ICES BIOLOGICAL EFFECTS MONITORING IN PELAGIC ECOSYSTEMS (BECPELAG) WORKSHOP: *in-vitro* BIOASSAYS

by Kevin Thomas[1], John Thain[1], Gerd Becker, Ketil Hylland, Jarle Klungsoyr, Thomas Lang, Bjorn Serigstad, Toril Inga Roe Utvik, Dick Vethaak, Werner Wosniok

Introduction

The ICES biological effects monitoring in pelagic ecosystems (BECPELAG) workshop is a multi-national, multi-dicipline workshop aimed at establishing suitable techniques for monitoring the effects of contaminants on pelagic ecosystems.

The main objective of the workshop is to assess the ability of selected methods to detect biological effects of xenobiotics in pelagic systems. In addition, the results from the workshop will be used as a basis to suggest methods for future monitoring of biological effects in pelagic systems.

Methods

One of the many activities that have been concurrently performed is the extraction of water samples using semi permiable membrane devices (SPMDs), blue mussels (*Mytilus edulis*) and large volume solid phase extraction (SPE) followed by *in vitro* testing and targeted chemical analysis of the concentrated extracts (Figure 1). The SPMDs and blue mussels were attached to large cages containing cod on two separate transects in the North Sea. One transect ran from the mouth of the River Elbe in a North-Westerly direction whilst the other ran in a South-Easterly direction from the Statfjord C oil platform in the Norwegian sector of the North Sea (Figure 2). Produced water from the platform was also extracted by SPE and tested.

SPMD (cage and membranes) | *Blue mussels* | *Large volume water sampler* | *Large volume SPE*

Figure 1: Sampling techniques used.

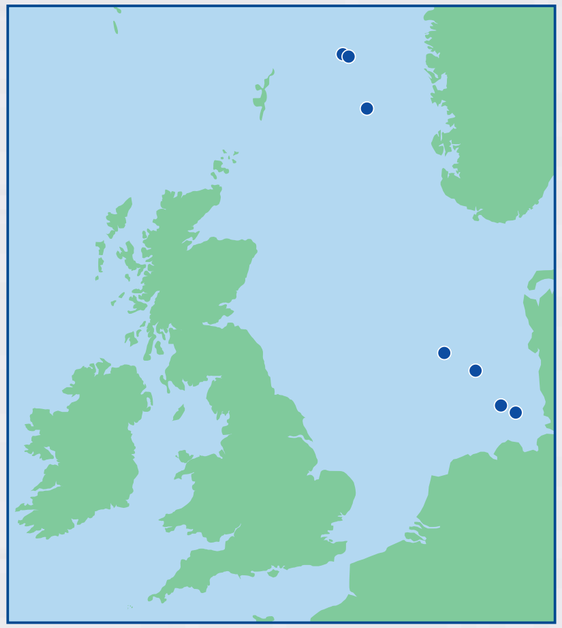
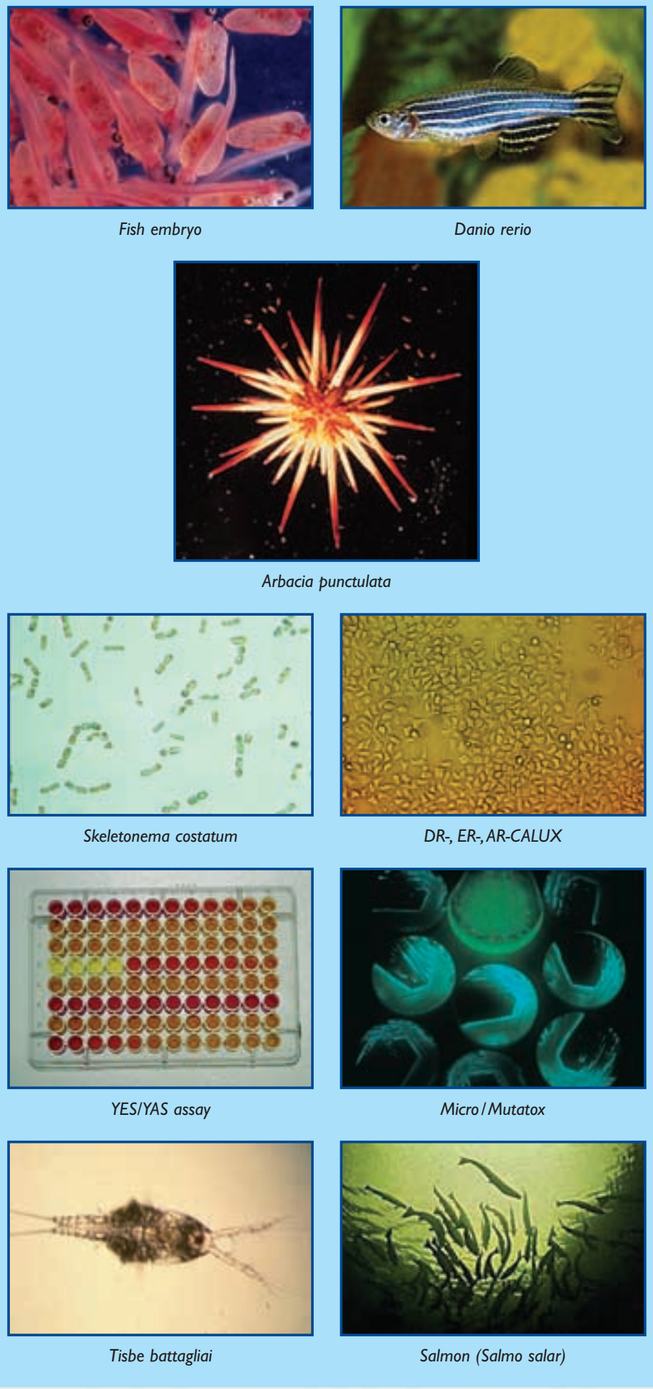


