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# High profile BONUS events 2011

Communication and visibility to the outside world has been one of the top priorities for BONUS throughout its lifetime. This year BONUS has particularly good reasons to show what a coordinated joint Baltic Sea research programme can achieve. Our 16 BONUS+ projects are proceeding towards the end and are therefore mature to present their main findings to the world.

On 19-20 May, during the European Maritime Day in Gdansk, BONUS's focus is on how the ecosystem-based approach should be applied in practice. BONUS+ projects provide good case studies on science based solutions when a BONUS overview is presented to a broad European audience.

During 22-26 August, BONUS projects will convene together with the Baltic Sea scientific community in St. Petersburg to the 8th Baltic Sea Science Congress. Altogether 8 out

of 19 thematic sessions are initiated and chaired by BONUS scientists, to whom this will be the main forum to present the new scientific achievements to their colleagues. In addition, BONUS will arrange a special training and networking session for young scientists - the 3rd convening of the BONUS Young Scientists' Club. Another event for presenting scientific results is the ICES annual science conference including a dedicated BONUS session during 19-23 September 2011 in Gdansk.

On 24 October, BONUS Forum composed by representatives of ministries across sectoral borders of the nine Baltic Sea countries – environment, transport, agriculture, forestry and science – will convene for a seminar in Gdansk to hear what is the latest knowledge about biodiversity and eutrophication, what is the status in assessing risks and stressors as well as what are the future scenarios of the Baltic Sea. In this occasion

we will announce the winner of the competition for the BONUS outreach award (see the back cover for more information). The BONUS Forum is open for all those who attend the joint conference of the EU Strategy for the Baltic Sea Region and the Baltic Development Forum on the following days (25-26 October).

Finally, there is a considerable number of EU Commission, Council and parliament officials, as well as Parliament Members who contributed significantly to the process of the decision concerning the BONUS programme. Hence, on 8 November, we will arrange a dedicated seminar 'BONUS+ highlights for the European community' in Brussels, where main success stories and achievements of the BONUS+ projects will take the centre stage.

**Kaisa Kononen**  
Executive Director, BONUS



Miikael Hyvönen



# Strategic research agenda: A critical milestone passed

by **Andris Andrusaitis**, Programme Manager, BONUS

In the morning of 17 March 2011 at Dikli Manor House in the Latvian countryside, the atmosphere was charged. More than seventy representatives of the national research funding agencies, European Commission services, research communities and stakeholders gathered in the plenary meeting hall to summarise the outcomes of the past two intensive work days; the BONUS Strategic Orientation Workshop (SOW) was about to be concluded.

The entire process was initiated last June by opening of the BONUS Poll, continued in October at the BONUS Forum and refined until February 2011 through a series of national stakeholder workshops run by the BONUS advocates.

Well before arriving to SOW, each participant received a set of background materials analysing the state of art and providing foresight in each of the potential research directions of the future BONUS strategic research agenda (SRA). The materials

were prepared by a dedicated drafting team which was formed to include best experts in relevant science disciplines. This way, most of the workshop time could be devoted to specialist discussions on thematic content and formulation of the SRA.

Page by page, the emerging SRA was scrutinised by the participants, the final comments expressed and noted by the BONUS secretariat team. The closer the final page came, the clearer it also became that we had achieved not only an agreement on

the direction of the strategic objectives but also on the priority research themes and on the structure of the SRA. This result is a critical milestone achieved in the light of BONUS's future plans.

## RESEARCH PROGRAMME RESPONDING TO GRAND CHALLENGES

The Baltic Sea region, like the whole of EU, stands on the threshold of major challenges: We will need to adapt to the effects of changing climate. Good environmental state and

healthy marine ecosystem will have to be restored before its resilience capacity reaches the tipping point. Furthermore, through ecosystem approach to management of human activities, we need to achieve genuine sustainability and safety in the use of ecosystem goods and services. Also our marine and maritime observation and data handling systems need to enter a new, much more integrated and cost-efficient generation. Sector policies and the entire governance of human activities need to be evaluated critically and developed boldly across sector and national borders. Last but not least, we also need a true shift in the value system and lifestyle of the modern society to safeguard sustainable way of living.

Finding solutions to these challenges is not thinkable without having the best possible scientific knowledge available and bringing together the effort of science communities of Earth system research in marine, maritime, economical and societal fields.

At SOW, five interlinked strategic objectives were confirmed. These do not only form the basis of the BONUS SRA but also address the challenges ahead. The strategic objectives of the BONUS SRA 2011-2013 are:

- Improving the capabilities of the society to respond to the current and future challenges directed to the Baltic Sea region
- Enhancing sustainable use of coastal and marine goods and services of the Baltic Sea
- Meeting the multifaceted challenges in linking the Baltic Sea with its coast and catchment area
- Understanding the Baltic Sea ecosystem structure and functioning
- Developing improved and innovative observation and data management systems, tools and methodologies for marine information needs in the Baltic Sea region

Each of these objectives will be addressed by several broad multi-disciplinary research themes that will constitute the contents of the BONUS calls for research proposals in 2011, 2012 and 2013. The review of the SRA will take place again in 2013 through a transparent and flexible process which takes into account future demands.

