



## Contents

Big cheers ..... 1

BONUS Forum ..... 1

BONUS Science for a better future of the Baltic Sea region ..... 2

Calling for knowledge-based governance of the Baltic Sea ..... 3

Shaping the Strategic Research Agenda ..... 4

BONUS Advocates build up stakeholder platforms ..... 5

BALCOFISH Investigates chemical pollution by developing fish monitoring ..... 6

BALTIC-C Building predictive capability regarding the Baltic Sea organic/inorganic carbon and oxygen system ..... 7

INFLOW Towards understanding the forcing mechanisms of environmental changes of the Baltic Sea and future scenarios ..... 8

# Big cheers

We, the BONUS community, have now a reason to celebrate and be proud of our achievement: after almost eight years of preparation, the European Parliament and Council co-decision about the Joint Baltic Sea Research and Development Programme worth of EUR 100 million was concluded on 22 September, and published in the Official Journal on 30 September 2010. In particular, the exceptionally high support by the MEPs – 97 % of votes for BONUS – shows that BONUS is considered by EU decision makers as the first model case for the development of science-based management of European regional seas. BONUS thus serves the whole Europe, not only the Baltic Sea region.

Eight years is a long time. It has included some ups and downs. Even if in the beginning we were not able to foresee the status of today, the vision was crystal clear – the Baltic Sea can be saved with the support of co-operative, coordinated and integrated science, and there is a need to develop funding and governing structure to support it.

It happened that in parallel with the evolution of BONUS the concern about the future of the European seas and oceans became a major

policy issue in the EU. Numerous policy documents and instruments with relevance to the Baltic Sea were launched, such as Integrated Maritime Policy, Marine Strategy Framework Directive, Roadmap for Maritime Spatial Planning and the Strategy for the Baltic Sea region. Common in all these instruments is that they emphasise the role of best scientific knowledge as the basis of policy making and integrated, holistic approaches in the management of the seas and oceans. So, one can say that favorable winds have been blowing and pushing BONUS towards the important milestone of today.

Celebrations are high points in life but afterwards starts the hard work. We have now received the funds and political support for our work, the challenge of the coming years will be to put it all into action, and more importantly, to create the anticipated impact. The Strategic Phase, which will last until the end of next year, is crucially important for the development of a policy-driven research agenda, and involving the key stakeholders to contribute to the programme's development. The BONUS Forum in Tallinn on 12 October, gathering ministries and research institutes from several societal and economic sectors, was



Dr. Kaisa Kononen

the first event specifically arranged for one of the key stakeholder groups. There is clearly a need for such platform, it appeared that in many cases this was the first time when professionals working with Baltic Sea issues under different ministries were sitting together and discussing research needs from their policy perspectives.

The work continues. From time to time external experts will evaluate the success of the programme – we hope that the outcome of those evaluations will again give us reason to celebrate. How our work has contributed to a better future of the Baltic Sea, however, can probably be judged by future generations only.

Dr. Kaisa Kononen  
Executive Director, BONUS

# BONUS Forum

Nearly 70 representatives of ministries and governmental research institutes from nine countries surrounding the Baltic Sea came together on 12 October at the BONUS Forum of Sector Research Kick-off Conference in Tallinn. This first BONUS Forum provided stakeholders with a platform to contribute to the development of the BONUS Strategic Research Agenda for the coming years.

*“When developing the programme’s Strategic Research Agenda it is crucially important to involve actors who actually design and implement marine and maritime policies in the Baltic Sea countries,”* said Dr. Kaisa Kononen, the Executive Director of BONUS. *“We were very pleased to see so many representatives of the ministries from the Baltic Sea countries, which deal with marine and*

*maritime issues, such as environment, agriculture and forestry, fisheries, transport and energy, attending the Forum.”*

The one-day Forum analysed the research needs that arise from the key international and EU policy documents, such as the Water Framework Directive, the European Maritime Policy, Marine Strategy Directive



and the Roadmap for Maritime Spatial Planning. Also, suggestions for research themes that were submitted through a Poll organised by BONUS during last summer, were considered.

*“Based on discussions at the Forum, there appears to be a wider need for research on interdisciplinary and cross-thematic issues of importance in regards of our joint efforts to secure a better future of the Baltic Sea,”* Kononen said. *“Also research that is related to management aspects and links to administrative and political issues need to be considered carefully.”*

Participants also discussed how integration of research and innovation to maritime policies on national level could support better the EU’s

Integrated Maritime Policy which calls for best scientific knowledge to be used in implementing it.

