SIXTH FRAMEWORK PROGRAMME

Project contract no. 003933

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 5 – D5.2.1
Test data sets for all levels ready for utilization

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Dissemination Level		
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

The overall goal of WP 5.2 is to assess to what extent different scalar measures of ecosystem function and community structure can reflect known spatial gradients, temporal trends, and experimental manipulations. WP 5.2 has its first Milestone at Month 28 (*Assessment of information value of proxies for key ecosystem processes and community structure, as revealed by analysis of dynamic coastal monitoring data sets including small-scale experimentation*), but work towards that includes, as a first step, compilation of test data sets of different levels of monitoring and experimental data. These sets represent Deliverable 5.2.1. which is reported here, and they will be augmented during the course of the project with increasing geographical coverage and data types.

1. Introduction

WP 5.2 will utilise comprehensive data sets (existing experimental data from previous EU-funded and national projects, existing monitoring data, and complementing experimental data created during THRESHOLDS) to analyse in detail the explanatory power of simple and robust indicators. The target is to define how far proxies for key ecosystem processes and structure of the food web can be simplified, in order to define measurements applicable to environmental management, without losing essential information excessively, using ecosystem properties derived from comprehensive data sets as benchmarks.

Three levels of assessment data will be considered:

Level 1. Coastal monitoring data series involving static measurements of chemical and biological parameters from regions of the Baltic Sea, North Sea, and/or Mediterranean Sea.

Level 2. Dynamic monitoring data series involving repeated short-term, small-scale experiments coordinated with traditional coastal monitoring in Danish and Finnish coastal waters (previous national and EU projects).

Level 3. Data sets from comprehensive food web experiments with controlled manipulations. Mesocosm experiments from earlier national and EU-projects COMWEB, BASYS, DANLIM, etc.

The test data sets of this Deliverable consist of Baltic Sea and Northern Atlantic data, which represent the abovementioned data levels.

2. Test data sets

2.1. Coastal monitoring data

Traditional coastal monitoring data for this task is available from numerous sources, both with open web-based access, with 'in principle' open access, and through personal communication with scientists and/or environmental management personnel.

Examples of open web-based monitoring data access are several, especially in the Baltic Sea region:

http://data.ecology.su.se/Models/bed.htm (SU, Baltic Environmental Database BED)
http://www.smhi.se/oceanografi/oce_info_data/shark/home_download_sv.html?language=s (SMHI database SHARK)
http://www2.dmu.dk/1_viden/2_Miljoe-tilstand/3_vand/4_mads/default.asp (NERI, Danish coastal monitoring data base MADS)

The 'in principle' openly accessible data can be found at international organizations (ICES, HELCOM), but experience has shown that retrieving the data is easily tedious and involves considerable time lags and problems related to data formats, lack of recent data submissions by national data owners, etc. Same applies, with increasing heterogeneity, to national institutes responsible for monitoring work. In most cases, only a fraction of national data is submitted to these international bodies. Finally, in some countries the monitoring data is in practice collected by institutes which consider the data as 'private project data', and accessibility is often very tardy, and dependent on personal level communication and most often strict adherence to 'not to 3rd parties' principle.

There is a clear continuum with increasing complexity of access, from chemical and physical to biological, and especially to taxonomic data.

The target of WP 5.2 is to compile an extensive data set from all abovementioned sources and data types, with emphasis on Baltic Sea data due to their excellent coverage both in time series and in eutrophication gradients. These data will be used extensively during the WP 5.2 work, but unfortunately, as a consequence of the heterogeneous data sources, the data cannot be used in their entity by scientists outside the specified WP 5.2 team. During the first months of WP 5.2 work, considerable effort has been laid on extensive contacts and negotiations with data owners, especially of taxonomical data, and essential parts of the data are covered by written or oral agreements that the data are available to this personnel and task only. While this is regrettable, and while the effort of getting data access is considerable, we consider the scientific benefits of compiling a full coverage data set obvious.

As the basic test data set, Finnish coastal monitoring data from 1975 – 2005 were compiled from more than 100 stations (up to 35 000 samples of basic physical and chemical variables with chlorophyll *a*; i.e. typical coastal monitoring data), which were clustered into 5 different coastal regimes with gradients of salinity and eutrophication. An example of the data structure for one variable and one coastal regime is presented in Fig. 1.

