Archipelago Research Institute
University of Turku

CURONIAN SPIT ENVIRONMENTAL MONITORING AND TOURISM INFORMATION SYSTEM - ANALYSIS OF EXISTING MONITORING PROGRAMMES AND RECOMMENDATIONS FOR FUTURE MONITORING AND TOURISM INFORMATION SYSTEM

Doc., Dr. Jari Hänninen
Archipelago Research Institute
University of Turku, FIN-20 014
Turku, Finland

Contents **page**

1. Acknowledgements

It has been a pleasure to participate this project. As environmental experts we have experience of environmental monitoring since 1975's (see selected references), and the Archipelago Research Institute (ARI) has done monitoring in the Finnish Archipelago since 1966. The international character of this project was, however, something new and challenging as most of monitoring programmes existing anywhere have a local or national character. Smooth progress during the project was made possible through highly professional and co-operative staff of all national parks studied. The motivation and knowledge of vice-director Albertas Kvietkas in the Kursiu Nerija National Park (KNNP) made it possible for us to finish our part in time. Substantial information and local knowledge were also provided by administrative officers Mr. Oleg Rylkov at Lesnoje, Kurskaja Kosa National Park (KKNP) and Mr. Jouko Högmander at Archipelago Sea National Park (ASNP). We also want to thank Prof., Dr. Arturas Razinkovas and Dr. Zita Gasiunaite for the practical help in field and all the arrangements. Also we acknowledge the continuous support and care by the director of the KNNP Mr. Vladas Portapas.

There were several surprises, such as the high quality and large volume of the environmental monitoring done at both the studied national parks, KNNP, Lithuania and KKNP, Russia. Another surprise, and a lesson learned was the actual lack of integration in all the studied monitoring programmes ,both Lithuanian, Russian and Finnish ones. This project will certainly remain as an important pioneering exercise towards a cost effective and scientifically meaningful integration of monitoring, leading finally to benefit the customers i.e. visitors of the national parks.

Doc., Dr. Jari Hänninen & Doc., Dr. Ilppo Vuorinen
Archipelago Research Institute
University of Turku, FIN-20 014
Turku, Finland

2. Introduction - what is monitoring ?

The website of US Environmental Protection Agengy (http://www.epa.gov/emap/) is indicative of central ideas, purposes and connections of environmental monitoring programmes in general and is here quoted as an example of an integrated monitoring system.

"The Environmental Monitoring and Assessment Program (EMAP) is a research program to develop the tools necessary to monitor and assess the status and trends of national ecological resources. EMAP's goal is to develop the scientific understanding for translating environmental monitoring data from multiple spatial and temporal scales into assessments of current ecological condition and forecasts of future risks to our natural resources.

EMAP aims to advance the science of ecological monitoring and ecological risk assessment, guide national monitoring with improved scientific understanding of ecosystem integrity and dynamics, and demonstrate multi-agency monitoring through large regional projects. EMAP develops indicators to monitor the condition of ecological resources. EMAP also investigates designs that address the acquisition, aggregation, and analysis of multiscale and multitier data."

Our aim was to assist as foreign specialists in preparing a cross border environmental monitoring programme and tourism information system in the Curonian Spit, Lithuania and Russia. The work was started by participating the first project seminar meeting at Smiltyne, Klaipeda in February 2003, where first drafts of Appendices 1 to 3 were prepared. In that meeting representatives of the KNNP, KKNP and the ARI presented a lecture about monitoring work done in each area. They were later completed and mended with additional information of both national parks sent by e-mail. Additional interviews were done in July 2003 during an expedition to the Curonian Lagoon. The work was further elaborated and discussed during an excursion to the Archipelago Sea, Finland in July 2003. During that trip the project participants were studying the environmental monitoring work done in the ARI and, specifically, in the Archipelago Sea National Park, Finland. Final version and recommendations were presented and discussed in the last project meeting at Nida, Curonian Spit in October 2003.

Monitoring is originally intended to help the park administration in decision-making. Furthermore, scientists may use the monitoring data in analysis of environmental changes and their origins. In this project the target is, however, different, because the monitoring data is intended to be used in a tourist information system.

We concentrated our exercise on environmental monitoring only when it is connected to a tourism information system. Other questions important for such a system, such as safety and health have not been considered in this report. Anyway some of these questions are touched e.g. when dealing with biohazard (poisonous biota, pests and parasites).

Furthermore, some important administrative questions have not been dealt with, such as problems of recreational overexploitation.