#### PREPARATIONS UNDERWAY TO THE FIRST CALL

In order to be ready to open the first competitive BONUS call in December 2011, several more important steps need seeing to. The BONUS SRA will be reviewed externally and reviewed and adopted by the BONUS Steering Committee in mid-June.

BONUS is a pioneering programme in many ways. Our intention is also to join forces with the region's leading agencies supporting technological development. Planning related to joint innovation-focused calls is underway and will also feed into the SRA. The final SRA will be made publicly available by the time of the BONUS+ Annual conference taking place in St. Petersburg in August 2011.

Subscribe to the BONUS Bulletin at [bonus@bonuseeig.fi](mailto:bonus@bonuseeig.fi) to receive future updates and check the BONUS website at [www.bonusportal.org](http://www.bonusportal.org).

*"Despite environment protection efforts by the countries surrounding the Baltic Sea, stretching today across several decades, society has not found efficient solutions to sustain the health of the Baltic Sea ecosystem. Examples of missing solutions to current and emerging environmental and sustainability issues in the Baltic Sea area are many as are the related knowledge needs. The main aim of BONUS as the joint Baltic Sea research and development programme is to respond to this unsustainable situation through a strong cooperation across the region and generate and disseminate knowledge and provide necessary know-how in support of knowledge-based governance and long-term solutions for the good of the Baltic Sea region."*

BONUS strategic research agenda 2011-2013, to be published in August 2011



Tiina Tembe

SOW participants in plenary session at Dikli Manor



Dzitra Upmace

A view of the Dikli Manor, Latvia

## Editorial box

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BONUS is a joint research and development programme producing knowledge to support development and implementation of regulations, policies and management practices specifically tailored for the Baltic Sea region. It issues calls for competitive proposals and funds projects of high excellence and relevance based on its strategic research agenda.

BONUS is supported by the national research funding agencies in the eight EU member states around the Baltic Sea and the EU Commission's Research Framework Programme. Scientists from the Russian Federation participate in BONUS research projects through a number of special agreements in BONUS through special agreements.

**BONUS in Brief** is published by the BONUS secretariat to keep the BONUS community, including partners and supporters, informed about current views and news about our activities and accomplishments.

BONUS EEIG is the legal management organisation of BONUS.

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#### BONUS members and related funding institutions 2011:

##### Denmark

- Danish Agency for Science, Technology and Innovation
- Danish Council for Strategic Research

##### Estonia

- Estonian Science Foundation

##### Finland

- FiRD Coop
- Academy of Finland

##### Germany

- Forschungszentrum Juelich Beteiligungsgesellschaft mbH
- Federal Ministry of Education and Research

##### Latvia

- Latvian Academy of Sciences
- Ministry of Education and Science of the Republic of Latvia

##### Lithuania

- Research Council of Lithuania
- Ministry of Education and Science of the Republic of Lithuania

##### Poland

- Foundation for the Development of Gdansk University
- Ministry for Science and Higher Education

##### Sweden

- Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning FORMAS
- Swedish Environmental Protection Agency

Russian scientists participate in BONUS through special agreements.

In this column we publish invited opinion articles by experts of their fields, featuring particular perspectives on a freely chosen topic relevant to the theme of knowledge-based governance of the Baltic Sea region.

## One and a half years into the implementation phase: **The EU Strategy for the Baltic Sea Region**

by **Anders Lindholm**, European Commission, Directorate General for Regional Policy



Väinö Silm, IP Turku

**Eight of the nine states bordering the Baltic Sea are members of the European Union. The introduction of Community rules, and the opportunities created by Community instruments and policies have opened important new possibilities for a more effective co-ordination of activities, thus delivering higher standards of living for the citizens of these member states. However, despite good levels of international and inter-regional communication and cooperation, the full advantage of new opportunities that EU membership provides has yet to be realised and challenges facing the region are yet to be addressed adequately. Furthermore, the Baltic Sea region is a highly heterogeneous area in economic, environmental and cultural terms, yet the countries concerned share many common resources and demonstrate considerable interdependence.**

The EU Strategy for the Baltic Sea Region (EUSBSR), endorsed by the European Council in October 2009, responds to the key challenges facing the region which no country can solve on its own. It provides a focused macro-regional framework for improving the environmental condition of the Baltic Sea. It addresses, among other concerns, transport bottlenecks at the external borders, insufficient energy interconnections and the challenges arising from increased oil transportation at the Sea. The main part of the Strategy is a detailed Action Plan where the Strategy sets out 15 Priority Areas and 80 concrete Flagship Projects across the four pillars 'Environment', 'Prosperity', 'Accessibility' and 'Safety and Security'.