*“We need to ensure that the open dialogue and regional coordination initiated at the Forum continues. The BONUS Secretariat will consider carefully the valuable material now produced during the Forum when developing its Strategic Research Agenda further.”*

The first call for proposals for a set of cross-sectoral and multidisciplinary projects based on the Strategic Research Agenda to be funded by BONUS will take place in early 2012.

A full report of the Forum is available for downloading at [www.bonusportal.org/forum](http://www.bonusportal.org/forum)

# BONUS

## Science for a better future of the Baltic Sea region



**Maija Sirola (M.Soc.Sc) began work in mid-August as the new Communications Manager of BONUS, located in the BONUS Secretariat, Helsinki, Finland.**

Dear readers,

I have joined BONUS at very exciting times: The 'go-ahead' has been given by the European Parliament and Council for the next six+ years, the BONUS Advocates have been appointed to lead us on country specific actions to ensure the most desirable stakeholder engagement, and the corner stone of the existence of BONUS, the *Strategic Research Agenda*, is being formulated together with the policymakers, funders and scientific community while we prepare for the first call of interdisciplinary and multinational BONUS funded projects in early 2012.

Now with two months of experience of BONUS under my belt, I am learning more and more about the outstanding achievements made so far by the BONUS community. Based on the vast number of names I have come across so far associated with BONUS, I feel there may well be some truth in a Finnish saying "a beloved child has many names". I've learned that BONUS, the Baltic Organisations' Network for Funding Science builds on the BONUS ERA-NET and BONUS+ that have to date made a respective number of suggestions and modifications to Baltic Sea related policy documents and action plans and benefitted from joint use of infrastructures. We are now in the strategic development

phase of BONUS-169, although very recently, when the EU renamed the article we deliver our programme against, we swapped the name to BONUS-185, but of course, the article number may change yet again to another, still unknown number. I've also come across BONUS Baltic in some communications, and there is also the BONUS EEIG which I belong to; the Secretariat for the programme which was established as an European Economic Interest Grouping. All these names make sense when considered one by one but somewhat confusing to anyone who looks at BONUS from "outside in".

On this backdrop, the BONUS Steering Committee in September endorsed a new approach for our communications: From now on we are known simply as **BONUS**. BONUS provides us an "umbrella" under which the entire continuum of different activities and phases initiated during all these years can be captured. BONUS continues to produce top research to support development and implementation of regulations, policies and management practices specifically tailored to the Baltic Sea region. This is also well reflected in our newly endorsed "strapline" describing our business: **Science for a better future of the Baltic Sea region.**

In the coming months and year BONUS focuses on building strong links across the wider communities and different sectors in the society within and between the Baltic Sea countries. To support this, apart from the clarification of our name and brand, we need to strengthen our communications and related tools, take stock of what we have achieved so far and plan new.

One key tool that needs auditing is this newsletter, now renamed as *BONUS in Brief*. It would be very helpful to hear your views about it: What has and has not worked to date, what type of stories you like to see covered and in what format you'd prefer to receive the newsletter. We would be very grateful for the 10 minutes of your time that it would take to fill in our online questionnaire simply by clicking on [www.bonusportal.org/survey](http://www.bonusportal.org/survey). Your views will provide us with the most valuable information when developing this newsletter and other communications efforts.

A big thank you in advance for all the help you will be able to provide us!

Maija Sirola  
Communications Manager  
BONUS

Maija has worked in different management roles in the field of communications for the past ten years, most recently in the UK developing and implementing the name and brand of a new organisation Vitae which champions researcher development in the UK, Europe and world-wide. Prior to Vitae, Maija led the communications efforts of TRAFFIC, the world's leading wildlife trade monitoring network, a programme of WWF and IUCN and an advisory body to the Secretariat of the CITES Convention. Maija has also worked at the European Molecular Biology Laboratory in Germany and in different communications roles in Finland.

### Editorial box

Hämeentie 33  
00500 Helsinki, Finland  
Tel. +358 40 040 4011  
Fax +358 9 4780 0044  
Email: [bonus@bonus.eeig.fi](mailto:bonus@bonus.eeig.fi)  
Website: [www.bonusportal.org/inbrief](http://www.bonusportal.org/inbrief)

Editor-in-Chief: Maija Sirola  
Editor: Tiina Tembe  
Editorial board: Andris Andrusaitis,  
Kaisa Kononen, Elise Oukka

Layout: Sole Lätti  
Printing: Kirjapaino Uusimaa, Porvoo 2010

BONUS is a joint research 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 institutions 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.

