SIXTH FRAMEWORK PROGRAMME

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THRESHOLDS
Thresholds of Environmental Sustainability
INTEGRATED PROJECT

Priority 1.1.6 "Sustainable Development, Global Change and Ecosystems"
Sub-Priority 1.1.6.3 "Global Change and Ecosystems"

Stream 4 – D4.3.3 (substitutes D4.3.2) Mesocosm experiment

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PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Executive Summary

Task 3.2 within Stream 4, originally to be reported Month 17, has been postponed in favour of Task 3.3: Mesocosm experiment and modelling (see First Year Report). This task has a final reporting date Month 48, but instead this has been put forward to reporting of all results in a preliminary manuscript Month 17. The finalised manuscript is to be submitted by the latest autumn 2006.

The aim of the mesocosm experiment was to study effects of pyrene on a pelagic system level including three trophic levels (algae, bacteria, zooplankton), under two nutrient conditions. Such an experiment can be used to investigate direct and indirect effects of the contaminant. Furthermore, effects on thresholds that depend on nutrient status can also be assessed.

The results show that effects of pyrene were evident irrespective of nutritional status. However, magnitude and type of response differed between the non-enriched and the enriched system, suggesting that thresholds for contaminants will vary with eutrophication magnitude. Therefore either thresholds should be set for a variety of eutrophication scenarios, or thresholds should include the variation given by external factors.

1. Introduction

The overall objective of Stream 4 is to analyse, compare and assess the effects of contaminants in coastal ecosystems from the threshold perspective. WP 3 is the work package where uncertainties in thresholds for contaminants due to combined effects with nutrients are investigated. Therefore is WP3 concentrated on tests performed with algal, bacterial and zooplankton communities under varying environmentally realistic conditions as a complement to WP1, where mainly thresholds for laboratory species and conditions are reported.

1.1. Context and objectives

Task 3.2 within Stream 4 has for two reasons been postponed in favour of Task 3.3: Mesocosm experiment and modelling,. The opportunity to perform a mesocosm experiment in 2005 could not be missed as the Tresholds team could join forces with a international research group which wanted to use our controls for other purposes. We were thereby able to strengthen the sampling effort and subsequent analysis compared to if the mesocosm experiment had been run on our own. Furthermore as task 3.1 due to this rearrangement is still being run, the basic hypothesis to be tested in 3.2 is not yet available.
The aim of the mesocosm experiment is to study effects of Pyrene on a system level that includes three trophic levels (algae, bacteria, zooplankton), in order to investigate the validity of thresholds for one of the model substances using a pulse addition. This type of experiment will also include indirect effects that are otherwise missed in single species or community tests. Furthermore, the effects of Pyrene were evaluated for two different nutrient conditions where one set of replicates had the naturally occurring nutrient and biomass status of the sampling site, whereas the other set of replicates were preincubated with nutrients to increase biomass.

2. Methods, Results and Discussion

The background, actual study, results and discussion of the mesocosm experiment is here reported in Annex I, as a preliminary manuscript. Some further statistical analysis especially on zooplankton community structure is to be included.

The full data-set will be up-loaded on the Thresholds web-site in order to facilitate modelling of food-web effects and development of multivariate analysis for determination of thresholds included in Stream 2 and 5 within Thresholds.

3. Conclusions

Nutrient enrichment did affect the plankton communities and differentiated nutrient enriched from non-enriched ones. The effects of pyrene were stronger in the enriched community in all the investigated trophic groups. Altering nutrient status and algal biomass can modify the magnitude of direct and indirect relative responses to pyrene. Under the investigated conditions of biomass and nutrient status, there were no dilution effects of pyrene. Diatoms were found to be the least sensitive algae to pyrene exposure in both non-enriched and enriched communities. Indirect effects on zooplankton reduced grazing pressure, which resulted in different phytoplankton responses to pyrene exposure between the enriched and non-enriched communities at the end of the experiment. Low levels of biomass and activity at the time of the second nutrient and pyrene addition lead to difficulties in determining small changes in responses. It is imperative to our understanding of contaminant effects on natural communities, that interactions between trophic levels and between chemicals and abiotic factors are investigated.