The Strategy cuts across the traditional borders between policy areas in a new and innovative way and promotes a more holistic way of looking at the challenges and opportunities faced. This is especially relevant for research; here the aim is to ensure that the results coming from programmes (for instance such as BONUS) are used in an optimal way in the implementation of the Strategy. A lot of crucial decisions will be made in the coming years to improve the sustainability of the region and they need to be based on updated and qualified research. Therefore, clear links need to be

established between the research community, the policy makers and the implementers of the EUSBSR.

### **KEEPING THE REGION INVOLVED**

A wide range of stakeholders from all levels are involved in the implementation of the EUSBSR. At national level, National Contact Points ensure the Strategy's implementation and its coherence with national policies. At sub-national level, individual euro-regions, counties and cities show strong commitment, and many play key roles in the practical implementation. The regional bodies such as Baltic Development Forum (BDF), the Baltic Marine Environment Protection Commission (HELCOM), Vision and Strategies Around the Baltic Sea (VASAB) are also involved and directly responsible for the implementation of various projects and actions listed in the Action Plan.

In order to ensure that the Strategy remains fully responsive to the needs of the region, the involvement of member states is also formalised through the High Level Working Group. The body consists of high-level senior officials representing all member states. Its aim is to advise the Commission on the progress and present the recommendations for further development of the Strategy.

To discuss the progress of the Strategy, the Annual Forum is the

main event gathering key stakeholders. It serves as an opportunity for all actors to present their work and exchange their views with regard to the implementation process. The first Annual Forum was organised on 14-15 October 2010 in Tallinn, the second is to be held in Gdansk on 24-26 October 2011.

### **STATE OF PLAY OF THE IMPLEMENTATION OF THE EUSBSR**

More than one and a half years into its implementation phase, the Strategy shows significant results. The wide spectrum of inter-linked projects respond to the main challenges of the region. Thanks to the Strategy, many new projects have been funded and developed, among them projects supporting farmers' cooperation to reduce eutrophication or providing planning support for transport infrastructure. The Strategy has also raised momentum for existing projects. It provides new working methods and networks as well as clearer and more direct links to national and European policies.

The Environmental Pillar has seen the largest number of new projects. In response to the problem of eutrophication, farmers' organisations from across the region joined forces to create the project 'BalticDEAL' that aims at reducing nutrient input to the Sea from farming. New projects on clean shipping

have been created to address another key source of pollution, namely that stemming from ship emissions. In addition, the project 'BALADAPT' has been created to establish a regional climate change adaptation plan. The early implementation phase of the Strategy has thus contributed to making national and regional efforts more coordinated and inclusive in order to improve the condition of the Baltic Sea; areas needing intensified action have been identified; and member states have assumed lead roles in securing quicker and better results.

### **ALIGNMENT OF POLICY AND FUNDING**

Thanks to the Strategy, the sectoral policies such as transport, education, energy and climate, environment, maritime, fisheries, industry, innovation, health and agriculture, can become more coherent and better suited to the needs of the Baltic Sea region as a whole. The first phase of the Strategy's implementation has shown the importance of an alignment of policy and it has proven its clear incentives. It is important to see the different policy initiatives as complementary and mutually supportive.

Alignment of funding is of key importance for the success of the implementation process. So far funding of the projects is available through ERDF and other major EU funds such as ESF, EAFRD, EFF as well as national funding sources. The European and Nordic Investment Banks have provided several projects with loans. Improved ways should, however, be developed to ensure that the funds are better linked and that contacts are established between funding authorities to ensure synergies and avoid duplications. BONUS can play an important role in this by ensuring that the recommendations coming out of the projects are picked up also by other funding programmes thus realising the necessary steps we need to take to safeguard our common environment.

For more information on EUSBSR, visit [http://ec.europa.eu/regional\\_policy/cooperation/baltic/index\\_en.htm](http://ec.europa.eu/regional_policy/cooperation/baltic/index_en.htm)



SEAS-ERA (2010-2014) is an EU funded project under the FP7 ERA-NET. It is a partnership of the leading Marine RTD Funding Organizations in 18 countries. In addition, a range of observers are associated with the project. SEAS-ERA aims at coordinating the national and regional RTD activities, and it embraces marine and maritime research in its entirety. It overarches the previous initiatives which only targeted a given area or basin and, therefore, constitutes of a stable and durable structure for empowering and strengthening marine research all across Europe. The Spanish Ministry of Science and Innovation (MICINN) is the project coordinator.

The project has thematic work packages which follow the rationale of the ERA-NET initiative (e.g. Information exchange, strategic analysis, implementation of joint activities etc.), and cover the key issues that are to be addressed by the European operational structure. These issues will be developed at a regional scale with the final goal of building a regionally based pan-European marine research strategy.

## Towards integrated European marine research strategy and programmes (SEAS-ERA): The Black Sea region

by **Tarik Şahin**, Scientific and Technological Research Council of Turkey

SEAS-ERA is implemented in three regions, namely the Atlantic, the Mediterranean Sea and the Black Sea through dedicated regional work packages. The work package eight (WP8) entrust marine research funding organisations in the Black Sea region to increase their joint activities, thus providing a basis for sharing of knowledge, expertise and resources to address issues at the regional level which are beyond the capabilities of individual states of Turkey, Bulgaria, Romania, Ukraine and Georgia, as well as enhancing synergy at pan-European level.