3. Analysis of existing monitoring programmes

In the comparison of existing monitoring programmes (Table 1.) it appeared that all the national parks run a very similar monitoring activity, although in ASNP it cannot be called a programme as such. The approach, however, in all the studied areas is to collect information in needs for administration so that scientists, environmental protection officers and economic decision-makers are provided with adequate and timely information about environmental parametres in the parks. This approach is for the purposes of this report called "factual orientation". Less important in all the studied parks seems to be the extraction of monitoring information for visitors, although it is done in some form in all the studied parks. Discussing this fact in project meetings it appeared that the approach the visitors i.e. tourists, take when visiting park, or planning the visit is actually very different. They are willing to know not only some facts (e.g. What are the air and water temperatures?) but also more recreationally oriented information (Can I go swimming?) The latter will be called "recreational orientation". These different approaches are compared in Table 2.

Table 1. Comparison of the monitoring programmes in Kursiu Nerija (KNNP), Lithuania, Kurskaja Kosa (KKNP), Russia and Archipelago Sea (ASNP), Finland National Parks, and the common features in the monitoring programmes.

	KNNP	KKNP	AS
Environmental Biology			
Forestry	+	+	not done
Bird observations	+	+	+
Mammals	+	+	+
Pests	+	+	+
Insects	+	+	+
Terrestrial vegetation	+	+	+
Aquatic vegetation	+	+	+
Soil	+	not done	not done
Fish	+	not done	+
Biodiversity	+	+	+
Environmental Physics			
Meteorology	+	+	+
Temperature (air and water)	+	+	+
Salinity (water)	+	+	+
Radioactivity in biota	+	not done	+
Environmental Chemistry			
Air pollutants	+	+	+
Hydrochemistry	+	+	+
Environmental Geography			
Coastline	+	+	not done
Erosion	+	+	not done
Landscape	+	+	+
Phenological observations			
Bird migration	+	+	+
Flowering of plants	+	+	+
Number of visitors	+	+	+

Table 2. Different orientation of administrators and tourists when asking information based on monitoring the coastal national parks.

Orientation			**Orientation**
Factual by:	**Questions asked**	**Questions asked**	**Recreational by:**
Administrators	*What is the temperature?*	*Can I go swimming?*	Children
Scientists	*How common are the endangered vipers?*	*Are the snakes dangerous?*	Adults
-..-	*What is causing the algal bloom?*	*Is it wise to go swimming there?*	-..-
Environmentalists	*Do mushrooms need protection?*	*Where I can find mushrooms?*	Visitors in the autumn
-..-	*Does the salmon enter the lagoon?*	*What kind of lure should I use?*	Recreational fishers
-„-	*Is there slitage and erosion of coastline?*	*Shall we climb the vista poin ?*	Trekkers

4. Criteria of monitoring programmes

When planning a monitoring programme there are questions to be solved prior the monitoring is started. Some questions deal with the monitoring effort required (Table 3.)

Table 3. Questions to be solved before the monitoring effort needed can be evaluated.

1. Monitoring what?
    - What kind of a change we want to observe? ►The smaller resolution, the bigger effort.
    - Is there seasonality in the measured parameter? ► If yes, at least 4 observations are needed yearly.

2. Towards whom the monitoring is oriented?
    - Scientific purposes ► bigger effort.
    - To audience ► probably smaller effort.

3. What kind of data analysis will be done?
    - Nothing special, just measuring or counting e.g. proportions of visitor groups in an area ► smaller effort.
    - Statistical, possibly predictive analysis ► regular numerical observations with unified methods ► larger effort with the effect of seasonality, autocorrelation and trends taken into account.
    - Modelling with uni- or multivariate models ► larger effort.

4. Cost of monitoring?
    - Monitoring should be kept as simple and cheap as possible ► smaller effort.

Concluding, recommended criteria for sustainable monitoring parametres include general features, such as:

- They must be cheap in order to facilitate the monitoring activity into not foreseeable future, and also to make it possible to arrange the monitoring in large enough scale (adequate number of parametres, monitoring localities and personnel).

- Furthermore, the planned monitoring must be done at a very general level in order to be understandable to the monitoring personal (they must not be specialists) and the large public, which is intended to be the audience.

- The monitoring should end up in numeric information in order to be easily transferred between the monitoring parties and the audience. The monitoring data will also be combined with data from other international and national monitoring programmes.

- It is also recommended to collect the data so that forecasts and short-term predictions can be made.

