

ASSESSING CAUSE & EFFECT: INTEGRATED MARINE ENVIRONMENTAL MONITORING OF CONTAMINANTS AND THEIR IMPACTS

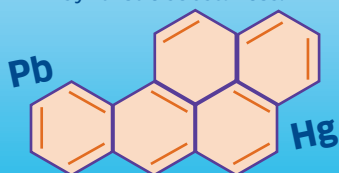


OSPAR COMMISSION

Hazardous

Substances Strategy

Contaminant concentrations are at background for natural substances or near zero for synthetic substances.



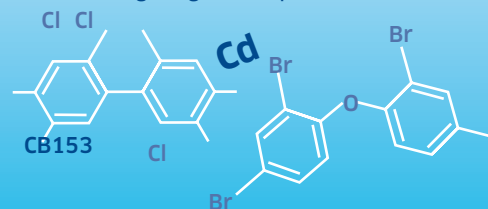
Water Framework Directive (WFD; 2000/60/EC)¹

“Progressively reduce pollution... Ceasing or phasing out emissions, discharges and losses...”

Ultimately achieve background (or close-to-zero) concentrations in the marine environment.

Marine Strategy Framework Directive Descriptor 8 (MSFD; 2008/56/EC)

“Concentrations of contaminants are at levels not giving rise to pollution effects”



ICES

International Council for the Exploration of the Sea

CIEM

Conseil International pour l'Exploration de la Mer

To increase the scientific knowledge of the marine environment and its living resources and to use this knowledge to provide advice to competent authorities.

A shared international vision of seas that are clean and safe

Marine Scotland Science (MSS) operate within a number of international agreements and organisations that have a shared vision of our marine environment, and we need to undertake monitoring for these organisations in a manner which is scientifically sound, coherent, and cost effective.



Developing an Integrated monitoring and assessment programme

In keeping with this, countries of NE Europe are required to undertake coordinated and coherent environmental monitoring as part of their responsibilities under OSPAR, the MSFD, and the WFD. To help with this ICES developed advice on how to undertake environmental assessments that are integrated at different levels:

- within samples (e.g. measuring concentrations and effects in the same fish),
- across environmental matrices (i.e. water, sediment, fish, invertebrates),
- through the approach to data interpretation (quality assurance and assessment), and at
- different geographical scales.

¹WFD requires assessment of the chemical status of coastal (≤12 nm) and transitional waters; the MSFD also requires pollutant effects to be assessed, but is not applicable to transitional waters

Trialling the ICES integrated approach

MSS agreed to trial the proposed ICES integrated approach by applying it to monitoring data collected from Scottish coastal waters. The approach is illustrated here using data from the estuary and Firth of Forth where there are both point-source and diffusive (runoff and atmospheric deposition) contaminant pressures.

- Water, sediments, flatfish, dogwhelks and mussels from the Forth were analysed for contaminants and/or their effects (Fig. 1)
- Data compared with assessment criteria (Fig. 2)
- Assessments integrated following ICES guidelines (Fig. 3)

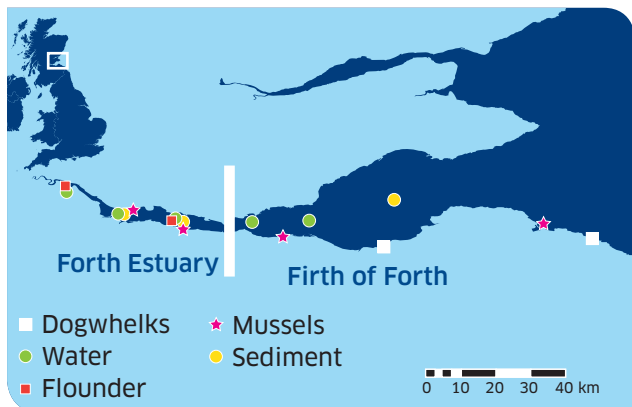


FIGURE 1 LOCATIONS OF SAMPLING SITES IN THE ESTUARY AND FIRTH OF FORTH.

Applying the ICES integrated approach allows a holistic interpretation of environmental status at different spatial scales (from individual sites up to North Sea-scale) and provides a common assessment framework for multiple environmental measurements. The assessments can be ‘unpacked’ readily to show what factors are contributing to poor assessments of environmental status in a given area.

The project has shown that by applying a wider array of monitoring endpoints and integrating sampling and assessment, monitoring data

from Scottish waters can be usefully applied to emerging international assessment frameworks.

Following a review of existing research and monitoring data, Marine Scotland Science will employ the integrated scheme in a targeted manner to undertake the status assessments required for the MSFD (Descriptor 8) and to indicate areas where additional measures may be required in order to further reduce the impacts of contaminants.

OSPAR	EU	ICES	
		Effects	Exposure ¹
>EAC ²	>EQS ³	>EQS/EAC	>BAC
BAC<x<EAC		BAC<x<EAC	
<BAC ⁴	<EQS	<BAC	<BAC

¹Some recommended biological markers indicate contaminant exposure, not a harmful effect;
²Environmental Assessment Criteria;
³Environmental Quality Standards;
⁴Background Assessment Concentration/Effect.

FIGURE 2 DATA WERE COMPARED AGAINST ASSESSMENT CRITERIA TO DETERMINE WHETHER EFFECTS / CONCENTRATIONS WERE AT BACKGROUND, WERE ACCEPTABLE, OR WERE UNSATISFACTORY.

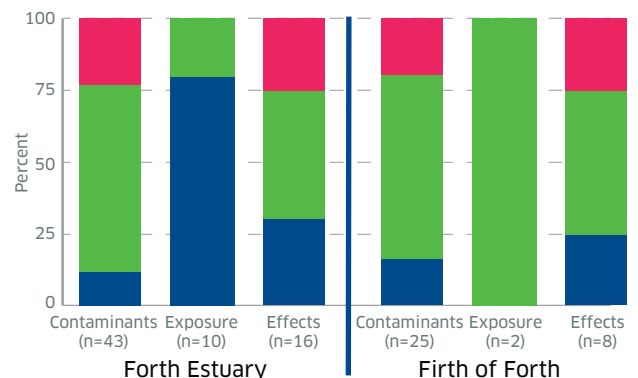


FIGURE 3 ASSESSMENT BY DETERMINANT GROUP (INTEGRATED ACROSS MATRICES AND SITES) FOR THE ESTUARY AND FIRTH OF FORTH.