The Scientific and Technological Research Council of Turkey (TUBITAK) leads the Black Sea regional network (WP8) which is to develop and implement common research strategies and programmes related to the Black Sea basin. The general objectives for the region is to develop a regional strategic research agenda (SRA), build up a common research programme and launch a joint call.

The result of the joint call and proposals for follow up actions will be examined and a roadmap for the "region-specific marine research infrastructures of international attractiveness" developed through mapping of the existing marine research infrastructures and

assessing the Black Sea position at the EU level. Also within the Black Sea initiative the existing instruments in human capacity building are to be improved and the Black Sea network managed.

Two national consultation meetings were organised in Turkey (10 January 2011) and Romania (8 March 2011) through which the process of determining the priorities for the Black Sea Basin was initiated. During the first strategic analysis workshop on 11 March 2011 in Ankara, experts from the Black Sea partner countries as well as the partner institutions shared their ideas about the SRA. The first draft of the agenda will be available for reviews by the

end of June 2011. The second strategic analysis workshop will take place in December 2011 and will consider the progress made. The final SRA will be approved by the SEAS-ERA Black Sea partners with a view of it being published in February 2012.

The intention of the Black Sea WP is to incorporate non-EU countries of the region to provide a comprehensive coverage of the key issues and efficient use of existing capacities in the Black Sea basin. The activities of the Black Sea SEAS-ERA will be closely coordinated with those of the recently established Black Sea-ERA.NET, thus ensuring complementary inputs and avoiding overlapping efforts.

A significant step will be taken in the countries surrounding the Black Sea for development of coherent, future-oriented policies in the area of science & technology. Different human capacity building schemes implemented at various marine research funding organisations at European, regional and national levels, and schemes existing in the Black Sea countries, will be reviewed and documented. Furthermore, the gaps will be identified and new mechanisms will be built for creating attractive environment for development of human resources and capacity in the Black Sea region.

For more information, visit [www.seas-era.eu/np4/3/54.html](http://www.seas-era.eu/np4/3/54.html) [www.tubitak.gov.tr/](http://www.tubitak.gov.tr/)



Participants at the first strategic workshop in Ankara on 11 March 2011

In the past four issues of the BONUS newsletter we have introduced ten of the BONUS+ projects: **IBAM** and **RECOCA** in April 2009, **BEAST** and **ECOSUPPORT** in November 2009, **PROBALT** and **RISKGOV** in May 2010 and **BALCOFISH**, **BALTIC-C** and **INFLOW** in November 2010. The following pages feature further three **AMBER**, **BALTGENE** and **HYPER**. Further four projects will take centre stage later this year, namely **BALTIC GAS**, **BALTICWAY**, **BAZOOCA** and **PREHAB**.

Furthermore, many events this year will feature results of the BONUS+ projects (see front cover for events 2011). For example, in August 2011, a quarter of the nearly 400 papers to be presented at the 8th Baltic Sea Science Congress, St. Petersburg, will showcase BONUS+ results.

For news and updates of all the 16 BONUS+ projects, check the BONUS website at [www.bonusportal.org](http://www.bonusportal.org).



iStock

# AMBER

## EU Common Agricultural Policy threatens the Baltic Sea

by **Joachim Dippner**,  
Leibniz Institute for Baltic Sea Research Warnemünde, Germany

**If the demand for humans' animal protein consumption increases as projected, it may be a major holdback to fulfil the environmental goals of the Baltic Sea Action Plan according to new results by international researchers of AMBER, the Assessment and Modelling Baltic Ecosystem Response project.**

AMBER implements and applies the ecosystem approach to management (EAM) of the Baltic Sea in order to provide a toolbox for better management action in the future. However, successful implementation of the EAM concept requires best available scientific information that can be used as the basis for integrated management. Therefore the project is based on three pillars:

- A. retrospective analyses on long-term data sets
  - B. intensive modelling with suites of models
  - C. selected measurements of biogeochemical transformation processes in the coastal water and the groundwater
- A) The human desire to look into the future requires investigations of the potential predictability of the system. For this to happen, sound science based indices are extremely helpful. AMBER has developed a new Baltic Sea environmental (BSE)

index (see Fig. 1), which performs better than any other index because it considers the important processes in the Baltic Sea. Moreover, AMBER has developed an indicator system for the eastern Baltic cod stock that is able to support cod stock management decisions and hence helps developing sustainable fisheries.

B) Models result from different regional climate change scenarios combined with the output from simulated changes in land use of watershed models. Climate and land use models are coupled to investigate the impact of combined effects such as precipitation, temperature and riverine nutrient transport. The central result shows that if the demand for humans' animal protein consumption increases as projected, it may be a major holdback to fulfil the environmental goals of the Baltic Sea Action Plan. However, most importantly, this result seems to be robust because it is obtained with three completely different model setups. The Baltic Sea may anticipate further nutrient increase due to the

The AMBER project generates new knowledge in support of decision making in the Baltic Sea region and includes leading scientists from five Baltic Sea countries, namely Finland, Germany, Lithuania, Poland, and Sweden.

