
en cours d'eau et eau littorale
dans le cadre des programmes
de surveillance DCE*

Recommandations techniques



Summary Conclusions

- Contaminant and chemical threats to our aquatic environment are ever increasing.
- Compliance limits and thresholds (*spot sampling*) are decreasing.
- Research on passive sampling is mature (~30 yrs) and continues to evolve.
- Research is now very applied and applicable in a monitoring context
- QC, performance studies, materials , now generally available > core to confidence
- Passive sampling applications in every country.
- Initiatives such as MONITOOL are Key.
- Collective work (and/or collations) is fundamental in the future.
- Passive sampling ***still*** has high “***potential***” as a support to monitoring.

Thank you for listening and happy for discussion