- The most important thing is, however that the monitoring must end up in results that are interesting for the audience, who is not asking factual but recreational questions, too. Examples of such questions deal with: temperature of the air and water, number of sheep ticks per m^2, possibly pollen, ice cover, blue green algal blooms, traffic, flowering of plants, nesting and migrations of birds and so on.

Thus discussions with park staff resulted in realising that phenological observations fulfil, or can be made to fulfil most of these criteria. Our recommendation based on these discussions and the analysis of existing monitoring programmes is to use phenological monitoring as the basis of tourism information system (http://www.nerija.ku.lt), and to build the integrated monitoring system so that phenological numeric data are easily collected and extractable from the programme.

It is also recommended to use the existing monitoring programmes as a basis for the tourist information system, because creating a completely new, and only recreationally oriented

monitoring system would be expensive. Most of the questions asked by recreationally oriented visitors could be answered by extracting information from the already existing programmes. Also planning the information system need to be done in an organised way, which already is provided by classifying the different monitoring parametres according to scientific principles. Thus a provisional list of recommended phenologic monitoring parametres to be included in the tourism information system is:

Biological phenological monitoring

- Seasonal migrations of birds and mammals, incl. seals and possible other aquatic animals, such as migrating fish species.
- Reproduction in the biota, e.g. trees and other plants flowering and seeding, birds having chicks, berries and mushrooms appearing, fish spawning.
- Seasonal phenomena generally

Physical phenological monitoring

- Ice cover.
- Temperature of air and water.
- Meteorological phenomena.
- Seasonal phenomena generally

Geographical phenological monitoring:

- Erosion of walking routes and landscape
- Changes in the coastline
- Changes in the landscape
- Generally long term and anthropogenic change

6. Conclusion and recommendations

The orientation of administrative and scientific staff of the parks is factual, while the tourists ask both factual and recreationally oriented questions. E.g. health is the concern of people planning the visit in the parks, and they ask questions about air and water temperature, potentially dangerous wild animals, but also questions about possible activities available in the parks (swimming, trekking, mushrooming).

It is recommended that the parks do a general survey among the visitors in order to list most important of these kinds of questions, and also to include a classification of the visitors into categories referred to in Table 2.

Concluding, the parks already do phenological monitoring and that is recommended to form the basis of the coming tourism information system. It is also recommended that monitoring results should be used in connection to other, international monitoring programmes, such as the bird-ringing programme run by the Russian Academy of Science at Rybachi.

7.Selected references

1. I.Vuorinen, J. Hänninen, E. Bonsdorff, B. Boormann & M. V. Angel 1997 Temporal and spatial variation of dominant pelagic Copepoda (Crustacea) in the Southern Ocean. **Polar Biology** 18:280-291
2. Flinkman, J., E. Aro & I. Vuorinen 1998 Changes in northern Baltic zooplankton and herring nutrition between 1985 and 1991 - top-down and bottom-up processes at work.. **Marine Ecology Progress Series** 165:127-136.
3. Vuorinen, I., Hänninen, J., Viitasalo, M., Helminen, U. & Kuosa, H. 1998 Proportion of copepod biomass declines with decreasing salinity in the Baltic Sea. **ICES J. Mar. Sci.** 55(4):767-77.
4. Rajasilta, M., Mankki, J., Ranta-aho, K. & Vuorinen, I. 1999 Littoral fish communities in the Archipelago Sea, SW Finland: a preliminary study of changes during the past 20 years. In. E.M. Blomqvist, E. Bonsdorff and K. Essink (eds.) Biological, Physical and geochemical Features of Enclosed and Semi-enclosed Marine Systems. **Developments in Hydrobiology** 135:253-260.
5. Kurki, H., Vuorinen I., Bosma, E., Bwebwa, D. 1999 Spatial and temporal changes in mesozooplankton communities in Lake Tanganyika. **Hydrobiologia** 407:111-120 and Developments in Hydrobiology.
6. Kurki, H., Mannini, P., Vuorinen I. Aro, E., Lindqvist, O.V. & Mölsä, H. 1999. Macrozooplankton communities in Lake Tanganyika indicate food chain differences between the northern part and the main basins. **Hydrobiologia** 407:129-135 and Developments in Hydrobiology.
7. Antsulevich, A., E., Maximovich, N.,V. & Vuorinen, I. 1999 Populations of the common mussel nearby the Island of Seili (Archipelago Sea, SW Finland). **Boreal Environmental Research** 4: 367-375.
8. Hänninen, J., Vuorinen, I., Helminen, H., Kirkkala, T. & Lehtilä, K. 2000 Trends and gradients in nutrient concentrations and loading in the Archipelago Sea, Northern Baltic. **Estuarine, Coastal and Shelf Science** (2000) 50:153-171.
9. Hänninen, J., Vuorinen, I. & Hjelt, P. 2000 Climatic factors in the Atlantic control the oceanographic and ecological changes in the Baltic Sea. **Limnology and Oceanography** 45:703-710.
10. Vahteri, P., Mäkinen, A., Salovius, S. & Vuorinen, I. 2000 Are drifting algal mats conquering the sea floor of the Archipelago Sea, in the SW Finland? **AMBIO** 29:338-343.