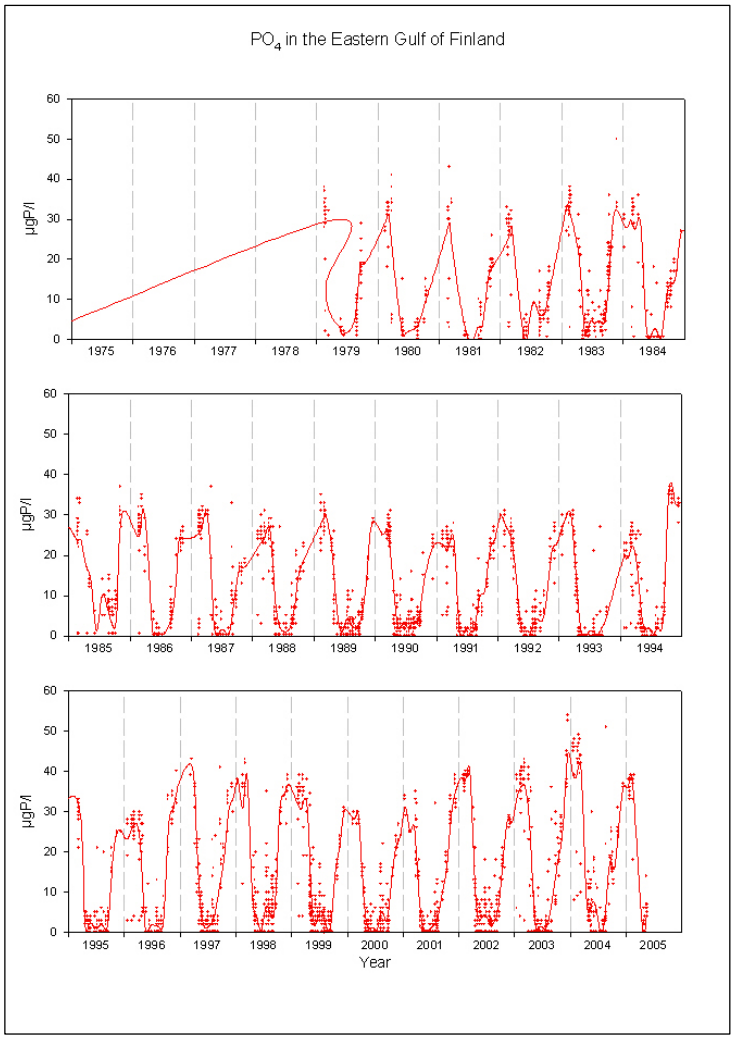

Fig. 1. Test data set example from the Eastern Gulf of Finland: Phosphate concentration (µg l^{-1}) in surface layer between 1979-2005.

Additionally, quantitative phytoplankton community data was compiled from Finnish national authorities (SYKE, City of Helsinki), yielding a total of 6000 outer archipelago and offshore phytoplankton samples, with good correspondence to the samples in the order-of-magnitude larger physico-chemical data set.

The test data sets of Level 1 are thus in operative condition and they have been already utilized for various time series and other analyses.

Also Finnish riverine discharge time series data for nutrients and other key elements, for the past 45 years, was compiled and clustered to corresponding coastal regions for the forthcoming WP 5.2 analyses.

2.2. Dynamic monitoring data

These data consist of 170 experiments (3 days duration) carried out during 3 annual cycles at 6 coastal locations of the Finnish coast, with nutrient (N, P) manipulations and several response parameters measured in time series (DIN, PO_4, chlorophyll a, primary productivity, POC, PON, POP; ca. 50 measurements of each per experiment). The target was to study the nutrient limitation patterns across salinity and eutrophication gradients of the coastal ecosystem. From the initial sample, regular monitoring data is available.

These data were produced during a national project (PELAG III) and partly treated during EU-project DANLIM. Statistical quality control was rigorously carried out for the whole data in WP 5.2 and finalized in spring 2006. The test data set is thus ready, and first analyses have already been submitted to scientific journals (Tamminen & Andersen 2006, Andersen, Saloranta & Tamminen 2006) or presented at symposia (Ptacnik et al. 2005).

An example of response data in one experiment is presented in Fig. 2.

