

**IMPACT OF ERIKA OIL SPILL IN BRITTANY COAST : USE OF BIOMARKER
INDEX SCALE IN MONITORING STRATEGY**

*Mr Jean François Narbonne, IFREMER - Rue de l'Île d'Yeu - BP 21105 - 44311 Nantes
Cedex 3 - France*

Secondary authors : Messrs. M. Daubèze, C. Clérandeau, G. Boquené, T. Burgeot* and
P. Garrigues.*

*LPTC, UMR CNRS 5472, Université Bordeaux 1, * DELPC, IFREMER Nantes France*

ABSTRACT

The ERIKA oil spill occurred in December 1999 and the oil spread down the southern coast of Brittany. Ten thousand tons of oil (Fuel N°2) containing high MW PAHs, methylated and sulfurated PAHs and mixture of heavy metals (vanadium, nickel, aluminium). Mussels was used as sentinel organism for the MONERIKA program (monitoring of the long term impact due to the ERIKA oil spill). The pollution assessment involved chemical measurements and indices of biological effects. The biomarker index scale was used for the first time in France in oil spill monitoring strategy. Mussels were sampled monthly (from January to December 2000) in 14 sites along the southern coast of Brittany. A battery of biochemical parameters were used to evaluate the response of mussels. Acetyl cholinesterase activity (AChE) is inhibited by some pesticides and also by heavy metals. Catalase activity (CAT) and lipid oxidation (evaluated as MDA) are markers of oxidative stress induced by number of organic and inorganic contaminants. Glutathione S-transferase activity (GST) is related to conjugation of organic compounds and benzo(a)pyrene hydroxylase (BPH) is induced by coplanar chemicals. AChE and GST were measured in gills (topic contamination from water column). BPH, CAT and MDA were measured in digestive gland (systemic way from food chain pollution). For each biochemical parameter a response index was allocated taken in account the levels of discrimination (variation range/confidence interval). For each site, a global index was calculated as a sum of index of five discriminant biomarkers. Finally a pollution scale was established including five levels (from lightly to highly contaminated). The global biomarker index of each site and for each month was converted in pollution level and associated to a color (red, orange, yellow, green and blue for classes from 5 to 1). These colors were reported on the map of the collected sites in order to visualize easily the temporal changes in effects of pollution. The results showed that for 8 sites the response to pollution were very significant during the 6 first months (from blue or green to yellow). For 4 sites, the index were slightly increased the 6 first months (green) and in 2 clean sites the index was mainly blue). A

**TOPIC 6 : Monitoring and R&D programmes
after a pollution**



Mr Jean-François Narbonne

discriminant analysis indicated that in polluted sites, the most sensitive factor was BPH activity, corresponding to high concentrations of PAHs in mussels. In sites exhibiting low contamination, the intrasite variations were discriminated by catalase activity indicating physiological changes. The results indicated that the impact of oil spill was significant in 8 sites among the 14 sampled, and the duration of the effect was only 6 months. The biochemical response of the animals was mainly due to PAHs, indicating no significant impact of metals.