11. Dippner, J., Hänninen, J., Kuosa, H. & Vuorinen, I. 2001 The Influence on Climate Variability on zooplankton abundance in the Northern Baltic Archipelago Sea (SW Finland). **ICES J Mar Sci**.58:569-578.
12. Hänninen, J. & Vuorinen, I. 2001 Macrozoobenthos structure in relation to environmental changes in the Archipelago Sea, northern Baltic Sea. **Boreal Environment Research 6**:93-105.
13. Vuorinen, I., Antsulevich, A.E., Maximovich, N.V. 2002 Spatial distribution and growth of the common mussel *Mytilus edulis* L. in the Archipelago Sea, Northern Baltic. **Boreal Environment Research** 7:41-52.
14. Hakala, T., Viitasalo, M., Rita, H., Aro, E., Flinkman, J. & Vuorinen, I. 2003 Environmentally induced short-term changes in growth rates of Baltic herring (Clupea harengus membras L.) larvae. **Marine Biology** 142:25-33.
15. Bonsdorff, E., Laine, A., Hänninen, J., Norkko, A. & Vuorinen, I. 2003 Zoobenthos of the outer archipelago waters (N. Baltic Sea) - the importance of local conditions for spatial distribution patterns. **Boreal Environmental Research** 8:135-145
16. O'Brien, K, Vuorinen, I., Hänninen, J., Kanerva, T., Metsärinne, L. 2003 Macrozoobenthos structure in relation to major environmental factors across the Archipelago Sea, northern Baltic Sea. **Boreal Environmental Research** 8:159-170.
17. Hänninen, J., I. Vuorinen & G. Kornilovs 2003: Atlantic climatic factors control decadal dynamics of a Baltic Sea copepod, *Temora longicornis*. **Ecography** 26:672-678.
18. Mäkinen, J., Vuorinen, I., Quishui He, Marjamäki, M., and Viljanen M. K. 2003 Prevalence of Granulosytic *Ehrlichia* and *Borrelia burgdorferi sensu lato* in *Ixodes ricinus* Ticks collected from Southwestern Finland and from Vormsi Island in Estonia. **Acta Pathologica, Microbiologica et Immunologica Scandinavica** 111:355-62.

Appendix 1.

Monitoring in the Lithuanian part of the Curonian Spit.

No.	Parameters	Data from	Number of stations
	Air pollution	**1980**	**1 (Preila)**
	Water monitoring		
1	Curonian lagoon macrophytes	1996-1998	
2.	Hydrochemical and hydrobiological monitoring in the Curonian lagoon and Baltic Sea	1997	6 (3 in the sea + 3 in the lagoon)
3.	**Soil**	1979	1
	Vegetation		
4.	State of the forests	1989	52
5.	Vegetation of sandy soils	2002	1 transect
6.	Radioactive pollution of mushrooms	1994	
7.	Rare species	2000	
	Animals		
8.	Mammals		All territory
9.	grey herons (*Ardea cinerea*) and cormorants (*Phalacrocorax carbo*)	1998	1(Juodkrantė)
10.	Autumn migrations	1963	1(Nagliai)
11.	Wintering water birds	1997	All territory
12.	Nesting water birds	2000	All territory
13.	Nesting predaceous birds	1999	All territory
14.	Bats	2000	8
15.	Fish stocks and migrations in the Baltic Sea coastal area	1994	5
16.	Fish populations and toxins in the fish	1993	
17.	Tick abundance	1980	
18.	Phenological observations	1998	All territory
	Landscape		
19.	Deflation of sandy dunes in the Juodkrantė- Pervalka	1998	
20.	Erosion in the Curonian Spit	2000	146 transects
21.	Visitors of National Park		3
22.	Meteorological observations		1 (Nida)