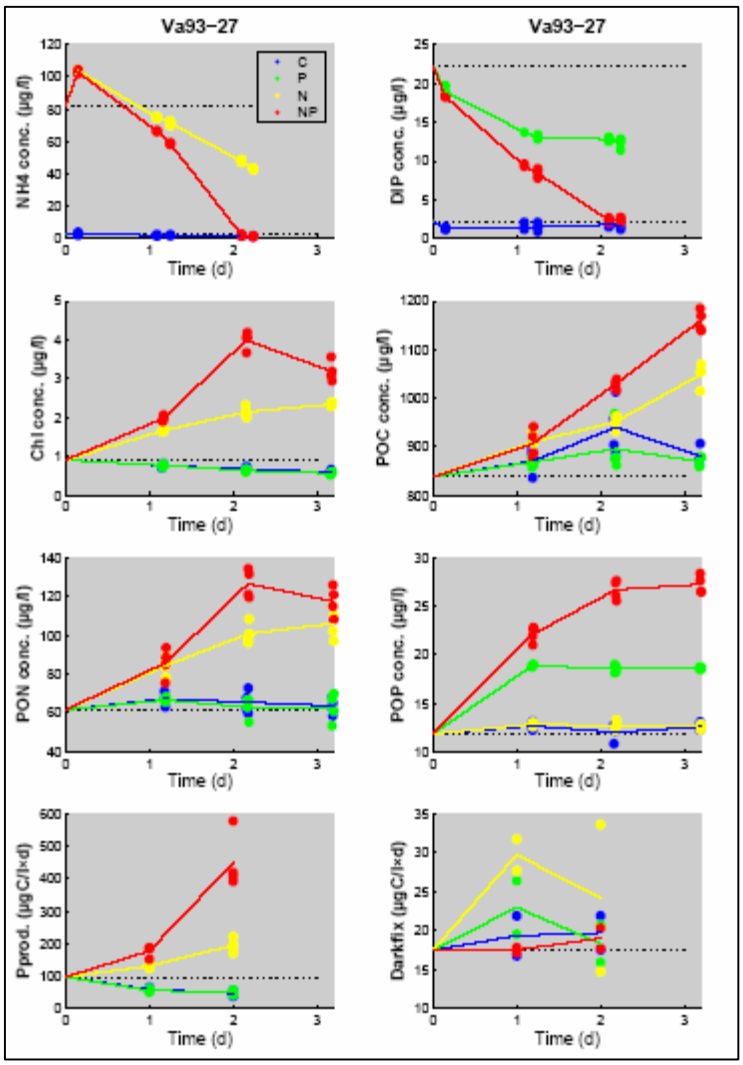

Fig 2. Example of responses in one nutrient limitation experiment to N and P additions (Bothnian Sea week 27/year 1993). Dynamic monitoring data set consists of 170 corresponding experiments over 3 annual cycles at 6 coastal locations in the northern Baltic Sea.

2.3. Comprehensive food web experiments

The extensive data sets for WP 5.2 work consist of relatively short-term mesocosm experiments (duration 2-3 weeks) with known perturbations of the planktonic community, most often with nutrient additions in different loading ratios and/or concentration gradients. The data are characterized by high intensity of sampling, and exceptional parameter coverage of the state and process variables of all major compartments of the food web (from bacteria to size-classified phytoplankton functional groups, protozoa and mesozooplankton) and nutrient pools (dissolved inorganic and organic, size-fractionated particulate nutrients).

The test data sets for WP 5.2 were selected from previous EU projects COMWEB and DANLIM, where key partners participated. This ensures immediate availability of quality-checked data, and the test data sets representing North Atlantic coast (project COMWEB) and Baltic Sea (COMWEB, DANLIM) are consequently already being processed by several partners in WP 5.2 work.

3. Conclusions

The test data sets for all predetermined data levels are organized and quality checked, which ensures effective continuation of WP 5.2 work, with important input from simultaneously finished WP 5.1 deliverables.

4. References

ANDERSEN, T., T. SALORANTA & T. TAMMINEN (*under revision*). A statistical procedure for unsupervised classification of nutrient limitation bioassay experiments with natural phytoplankton communities. Submitted to *Limnol. Oceanogr.: Methods*.

PTACNIK, R., T. ANDERSEN & T. TAMMINEN. Nutrient limitation in the eastern Baltic Sea – Information from bioassays vs. 'conventional wisdom'. Presentation at ASLO Congress, Santiago de Compostela, 2005.

TAMMINEN, T. & T. ANDERSEN (*under revision*). Seasonal phytoplankton nutrient limitation patterns as revealed by bioassays over Baltic Sea gradients of salinity and eutrophication. Submitted to *Mar. Ecol. Prog. Ser*.