*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.

© 2010 BONUS Baltic Organisations' Network for Funding Science EEIG

#### BONUS members and related funding institutions 2010:

##### Denmark

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

##### Estonia

- Estonian Science Foundation

##### Finland

- FIRDCoop
- 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

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.

# Calling for knowledge-based governance of the Baltic Sea

by Dr. **Laura Raaska**, Chair of the BONUS Steering Committee, Academy of Finland



*"The overall driving force of BONUS is to enhance socially, economically and environmentally sustainable use and protection of the Baltic Sea."*

Currently, the BONUS Programme is entering a new phase in which valuable research results of nutrient load, biodiversity loss and overfishing are being applied in the efforts aiming to solve tangible problems of the Baltic Sea. In a process, BONUS has a huge opportunity to create a powerful knowledge-base that can be utilised in decision making in order for us to ensure a better future for the Baltic Sea region.

**Dr. Laura Raaska becomes the new Chair of the BONUS Steering Committee**

**Successful application** of the sound knowledge requires a close interaction between basic research, more applied science and policy making. The research community knows how to protect water quality, guarantee maritime safety, provide pristine nature to nature lovers and good catches for fishermen. However, researches do not know necessarily how this knowledge base would optimally support decision making and vice versa, the end-users of research and decision makers do not know how the results obtained can be utilised in the decision making. In particular, there are three distinct challenges that need addressing. These relate to:

- 1. Governance:** There is too little interaction between research and policy making.
- 2. Cooperation:** There is a clear need for more cooperation between academic research and more applied sectoral research to make the knowledge base more comprehensive and usable and to avoid overlapping activities.
- 3. Societal impact:** Grand challenges e.g. climate change that our society is facing need problem-oriented approach and multidisciplinary research.

The *Strategic Research Agenda* of BONUS will tackle these challenges. The forthcoming BONUS calls will focus on multidisciplinary research

areas and invite proposals from different sectors of basic and applied research with close connection to a relevant policy making bodies (see page 4 for more on the *Strategic Research Agenda*). We hope to see proposals with deep cooperation between e.g. environmental, bio-, chemical, economic and societal sciences.

Furthermore, a network of national BONUS Advocates has been appointed to enhance coordination and facilitate dialogue between academic research, sector research, research funders and policy makers as well as end-users of research results in the Baltic Sea countries. Together with other investments to communications this works towards ensuring a smooth two-way information flow and engagement of stakeholders (see page 5 for more on the Advocates). Through this cooperation and dialogue we will establish durable link from basic research to applied research and policy making and create a sounder base for successful policy and decision making.

The BONUS Programme is aiming at holistic understanding of the Baltic Sea ecosystem and seeking for sustainable solutions for the Baltic Sea region. BONUS is taking a significant step forward when expanding the research area to the catchment-cost-sea continuum. The sea is tightly connected to its catchment

areas; the rivers are our richness and source of challenges, too. The sound, sustainable and holistic solutions are not feasible without taking catchment areas into account.

Encouraging success stories are now also emerging, demonstrating holistic and effective application of sound knowledge of basic and applied research into policy development and an array of activities of civil society. We need multidisciplinary research, which provides results for example on how fishing fleet, cruising ships and oil tankers can use Baltic Sea in a sustainable way. For this, climate change research may provide a feasible working model for BONUS, for example in a format of successful application of the basic research results in meteorology. This cooperation has produced many practical solutions to aviation and maritime transport and in turn resulted in successful applications supporting the formulation of climate change policies across different sectors of civil society. It is clear that research has indeed its undisputed place in building the soundest solutions for the environmental challenges. The BONUS Programme provides an excellent opportunity to all stakeholders in the innovation chain to make Baltic Sea Region environmentally, socially, and economically attractive and a wealthy place to live.