Comments and additonal information based on an interview of Albertas Kvietkus at the Spit in July 2003:

Air monitoring is connected to observations at Klaipeda, which have a tradition longer than hundred years. Forests were planted some 200 years ago in order to combat erosion of the

dunes. Protection of nature thus is very old in the area, and will be celebrating its anniversary at the end of Sept. in 2003. Forestry is done in the park area in unified methods according to Lithuanian principles since the 1940´s. They use a management plan for 10 year periods, which was slightly modified after the independence. There is a common management plan on the way in a TACIS-project coming in 2004. Forestry monitoring is done by Kaunas Agricultural University (Faculty of Forestry) and included an aerial frame survey in 2003 from Klaipeda-Nida area. Rare and endangered terrestrial plants are included in the monitoring. The bird monitoring is considered as high quality and already traditional, it is based on a network of voluntary birdwatchers. There is an ornithological station at Juodkrante, where a Helgoland trap is used in a bird-ringing programme. Monitoring reports are made on a yearly to biyearly basis both for terrestrial and aquatic habitats. Mammals include game, such as elks, wild boar, deer, beaver, fox, roe that are followed all the year by footprints, excrement and airborne surveys. In Lithuania this is done together with the Ministry of Environment in combination with other monitoring activities. Bat monitoring is in Lithuania done by inviting people (e.g. ornithologists) from the Ecological Institute of the Vilnius University once a year, the activity is around 10 years old. Data is sent yearly from the researchers and reported in five-year periods. At Preila the atmospheric monitoring includes transboundary air streams, cloudiness, cyclones, phenols measured at a physico-chemical station. The atmospheric monitoring has been carried on for the last ten years. The data set includes data from Vilnius, e.g. CO_2, from an automatic physical measuring station (according to international atmospheric programmes). Phenological monitoring includes: flowering of plants, first bird species to migrate in spring, mushrooms etc. the data is collected by the park staff, e.g. the foresters, in a form. The coastline is monitored by the geological Institute from the Vilnius University and observations are done of beach, underwater and coastline changes. Sanitary monitoring is not considered an issue since the beaches are on the Baltic Sea side, and blue green algae or oil have prohibited swimming only occasionally at Klaipeda.

Appendix 2.

Monitoring in the „Kuršskaja kosa“ National Park (see also http://www.nerija.lt/en/)

	Monitoring	From	Frequency (years)	Number of stations (transects)
1.	Bird migrations	1956	0,5	2
2.	Forest pathology	1991	1	23
3.	Animals	1995	1	All territory
4.	Forests	1998	2	6 +23
5.	Air	1995	1	1
6.	Phenological observations	1998	1	2
7.	Curonian lagoon: macrophytes, macrozoobenthos, zooplankton, phytoplankton, temperature, transparency, salinity	2001	1	6
8.	Vegetation	2001	5	7 transects (96 stations)
9.	Coastline: sea lagoon	 2001 2001	 0,5 0,5	 10 6

Complementary information gathered in an interview of the administrative officer Oleg Rylkov at Lesnoje and Rybachi, and onboard the research vessel. Air monitoring is done at Kaliningrad and some results should be available in the net. Forest monitoring was considered similar to the Lithuanian one, incl. pine monitoring, biotopes and habitats, special points, aerial frame surveys (in 1998 Zelenograd-Rybachi, 2000 Zelenograd-Morskoja), and satellite pictures. This is performed by an institute from the St.-Petersburg and also is connected to the Vilnius University. Forest pathology, specifically, is done by the Institute of Forestry in Moscow and includes pests, insects, damage to trees etc. Air monitoring includes meteorological observations, such as temperature, pressure, CO, phenols, nitrogen oxides, and are done at Pioniersk, close to Zelenograd. Bat monitoring is on a voluntary basis and done by one enthusiast person collecting also insects. Kaliningrad floral specialists are planning to meet in Aug. 2003. Geological coastline monitoring is done by Kaliningrad University.

The ticks are monitored and, the collection method is dragging a cloth, the studies are done by St. Petersburg zoologists. There is a programme of vaccination (but it remained unclear for which disease it is directed, probably for tick born encephalitis). Sanitary monitoring is

done by a state organisation at Zelenograd, the District Epidemiological Station. The number of visitors is monitored using information from border authorities and Kaliningrad.