**Participating institutes:**

- Leibniz Institute for Baltic Sea Research Warnemünde, Germany
- Forschungsverbund Berlin e.V., Germany

- University of Helsinki, Finland
- Stockholm University, Sweden
- Swedish Meteorological and Hydrological Institute, Sweden
- University of Hamburg, Germany
- University of Turku, Finland
- Coastal Research and Planning Institute, University of Lithuania
- Institute of Oceanology Polish Academy of Sciences, Poland
- Aalto University School of Science and Technology, Finland

increasing economy and the increasing animal protein consumption in all riparian countries.

C) Little is known about the role of dissolved organic substances as an additional carbon or nitrogen source for production in the Baltic Sea. The same is true for the input of nitrogen from ground waters and the removal of nitrogen in coastal areas. All three of these major gaps have been at least partly closed and new insights generated by AMBER's measurement campaigns which provided substantial new information. Results suggest strongly that:

1. dissolved organic substances play a much more vital role in the nutrient budgets than previously thought and needs to be considered for inclusion in the monitoring program of HELCOM
2. groundwater inflow sites such as the one on the Puck Bay, Poland, seem to have mainly local impacts
3. the nitrogen removal capacity especially in coastal sites is high and partly counteracts the anthropogenic inputs but threats to this natural nitrogen removal may be the spreading of anoxic zones

All obtained results will be compiled into synthesis papers for stakeholders, in particular policymakers, during this year.

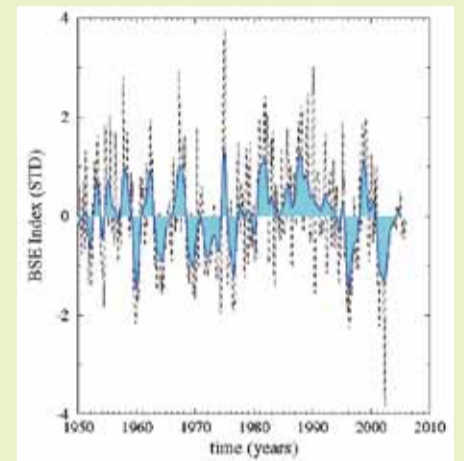


Figure 1: Monthly values of the Baltic Sea environmental index (dashed grey line). The blue filled line shows the time series filtered with a cut off period of 25 month.



A. Roepert  
Submarine groundwater discharge measurements on Hel peninsula in Puck Bay, Bay of Gdansk.

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[www.io-warnemuende.de/amber](http://www.io-warnemuende.de/amber)



Tasavallan presidentin kanslia  
The AMBER project has been generating general interests already at the highest level of the stakeholders when it was presented to the presidents of Finland and Russia during their stay on the Archipelago Research Institute of the University of Turku in July 2010.



Daniel Johansson

# BALTGENE

## Assessing patterns and importance of genetic biodiversity

by **Kerstin Johannesson** and **Eva Marie Rödström**,  
Department of Marine Ecology, University of Gothenburg, Sweden

Environmental changes challenge local and global survival of populations and species. In a species-poor environment like the Baltic Sea this is particularly critical as major ecosystem functions are upheld by single species and genetic variation may be fundamental to both species survival and function. BALTGENE maps the genetic variation of Baltic Sea key species, outlines factors underlying the patterns of genetic variation and investigates effects on ecosystem functions.

BALTGENE is a multi-disciplinary project involving research in social science as well as several science disciplines such as genetics and ecology. Major findings to date show that policies related to management of genetic biodiversity are either complex or lacking. Species assumed to be genetically homogeneous are in most cases highly structured genetically with local populations being delineated by physical or behavioural barriers (e.g. homing) to gene flow. We have found evidence of a recent speciation event inside the Baltic Sea, resulting in the only known endemic Baltic Sea species. We have also examined the importance of fisheries induced selection. Furthermore, the results to date show that genes involved in immuno-responses are under stronger pressure from selection than other genes, suggesting that unwanted introductions of new pathogens in the environment with increasing temperature will put pressure on evolutionary rescue mechanisms.

### RIO CONVENTION IS FAR FROM IMPLEMENTED

Genetic biodiversity is one of the three main levels of biodiversity according to the Rio Convention. Despite this the genetic level of biodiversity is poorly, if at all, considered in policies and regulations dealing with biodiversity. BALTGENE has studied in detail both policies and regulations related to stocking of salmonid fishes, in particular in Sweden and Finland, and has found that there is a general lack of consideration of the genetic level of biodiversity within institutions and policies. When direct issues appear, for example when permissions for stocking of fish should be granted, the policy systems are complex and mostly depending on the policy beliefs held by individual employees.