Figure 2: Study area selected for the analyses.

The concentrated extracts obtained were collected using the following *in vitro* bioassays: AChE inhibition, fish hepatocytes, DR-CALUX, ER-CALUX, AR-CALUX, Microtox, Mutatox, yeast oestrogen and androgen screen (YES & YAS), *Danio rerio*, *Arbacia punctulata*, blue mussel (*Mytlus edulis*) embryo, *Skeletonema costatum*, *Tisbe battagliai*, *Arcartia tonsa*, and *Salmo salar* (Figure 3). The end points to be used are described in Table 1.



Fish embryo | *Danio rerio* | *Arbacia punctulata* | *Skeletonema costatum* | *DR-, ER-, AR-CALUX* | *YES/YAS assay* | *Micro / Mutatox* | *Tisbe battagliai* | *Salmon (Salmo salar)*

Figure 3: Examples of bioassays used.

Table 1: Bioassays being used.

Test system	Endpoint
pure enzyme	AChE inhibition
primary fish hepatocytes	apoptosis, DNA damage, viability, mitochondrial function, vtg, CYP induction
modified cell lines with reporter genes	dioxin, estrogen, androgen receptor
bacteria	microtox, mutatox
modified yeast with reporter gene	estrogen receptor
juv. salmon, i.p. injection	vtg, zrp, CYP induction
egg microinjection, salmon	embryonal development
early life stage *Danio rerio*	embryonal development
oyster embryo, *Tisbe* sp, algae	toxicity
Arbacia punctulata	fertilisation, embryonal development
invertebrate larvae	toxicity; UV-exposure*
Acartia tonsa	survival, reproduction

Complimentary targeted chemical analysis of the sample concentrates has also been performed with samples being analysed for: polycyclic aromatic hydrocarbons (PAH), organochlorines, organotins and alkylphenols. These data will be statistically correlated with the results of the *in vitro* tests.

Discussion

The development of methods to assess the effects of contaminants in pelagic systems is important for the monitoring of coastal waters and to understand the impacts of oil production in the North Sea. The results from the workshop will be used as a basis to suggest methods for future biological effects monitoring and environmental management of contaminants in pelagic systems.

The data generated by this workshop will be presented at a wrap-up conference to be held in Copenhagen, DK on the 19/21 August 2002.

Acknowledgements

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http: //www.niva.no/pelagic/web/ [1] The Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Burnham Laboratory, Remembrance Avenue, Burnham on Crouch, Essex CM0 8HA, UK. Poster produced by CEFAS http://www.cefas.co.uk