There is a prominent bird ringing station at Rybachi, former Rossiter, started by the Prussians a hundred years ago. The activity is currently supported by a German sponsor, which has developed especially the informational activity towards visitors. The monitoring work itself is strictly scientifically oriented, and in itself makes valuable resource to be considered carefully as an opportunity when this project is making proposals.

Appendix 3.

Monitoring in the Finnish Archipelago Sea

Based on a lecture by Ilppo Vuorinen at the headquarters of the Kurskaja Kosa in Jan. 2003

1) Private consultants, e.g., Water Protection Association of the SW-Finland (WPA); – hydrography, hydrochemistry, biological oceanography, environmental state generally
2) Governmental Research Institutes, e.g. Southwest Finland Regional Environmental Centre (LoSYK); – hydrography, hydrochemistry, biological oceanography, environmental state generally incl. cultural landscape and regional planning
3) the Finnish Environmental Authority (SYKE); – hydrography, hydrochemistry, biological oceanography, environmental state generally, incl. forcing of environmental legislation
4) Intergovernmental institutes at the open sea, e.g. HELCOM; – chemical, biolocical and physical oceanography
5) Finnish Institute of Game and Fisheries Research (RKTL); – fish and waterfowl monitored both areally and internationally
6) ICES; – commercial fish
7) Åbo Akademi University (together with the regional government of the Åland Islands);– marine biology and environmental care
8) University of Turku; – environmental state of the archipelago
9) University of Helsinki (Tvärminne Zoological Station); – zoological research
10) Regional fisheries authority (TE-keskus); – commercial fish catches
11) Institute for radiation safety (Säteilyturvakeskus)
12) Finnish Meteorological Institute (FMI); – meteorological station at Utö
13) Municipalities (e.g. the Environmental office of the City of Turku); – sanital state of beaches, sewage effluent etc.
14) Archipelago National Park; – number of visitors, nesting of the sea eagle
15) The Finnish Institute of Marine Research (FIMR); – temperature and salinity of sea water

16) Regional Government of the Åland islands (Ålands Landskapsstyrelse); – state of the environment
17) Agriculture Research center (Maatalouden tutkimuskeskus); – nutrients in the river runoff
18) National Maritime Institute (Merenkulkulaitos); – traffic incl. planning
19) Finnish coastal defensive forces; – traffic
20) National Board of Antiquities; – cultural landscapes incl. historic buildings and prehistoric sites

There is no planned integration at all between these various monitoring programmes. Some integration, however, is provided to the system due to activities of some central institute e.g. Archipelago Research Institute of University of Turku performing much of the actual sample collecting. This is done e.g. for WPA, FIMR, SYKE, LoSYK, Säteilyturvakeskus. Thus, it has been possible to place several sampling programs from various instutes on same locations, e.g. water salinity, temperature and zooplankton measurements for the FIMR are done at the same constant moored sampling site with those of LoSYK and the University of Turku (Fig 1).