**GENETIC MAPPING SHOWS HIGHLY STRUCTURED SPECIES**  
BALTGENE, as well as similar studies from other parties, show clearly that most marine species have

populations that are much more structured than believed earlier. For example, despite most fishes being highly mobile (like cod, herring, sprat and salmonid fishes) species are delineated into genetically distinct local populations. In some species, differentiation is continuous while in others discrete. The strong genetic structure is also, and perhaps less surprisingly, found in seaweeds, but again patterns of variation are species-specific and we have found clear differences between very closely related species.

### COMBINING OCEANOGRAPHIC MODELLING AND GENETIC DATA

In BALTGENE we test the role of oceanographic currents in the structuring of populations. For passively dispersed species, we hypothesise that propagules are spread by oceanographic currents and that the pattern and magnitude of long-range dispersal shape metapopulation structure and connectivity among populations. To test this hypothesis we compare predictions from advanced oceanographic models in which current rates and directions are modelled based on the existing climate (mainly winds and water level) during the past years. These models have a very high resolution and vectors for dispersal can be predicted down to scales of a few kilometres.

### GENETIC VARIATION AND ECOSYSTEM FUNCTION

A critical issue is what it means for an ecosystem that the more important species (foundation species, key species, habitat forming species and similar) are more or less genetically variable. Experimental work has shown that genetic variation in habitat-forming plant species favour biodiversity of associated species. Likewise productivity and other ecosystem functions have been shown to increase with level of genetic diversity in foundation species. In BALTGENE we have performed experiments that show that populations composed of individuals of different genotypes are more likely to survive extreme physical stress compared to populations of the three most common clones presently found in this endemic Baltic species.

### WHAT IS NEEDED FOR A SUSTAINABLE MANAGEMENT OF THE BALTIC SEA SPECIES?

Climate models suggest that the Baltic Sea will evolve towards even lower salinities than today and this will put a strong pressure on the originally marine species currently dominating the Baltic ecosystem. However, it is clear that many of these populations have evolved very rapidly increased tolerance toward low salinities. The potential to evolve even more extreme tolerances are a matter of how much genetic variation is preserved in the populations - the more genetic variation, the larger is the chance that gene variants needed are present. In BALTGENE we approach this issues by analysing how the so-called "effective population size" ( $N_e$ ) varies in populations. By estimating  $N_e$  for a population, it is possible to predict how much

genetic variation the population lose by random processes in each generation. To promote a science-based management of Baltic Sea populations, a key approach is to monitor genetic variation (essentially  $N_e$  data) and design proper measures for conservation or sustainable harvest.

### A FUTURE CHALLENGE

The Baltic Sea has notably low species diversity, and only a handful of species dominate the ecosystem in biomass and numbers. The majority of these have already been transformed rather strongly to withstand an environment which is totally different from their ancestral environment, the Atlantic. Some of the species have done this by local adaptation (that is, by genetic changes), while others mainly through having a plastic phenotype with a large tolerance range. To be able to understand what will happen in the future we need to study the evolutionary mechanisms in more detail. In BALTGENE we are taking the first steps to address these issues using new genomic approaches. By screening tens of thousands of genes in sticklebacks and herring we are able to separate out some that may be affected by selection from others that are, presumably, neutral to environmental changes. From these first data the next step will be to try to understand the link between the genetic changes that have taken place and the effects these have on the traits of the individuals. This approach will indicate which particular genes may be valuable for conservation in the future.

### DISSEMINATION THROUGH A WIKI

Our outreach activities are centred around building an open access web-page that gives scientific arguments and outlines approaches for management of Baltic Sea genetic biodiversity.

For more information visit [www.bonusportal.org/baltgene](http://www.bonusportal.org/baltgene) and the BALTGENE website at [www.tmbi.gu.se/BaltGene](http://www.tmbi.gu.se/BaltGene) or contact Professor Kerstin Johannesson, BALTGENE Coordinator, email: Kerstin.Johannesson@marecol.gu.se or Eva Marie Rödström, BALTGENE Programme Officer, email: Eva.Marie.Rodstrom@gu.se



L. Bergström

### BALTGENE partners:

- University of Gothenburg, Sweden
- Stockholm University, Sweden
- University of Helsinki, Finland
- Luleå University of Technology, Sweden
- Institute of Cytology, Russian Academy of Sciences, Russia
- Institute of Oceanology, Polish Academy of Sciences, Poland
- University of Turku, Finland



Tom Jilbert



Claudia Frey



Anna Villnäs

# Young scientists perspectives on HYPER

## Improving our understanding of the mechanisms underlying hypoxia

by **Jacob Carstensen, Ditte L. Jansen Petersen,**  
National Environment Research Institute, Denmark

The increase of hypoxia (oxygen depletion) in the Baltic Sea over the last century due to human induced nutrient loading is one of the most profound effects on the health of the Baltic Sea ecosystem. HYPER aims at establishing a sound scientific basis for nutrient management and mitigating hypoxia in order to restore ecosystem services. Also, HYPER will add to the description of interaction between benthic fauna and biogeochemical processes in different regions of the Baltic Sea and this way allow for upscaling of the field samplings to a holistic ecosystem assessment. Close collaboration between geologists, ecologists, biogeochemists, modellers as well as young scientists in the research is already generating important results from the project. In the below, three young scientists present their viewpoints on HYPER.

