



PRAGMA



Emun ta zabal zazu



Universidad del País Vasco Euskal Herriko Unibertsitatea

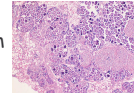
PRAGMA - A pragmatic & integrated approach for the evaluation of environmental impact of oil and chemical spills at sea

Baussant Thierry¹,
Le Floch Stephane²,
Theron Michael³,
Cajaraville Miren⁴

1-IRIS-Biomiljø, Mekjarvik 12, 4070 Randaberg, NORWAY
2-CEDRE, rue Alain Colas, 29218 Brest, FRANCE
3-UBO/UPCI, Av le Gorgeu, 29238 Brest, FRANCE
4-UPV, Barrio Sarriena s/n, 48940 Leioa, SPAIN

Pragma in brief ...

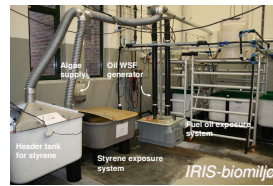
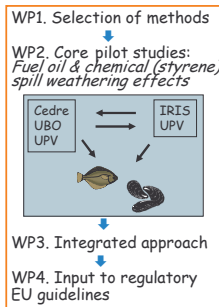
- ✓ Implement well-established methodologies based on **biological markers** and **integrate** them in current **EU guidelines** as decision-making criteria for the assessment of environmental **impact** and **recovery** in disaster accident
- ✓ Propose a **pragmatic** monitoring approach based on simple, cost-effective analytical tools like **biosensors** as "first level" monitoring techniques used *in situ*



Histological section of female mussel mantle (UPV)



Biosensor array cell (Univ. of Lund, Sweden, Dr. Eva Dock)

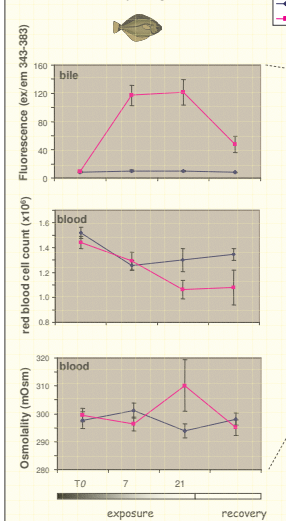


Experimental system in pilot studies

Preliminary results with fuel

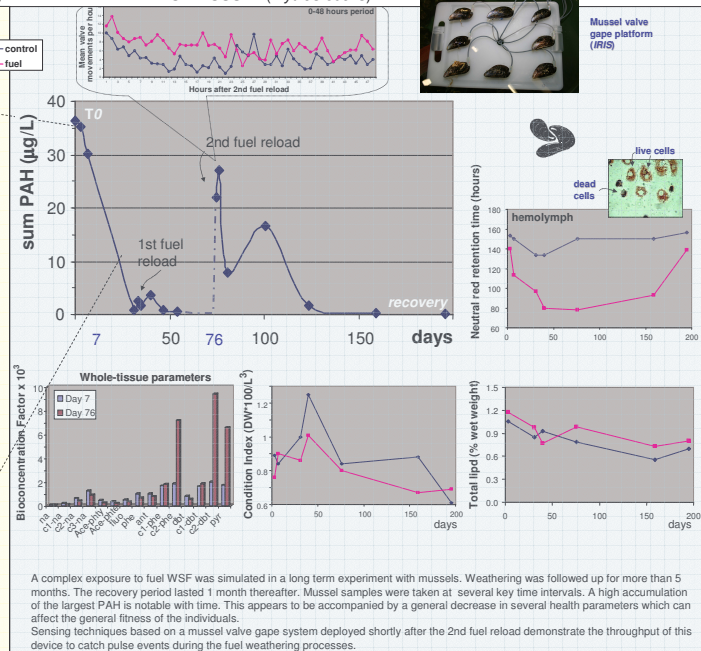
TURBOT (*Scophthalmus maximus*)

Turbots were exposed to the dissolved fraction of a heavy fuel oil during 3 weeks. They were then placed in clean water for recovery during 1 week.



A clear increase of biliary metabolites is demonstrated after the exposure. This is accompanied by an important decrease in red blood cells following haemolysis and a strong increase of osmolality after 3 weeks. Restoration is not fully obtained after 1 week in clear water.

BLUE MUSSEL (*Mytilus edulis*)

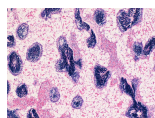


A complex exposure to fuel WSF was simulated in a long term experiment with mussels. Weathering was followed up for more than 5 months. The recovery period lasted 1 month thereafter. Mussel samples were taken at several key time intervals. A high accumulation of the largest PAH is notable with time. This appears to be accompanied by a general decrease in several health parameters which can affect the general fitness of the individuals. Sensing techniques based on a mussel valve gape system deployed shortly after the 2nd fuel reload demonstrate the throughput of this device to catch pulse events during the fuel weathering processes.

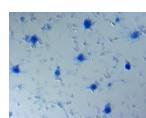
Other on-going assessments



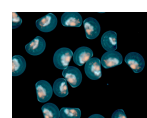
Genosensor in fish samples (Univ. degli studi di Firenze, Italia, Prof. Mascini)



Histopathology gonad & digestive gland (UPV)



Blood parameters: micronuclei, immunodefence (UPV, UBO, IRIS)



Bioassay: larval stages of blue mussel (IRIS)

- OTHER PARAMETERS**
- Acid/base equilibrium (UBO)
 - Blood gases (UBO)
 - Hydromineral status (UBO)
 - Endocrine disruption (UPV)
 - Proteomics (UPV)
 - Genomics (UPV)
 - Lysosomal responses (UPV)
 - Peroxisome proliferation (UPV)
 - Comet assay (IRIS)
 - Stress On Stress (IRIS)
 - Clearance rate (IRIS)

The vision ahead: biological-based environmental index

After selection of the most successful parameters indicative of possible deleterious effect at different levels, it seems essential to develop simple and manageable decision making methods that integrate individual biological markers in one pollution index. To that purpose, attempt to combine the individual responses into an assessment of the overall health status of organisms will be done. This step is seen as a pragmatic way towards a simplified communication and an harmonization of environmental results within member states and for decision-makers. On the long term, this should allow for a manageable and cost-effective monitoring strategy for assessing the environmental impact of spill where sensing and biosensor-based techniques could be used as "front line" devices while a sound biological-based assessment will support the final decision and actions to be undertaken for recovery post-spill.

Acknowledgements

This project has been granted by the EU-DG Environment under the "Marine pollution framework 2005" (Grant agreement 07.0309000/2005/429172/SUB/A5). We would like to thank TOTAL E&P NORGE for their financial participation and the Basque Government through project ETORTEK-IMPRES. We are very grateful to all staff from the different institutions that contributed to this project. <http://www.iris.no/pragma>

A similar type of study has been performed with styrene and the same evaluations is under investigation.