QUASIMEME development exercises to improve world-wide reliability of data in the marine environment

Steven Crum, Joop Harmsen and Winnie van Vark

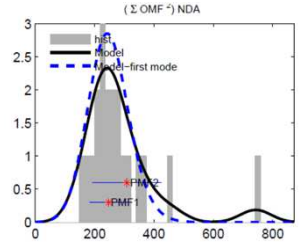
Introduction

QUASIMEME stands for Quality Assurance of Information for Marine Environmental Monitoring. At the heart of the programme is a holistic learn-by-doing spiral. The routine laboratory performance studies provide the basis of external quality assurance for institutes that make regular chemical measurements in the marine environment.

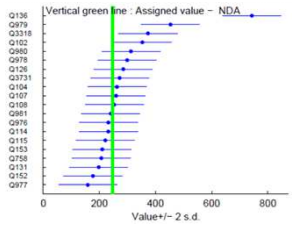
QUASIMEME is an interactive scheme in which the expertise of participating laboratories is leading. Participants can request specific determinants and matrices for inclusion in the programme, make suggestions for development exercises and workshop topics.

QUASIMEME Statistics

Sophisticated statistical methods are required to obtain meaningful assessments. The model that is chosen calculates population characteristics (mean and standard deviation) from experimental datasets (Cofino 2000). It uses an estimate for the probability density function (pdf) of the measurement process and calculates a best fit based on all observed values. We use a specific implementation of the model: the so-called Normal Distribution Approximation (NDA).



Example of histogram of results supplied by participants and Normal Distribution Approximation



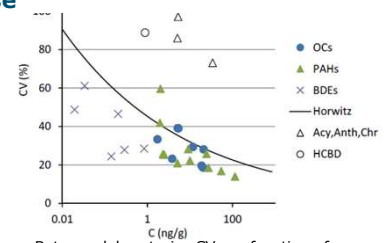
Ranked overview Passive sampler exposed to Benzo[a]anthracene

Development Exercises

For routine parameters a performance study can be organized on regular basis. For new parameters, for instance emergent pollutants, a more fit to purpose approach is necessary as used in the QUASIMEME development exercises. These improvement programmes may be initiated through a workshop and with a series of Development Exercises to provide detailed tuition, information and test materials tailored to the specific needs of the problem. The workshops to exchange information and experiences are essential.

Passive Sampling exercise

Passive sampling is a promising tool for measurement in the water phase. 21 laboratories were involved in a QUASIMEME study in which the performance of a Silicone passive sampler has been evaluated.



Between laboratories CVs as function of concentration. The Horwitz equation is presented as reference

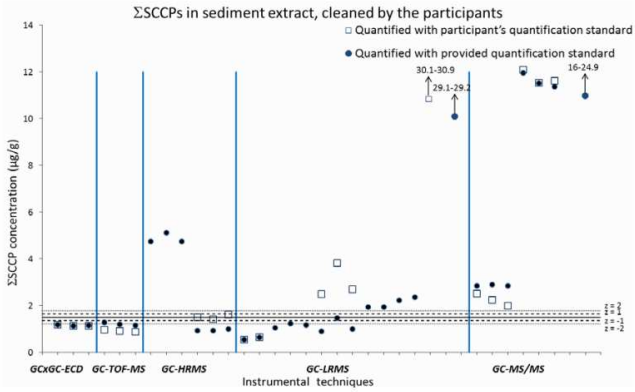
Chlorophyll exercise

Different steps of the analysis were evaluated and discussed during a workshop (Chlorophyll-a concentrations in µg/L) . Matrix and Analysis/Detection are important factors.

Processing step	*Nannochloropsis*	Algae mix	Seawater
Extraction liquid			
acetone	3.00 ± 2.21	1.30 ± 0.47	5.04 ± 1.41
ethanol	9.84 ± 3.15	1.62 ± 0.31	5.29 ± 1.22
methanol	9.30 ± 2.07	1.49 ± 0.18	4.46 ± 1.15
Analysis/Detection			
spectrometry	6.99 ± 4.10	1.57 ± 0.39	5.54 ± 1.26
fluorimetry	3.73 ± 3.61	1.29 ± 0.48	4.82 ± 1.40
HPLC	3.62 ± 2.79	1.19 ± 0.17	3.99 ± 0.63
Extraction volume			
<10 ml	5.07 ± 4.08	1.27 ± 0.32	4.85 ± 1.09
10 ml	5.88 ± 4.07	1.76 ± 1.08	5.09 ± 1.24
>10 ml	3.59 ± 3.84	1.29 ± 0.47	4.57 ± 1.35
Extraction time			
< 1 min	4.75 ± 2.01	1.25 ± 0.13	4.32 ± 0.93
1 - 60 min	7.12 ± 4.15	1.44 ± 0.39	5.39 ± 1.88
>60 min	4.77 ± 4.18	1.42 ± 0.48	5.05 ± 1.26
Extraction type			
homogenisation	5.94 ± 3.60	1.50 ± 0.48	5.16 ± 1.08
sonification	1.49 ± 0.88	1.24 ± 0.20	4.60 ± 0.77
soaking	4.74 ± 4.03	1.34 ± 0.45	4.85 ± 1.33

Short Chain Chlorinated Paraffins exercise

- The variation in results are caused by differences in standards and differences in instrumentation.
- Using the Electron Ionization mode, more outliers are produced.
- Although the variation is still high (see below), results are improved compared to the previous round organized.



Plot of applied instrumental techniques and reported ΣSCCPs concentrations (in triplicate) in the sediment extracts cleaned up by participants and determined with provided quantification standard (blue circle) and with participants own quantification standard (square). Result of round 3.

Acknowledgements

All laboratories involved in the exercises. In particular NIOZ, Texel and Deltares, Delft (Passive sampling exercise), KBIN-OD nature-Ecochem, Oostende (chlorophyll exercise) and IVM , Institute for Environmental studies, Amsterdam (Short Chain Chlorinated Paraffins exercise) for heaving the lead in exercises.

WEPAL/QUASIMEME Laboratory Performance Studies
Wageningen UR P.O. Box 8005
NI-6700 EC Wageningen
The Netherlands

Tel: +31 (0)317 486546
Fax: +31 (0)317 485666
E: quasimeme@wur.nl
www.quasimeme.org