The HYPER project has been an excellent platform for young scientists to gain valuable experience and knowledge, as well as becoming involved in a larger research project. The young scientists have made important scientific contributions to the project through their research which has provided new insight into some of the fundamental biological and biogeochemical processes. These results have been placed into a larger ecosystem-wide context,

highlighting the importance of their efforts. In addition to this, the young scientists have been introduced to a network of Baltic Sea scientists from which they hopefully can benefit in the future. The young scientists emphasise the multidisciplinary nature of HYPER as an ideal environment for their career development and that the organised structure of the project has enabled collaboration across the various institutions participating in the project.

Young scientist Tom Jilbert was invited to become a postdocotral researcher to Caroline Slomp, a geochemist and a Principal Investigator (PI) of HYPER at Utrecht University in the Netherlands. Tom's research in HYPER has focused on understanding the natural mechanisms by which phosphorus is permanently buried in the Baltic Sea sediments, and is hence prevented from driving continued eutrophication in the basin. By looking at the chemistry of both the sediments and the so-called 'porewater' fluids between sediment particles, the geochemists in HYPER have shown that highly unusual mineral phases are currently forming which trap phosphorus below the seafloor. On the other hand, they have shown that much of the phosphorus brought to the seafloor as organic material is released back to the water column during organic matter decay in hypoxic or anoxic conditions (Figure 1).

Such results are of interest well beyond the Baltic Sea, since many

of the environmental conditions are replicated in other hypoxic zones around the world. "As well as the opportunities for scientific progress, HYPER has broadened my research network, both in geography and discipline", says Tom. "The organised structure of the HYPER project has made collaboration much easier. During the annual meetings, on cruises or during visits between the participating institutes, the project partners meet and discuss ideas. Although HYPER includes leading scientists of various aspects of hypoxia research, the atmosphere is always very relaxed and the opinions of young scientists are heard and valued."

PhD student Claudia Frey got the opportunity to join HYPER after having written her diploma thesis supervised by HYPER PI Maren Voss from Institute of Oceanography Warnemünde, Germany. In HYPER, Claudia is investigating how hypoxia influences the nitrogen cycle in the Baltic Sea.

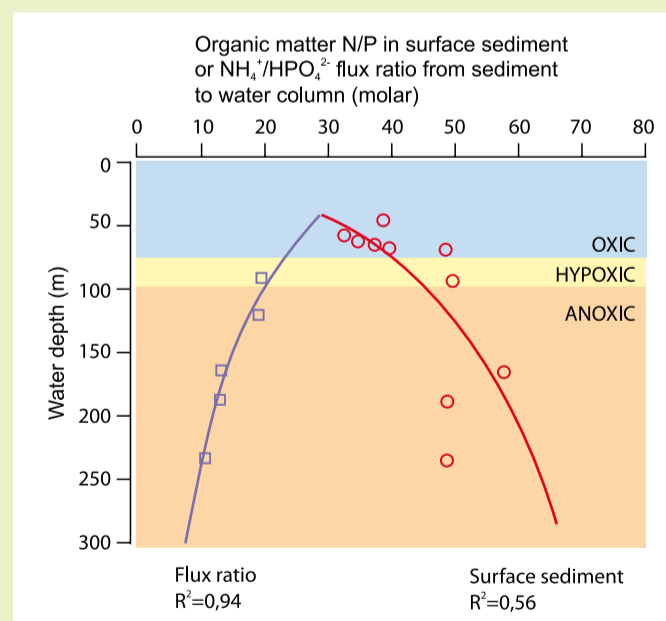


Figure 1: The effect of hypoxia on Baltic Sea nutrient cycles from the perspective of sediment and porewater geochemistry. Organic matter arriving at the seafloor partially decays, releasing 'fluxes' of nitrogen (as  $\text{NH}_4^+$ ) and phosphorus (as  $\text{HPO}_4^{2-}$ ) into the porewaters and eventually back to the water column, and maintaining biological productivity in the surface waters. However, as oxygen decreases with water depth, the relative release of nitrogen and phosphorus from the surface sediments changes. Preferential decay of phosphorus with decreasing oxygen leads to these 'mirrored' profiles of the  $\text{NH}_4^+ / \text{HPO}_4^{2-}$  flux ratio and the N/P ratio of the organic matter remaining in the sediments. Each point in this figure represents one coring station from the HYPER/COMBINE cruise of the R/V Aranda, 2009, with approximate water-depth thresholds for hypoxia and anoxia indicated. For further details, see "Beyond the Fe-P-redox connection: preferential regeneration of phosphorus from organic matter as a key control on Baltic Sea nutrient cycles", T. Jilbert, C. P. Slomp, B. G. Gustafsson, and W. Boer, *Biogeosciences Discussions*, 8, 1–52, 2011.