Dr. Laura Raaska started her work as the Chair of the BONUS Steering Committee for the period of one year replacing the previous chair, Professor Jüri Elken, on 1 July 2010. Laura has a strong background in research, both in basic and applied fields of microbiology, and has developed extensive networks within the sectoral research and industry over the years. Most recently Laura held the post of the technology manager for Bioprocessing in the VTT Technical Research Centre of Finland. Currently Laura leads the Biosciences and Environmental Research Unit in the Academy of Finland. The board for the Academy of Finland unit and the respective council have allocated considerable resources to Baltic Sea research over the past seven years, especially through investment on BONUS and related activities.



# Shaping the Strategic Research Agenda

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

**Summing up** the formal legislative language of European Parliament and Council Co-decision, BONUS *Strategic Research Agenda* shall:

- identify the set of policy-driven research directions that BONUS will pursue in the coming years
- be based on the today's cutting-edge research, and be farsighted enough
- cut across the sector interests and traditional research disciplines.

## ROADMAP FOR THOSE WITH A STAKE IN THE STRATEGIC RESEARCH AGENDA, ITS DEVELOPMENT AND IMPACT

Keeping in mind that the most of the enormous joint funding volume raised by the participating countries and the Community will be utilised through transnational research projects, competed in the annual thematic calls, the *SRA* will provide both a prioritised contents of the Programme and a timeline for its implementation – more detailed for the nearest calls and more general for more distant ones. The *SRA* must also be created in close consultation with the stakeholders of the marine and maritime research – for this purpose BONUS is constructing specific stakeholder platforms to represent both the public and private interests: governmental institutions, industries and NGOs.

### Contributing factors: BONUS Poll, BONUS Forum of Sector Research and country-specific workshops

The online *Poll on Priority Research Topics in Baltic Sea System Science* was accessible to everyone from May to August 2010. More than three quarters of the respondents represented the research community – including both academia and applied research institutions from all around the Baltic Sea (see the *Report on the BONUS Poll outcomes* at [www.bonusportal.org/reports](http://www.bonusportal.org/reports)). As an outcome of this Poll, the framework of the Research Areas listed in the *Outline of the BONUS Joint Baltic Sea Research Programme* (see the Outline report at [www.bonusportal.org/series](http://www.bonusportal.org/series)) was overgrown by a layer of more concretely formulated sub-areas and research questions that scientists see as the most important for the coming ten and more years. Many of the research questions formulated through the Poll will, no doubt, find their way into the *SRA*.

**BONUS has the potential of becoming the flagship in arranging the future marine and maritime science in the European Union – an effective macro-regional pilot of joint research programming. It has been initiated by eight member states of the Baltic Sea Region in a support of the region's sustainable development, and affirmed by the entire European Community. But before its ambition can be substantiated, BONUS has to develop its *Strategic Research Agenda (SRA)* – the backbone of the Programme.**

Another extremely important contributing factor is the outcome of *BONUS Forum of Sector Research* that brought together nearly 70 government agencies dealing with the Baltic Sea issues to Tallinn in mid-October (for more information, see the cover page of this newsletter and the Forum report at [www.bonusportal.org/forum](http://www.bonusportal.org/forum)).

Furthermore, a series of country-specific workshops that are being arranged by the BONUS Advocates in the Baltic Sea Region in the coming weeks and months will provide key intelligence to the development of the *SRA*. By setting up a broad yet specific dialogue with the stakeholders of marine and maritime research, BONUS first maps and analyses the stakeholder landscapes in different countries, and then engages the stakeholders in specialist discussions on the future needs for scientific knowledge. Dedicated stakeholder workshops and meetings are continuing in all BONUS countries throughout the end of 2010 and early 2011. (See next page for further information about the BONUS Advocates.)

a consensus on the contents and priorities of the *SRA*. Providing a firm guidance for the two first years of the BONUS Implementation Phase, this agenda will not cease to develop. Its first update in 2013 will build on the outcomes of the BONUS+ projects, and other marine and maritime research and development efforts and will be cross-checked with the guiding signals generated by the BONUS stakeholder consultation platforms.

### A RESEARCH PLATFORM FOR THE EU STRATEGY FOR THE BALTIC SEA REGION

Parallel to the developments with BONUS, the European Commission published the EU Strategy for the Baltic Sea Region (BSR) in June 2010. For the first time we have a comprehensive strategy covering several Community policies which focuses on one of the Europe's macro-regions (see [http://ec.europa.eu/regional\\_policy/cooperation/baltic/index\\_en.htm](http://ec.europa.eu/regional_policy/cooperation/baltic/index_en.htm) for more). Four pillars of the Strategy are (i) environmental sustainability, (ii) prosperity, (iii) accessibility and attractiveness, and (iv) safety and security.