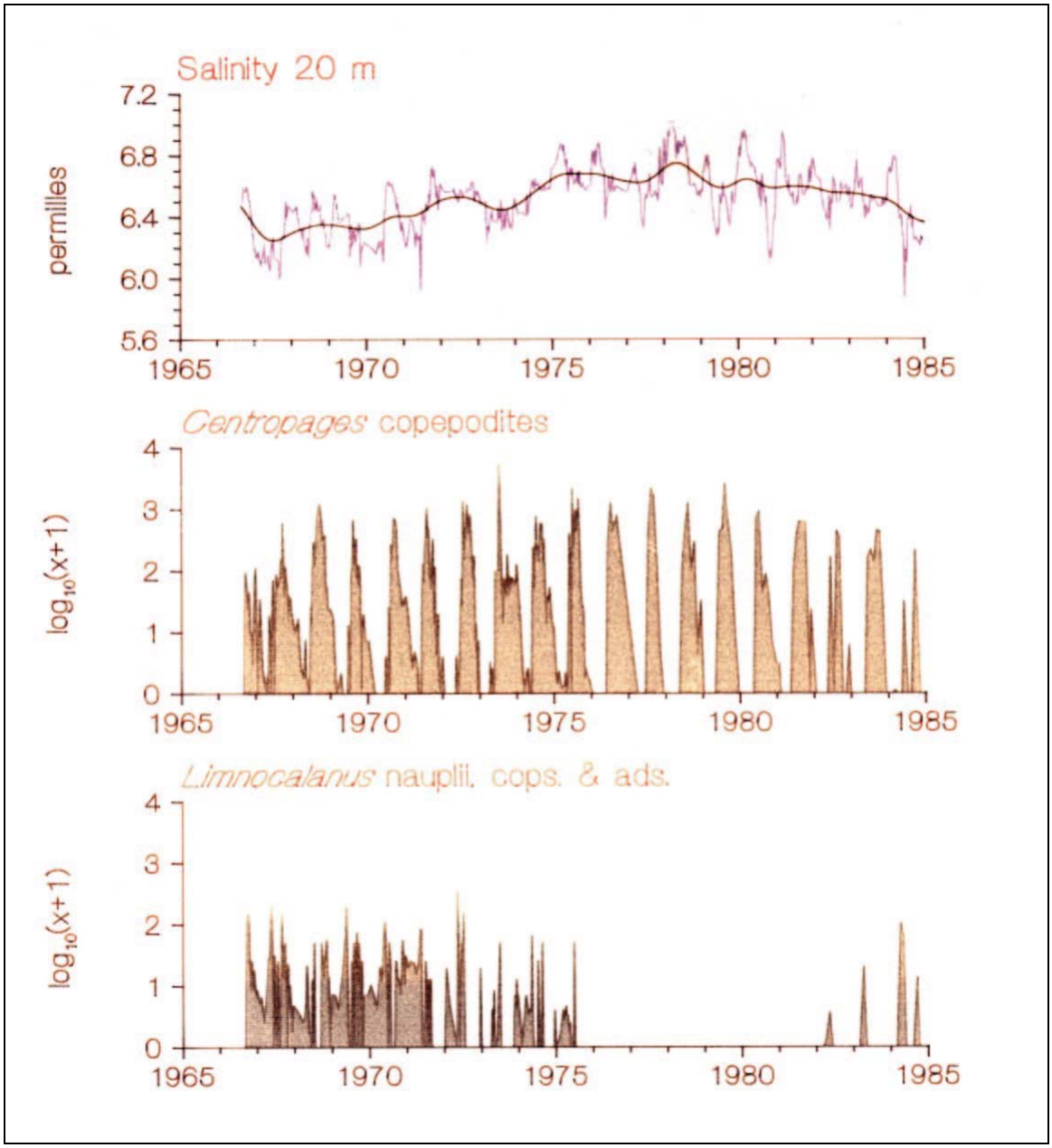

Fig 1. Seawater salinity and abundance if two planktonic copepd species at the island of Päiväluoto, SW-Finland.

Also, when given a change the personnel of ARI is placing sampling location along three cross sectional lines from the inner towards the outer archipelago. All these lines cross the three archipelago zones and all of them have a freshwater source in the innermost end (Fig. 2).

Also integration is provided by the local environmental authority by specific projects under the umbrella of regional municipal authorities, University of Turku and the local environmental agency (http://www.lounaispaikka.fi/eng/index.html).