In her work, Claudia considers several interlinked transformation processes in order to understand the coupling of processes within the nitrogen cycle. Nitrogen stable isotope distribution in the dissolved and particulate pool can help to unravel these processes. First isotope analysis show lower isotope signatures in nitrate than expected from a strong fractionation by denitrification, which might be due to a strong coupling of nitrification and denitrification. "My goal is to assess the relative importance of these processes", Claudia says and continues by describing her HYPER experience: "HYPER resembles a great platform where to discuss concepts and results in a broad perspective from which I have greatly profited."

HYPER PhD student Anna Villnäs from Marine Research Centre – SYKE/Åbo Akademi University in Finland focuses on how macrobenthic communities affect sediment nutrient cycling and ecosystem function under different levels of hypoxic stress. By performing field experiments, where oxygen deficiency is artificially induced to the seafloor, she evaluates the consequences of losses in benthic community

function for sediment nutrient cycling and ecosystem resilience in coastal areas. "Through the HYPER-collaboration it has been possible to extend the research questions even further, to encompass additional ecological and biogeochemical response parameters, with, hopefully, useful results for future modeling. Such an integrative approach would not be possible without the expertise provided by researchers working in different disciplines," Anna says.

Seven out of the nine partners in HYPER have young scientists working on HYPER as part of their educational training. The young scientists have contributed to almost half of the scientific presentations and all the posters at the two annual HYPER meetings held so far. One of the young scientists took even the initiative to create a logo for the project. The scientific discussions have been stimulated by having young scientists in the project, as they often ask questions about issues that may be taken for granted in the established scientific community. According to the coordinator the engagement and creativity of the young scientists is vital to HYPER.

#### Young scientists in HYPER

Interdisciplinary collaboration and collaboration between different workpackages (WP) of HYPER form the basis for scientific advancement and extension of research networks. A total of 6 post docs, 5 PhD students, 2 MSc students and 2 BSc students have participated in the HYPER project to date.

The young scientists have taken part in the work related to WP1-4 which address investigations of hypoxia trends and understanding and quantification of the relationships between oxygen concentrations, benthic organisms and biogeochemical processes. More specifically they have contributed to:

- a better understanding of the natural mechanisms for phosphorus burial in Baltic Sea sediments
- investigations of the relative importance of the coupling of processes within the nitrogen cycle
- evaluation of the consequences of losses in benthic community function for sediment nutrient cycling and ecosystem resilience in coastal areas

Furthermore, the young scientists have actively contributed to HYPER by writing scientific papers, participating in cruises, meetings and discussions as well as in dissemination activities and media events.

#### HYPER partners are:

- Aarhus University, Denmark
- Leibniz Institute for Baltic Sea Research Warnemünde, Germany
- Lund University, Sweden
- Marine Research Centre - SYKE, Finland
- University of Gdansk, Poland
- University of Helsinki, Finland
- Utrecht University, The Netherlands
- Zoological Institute, Russia
- Åbo Akademi University, Finland

More information about HYPER can be found at [www.bonusportal.org/hyper](http://www.bonusportal.org/hyper) and <http://hyper.dmu.dk>



Jerzy Dabraowski, IOPAS

## Award for the best dissemination action or product

The BONUS secretariat is running a competition for the best outreach activity or product carried out or developed by a BONUS+ project during the full funding period of 2009-2011.

The winning BONUS+ project will be presented with EUR 5000 award and its use is to be decided within the winning project team alone.

The award ceremony will take place during the BONUS Forum on 24 October in Gdansk, Poland. The BONUS Forum will be hosted by the BONUS secretariat to showcase the results of the BONUS+ projects to the stakeholders. This year the BONUS Forum will share a mutual stakeholder platform with the EUSBSR/BDF conference 2011.

The winning entry will be decided in the spirit of the BONUS Action Plan 2008-2011 which states that one element in the activities planned for the period is 'Increasing the profile of stakeholder involvement in the science products for the management of the Baltic Sea'.

Further details, including the outline of the judging process will be announced on the BONUS website at [www.bonusportal.org](http://www.bonusportal.org) and the BONUS Bulletin (subscribe at [www.bonusportal.org/bulletin](http://www.bonusportal.org/bulletin)). The deadline for submissions will be set for early autumn. More information will be made available in late June 2011.

## Review of BONUS successes and activities in 2010

After the European Parliament supported the European Council's decision in June 2010 which launched the BONUS programme for the years 2010-2016, the focus of the BONUS community has been in three important areas of development: stakeholder platforms, strategic research agenda and implementation modalities of the new programme. The exceptionally high support by the Members of the Parliament - 97 % of votes to BONUS - reflects well also the status of BONUS as the first model case for the development of science-based management of the European regional seas. Furthermore, the 16 BONUS+ pilot projects funded for 2009-2011 continued to perform well in their second year of implementation.

The BONUS annual report summarises these key activities and achievements of the year 2010. It also takes a look of key events and activities of the coming year that will go forward together with key actors, including many of the readers of the BONUS in Brief newsletter, who share the common goal of seeking solutions to complex and urgent issues in order to ensure a better future of the Baltic Sea region.



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