With its *SRA* built on the overarching and crosscutting approach and generated in close consultation with the stakeholders, BONUS will be in position to provide vital scientific knowledge for implementing the Strategy, ultimately ensuring a better future for the Baltic Sea region.

### BONUS Strategic Orientation Workshop

Output of the BONUS Poll, BONUS Forum, reports by the BONUS Advocates, state-of-the-art and foresight analysis in various fields of research and development will all form the body of input material for the BONUS Strategic Orientation Workshop scheduled for March 2011. We believe that the BONUS approach will allow all of the most urgent research needs to be expressed by the most legitimate stakeholders that need to be heard.

During three days of intense creative work representatives of the research policy-making institutions, research community, research funding organisations and stakeholders will seek

### PRIORITY OBJECTIVES OF THE EU STRATEGY FOR THE BALTIC SEA REGION

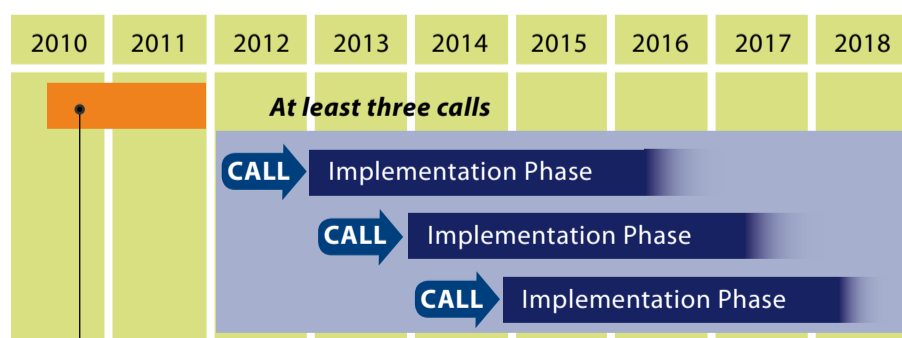
Those of direct relevance to the BONUS *Strategic Research Agenda* are indicated in blue, those of indirect relevance in green:

1. Reduce nutrient inputs to the Sea to acceptable levels.
2. Preserve natural zones and biodiversity, including fisheries.
3. Reduce the use and impact of hazardous substances.
4. Become a model region for clean shipping.
5. Mitigate and adapt to climate change.
6. Remove hindrances to the internal market in the BSR.
7. Exploit to the full region's potential in research and innovation.
8. Promote entrepreneurship, SMEs and effective use of human resources.\*
9. Reinforce sustainability of agriculture, forestry and fisheries.
10. Improve the access to, and the efficiency and security of the energy markets.
11. Maintain and improve internal and external transport links.
12. Maintain and reinforce attractiveness of the BSR, in particular through education, youth, tourism, culture and health.
13. Become a leading region in maritime safety and security.
14. Reinforce protection from major emergencies at sea and on land.
15. Decrease the volume of, and harm done by, cross-border crime.

\*Several flagship projects under this priority tackle the eco-innovation issue.

### For more information and to get involved:

- **Subscribe to the BONUS Bulletin (provided by email) at [bonus@bonuseeig.fi](mailto:bonus@bonuseeig.fi)**
- **Follow the updates on the BONUS website at [www.bonusportal.org](http://www.bonusportal.org)**
- **Get in touch with your country specific advocate (see next page)**
- **Contact directly the BONUS Secretariat at [bonus@bonuseeig.fi](mailto:bonus@bonuseeig.fi)**



### Strategic Phase:

- Establish appropriate stakeholder consultation platforms
- Establish policy-driven strategic research agenda
- Develop appropriate implementation modalities

# BONUS Advocates build up stakeholder platforms

One of the key activities of BONUS during the coming year is the creation of stakeholder platforms for the BONUS Programme. The spectrum of stakeholders for Baltic Sea issues is wide, including various societal and economic sectors in national, regional and international levels. Therefore the work has to start with a thorough analysis of the actors involved, with defining who are the key players and how to approach various groups.

In order to foster the involvement of stakeholders of the BONUS Programme in the country level, eight BONUS Advocates started to work in their respective countries. They are all familiar with their countries' marine/maritime governance and RTD system, and as a group represent various marine/maritime sectors including environment, transport, agriculture and forestry as well as international politics.