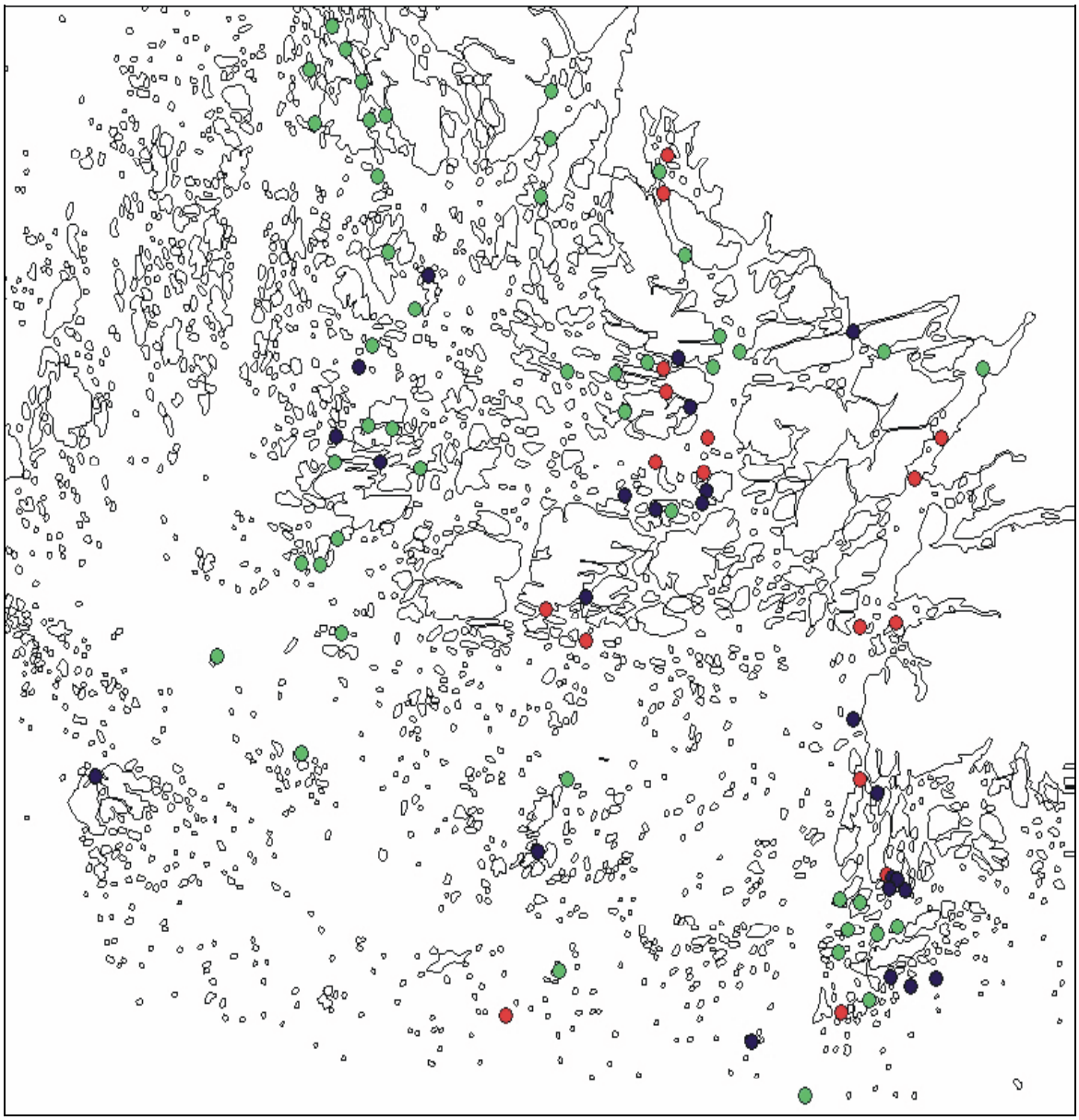

Fig. 2 Distribution of anoxic (blue), temporarily anoxic (red) and oxygenated (green) bottom sediments along three study transects, Paimionlahti-Örö, Airisto-Jurmo and Kustavi-Kökar (Viitasalo et al. 2003).

Interviewing Mr. Jouko Högmander, the director of the park in Oct. 2003, gathered additional information from the ASNP. The few examples monitored annually are:

1) Number of visitors in the park, and
2) Nesting success of the sea eagles (started already in 1972, published as apart of alrger overview and done by experienced amateurs and WWF on co-operation).

It appeared the ASNP does not run a formal and documented monitoring programme. Instead they have performed various project-type researches, which actually could be built up in a monitoring programme. Examples of such are:

3) Bird sightings count in the co-operation area of the park was done in 1970's and redone in 1990's, and produced e.g. 122 species in the 70's and 125 species in the 90's. That will be repeated again in 2004, which actually can be called a monitoring exercise.
4) The underwater research of the coverage of marine algae (the bladder wrack as the most interesting). That study was redone by the University of Turku and Archipelago Research Institute in early 2000's and produced a decline of the coverage percentage especially in the outer archipelago.
5) Terrestrial research done include the rare species as ASNP have monitored so called responsibility species (*Botrychium simplex* and *Potentilla anglica*), which they count yearly or every other year.
6) They have participated in the co-operational census of the sheep ticks at the archipelago, done in late 1990's (Archipelago Research Institute, City of Turku and Finnish National Health Authority)(Mäkinen et al. 2003).
7) In the park there also is a fish monitoring programme initiated by the Nordic Counsil of Ministers, which performs gill netting in some Baltic Sea coastal areas, e.g. in Estonia, Åland Islands and Finland.
8) There is a project following the effects of removal of the American mink.
9) There is a program monitoring the numbers of seals.
10) Littoral fish species were seined in early 1990's.
11) There also is a current project studying the bats in the archipelago.

Furthermore, the park service has hired a marine ecologist, which is currently co-operating with universities in several research projects generally gathered around the topic of marine biodiversity.

Turku, Finland 1.10.2003

.....

Jari Hänninen
Teijulantie 8
Lieto, FIN-21 420