The Advocates held their first workshop on 8-9 September 2010 in Stockholm. Each Advocate had prepared a country specific plan on how to approach the stakeholders in the field.

In order to learn more about the national plans, how to engage and how to support BONUS, contact your country specific Advocate.



## Denmark

Professor Bo Riemann is an aquatic biologist by his scientific background. He has extensive experience in ecological and ecotoxicological studies on freshwater and marine environments. He has been responsible for planning and executing a number of major research projects since 1978 and has an extensive participation in various national and international scientific committees and boards. His career includes leading positions as Director of Research in the Water Quality Institute and Danish Environmental Research Institute and as an External Professor of University of Roskilde.  
**email: [bri@dmu.dk](mailto:bri@dmu.dk)**



## Estonia

Engineer-economist Peeter Tiks has worked for the last five years in the Ministry of Economic Affairs and Communications of Estonia as a transport (and regional planning) expert in Economic Development Department. The work has included management of scientific work. His basic education is in construction economics. His main career has been within the field of transport development, policy management and implementation both in the private sector and in the Estonian Ministry of Economic Affairs and Communications. In particular, he was responsible for organising the policy establishment and communications networking in Estonia.  
**email: [peeter.tiks@gmail.com](mailto:peeter.tiks@gmail.com)**



## Finland

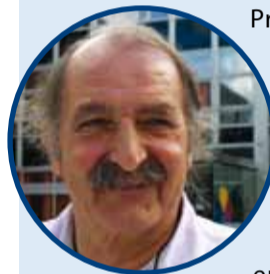
Councillor Elina Nikkola has a double university degree in both biology and environment protection technology. She has thirteen years working experience, currently as a councillor, in the Finnish Ministry of Agriculture and Forestry. Her specific responsibility has been the development and implementation of research administration in the field of the Ministry. She has also worked as an expert secretary in one of the subcommittees of the Advisory Board for Sectoral Research, appointed by the Finnish Government. At EU and international level she has attended the work of EU's Standing Committee on Agricultural Research and also the OECD's Joint Working Group of Agriculture and Environment Policy Committees.  
**email: [elina.nikkola@aka.fi](mailto:elina.nikkola@aka.fi)**

## Lithuania

Chief Adviser to the Director, Liutauras Stoškus is working in the Environmental Protection Agency, Vilnius. He has his basic university degree in biology. He has a nine years working experience in organising, financing, reporting, and expertise in the field of environmental monitoring in Lithuanian Environmental Protection Agency. He has gained a thorough experience in and knowledge of European environmental obligations and international environmental treaties. He has also been involved as an expert in the work of HELCOM, GMES and EEA.  
**email: [l.stoskus@aaa.am.lt](mailto:l.stoskus@aaa.am.lt)**



## Germany



Professor Bodo von Bodungen's scientific background is in biological oceanography. He worked as a research scientist in Germany and US until he was appointed in 1993 first as the Head of Biological Oceanography and later as the Director of Institute of Oceanography, Warnemunde. He is retiring from the director's position during this year. Bodo has a broad experience in teaching and research in international groups and programmes as well as in various HELCOM contexts.  
**email: [bodo.bodungen@io-warnemuende.de](mailto:bodo.bodungen@io-warnemuende.de)**

## Sweden

Dr. Erik Fellenius is the former Director and Head of Research and Development, Swedish Environmental Protection Agency, and currently, after retirement, working as a private consultant. His scientific background is in zoophysiology. He has a long career first as a scientist in the pharmacological industry and later as the head of research and development in the Swedish Environmental Protection Agency. In this capacity he has gained an extensive experience in various Swedish and EU wide research and policy interlinkages. Erik has been involved in BONUS from its' very beginning as a Steering Committee member of both BONUS ERA-NET and BONUS EEIG.  
**email: [erik.fellenius@naturvardsverket.se](mailto:erik.fellenius@naturvardsverket.se)**



## Latvia

MA Signe Martisune's latest working experience involved working for six years as a Science attaché in the Latvian Permanent Representation to the EU. She has a university degree in political science and international relations from the University of Latvia, and in diplomacy, international organizations and enterprises from the University of Paris. Her earlier working experience includes various shorter term duties concerning media policy, inter-ethnic relations, minority rights,



*not appointed, in an interim please contact the BONUS Secretariat*  
**email: [bonus@bonuseeig.fi](mailto:bonus@bonuseeig.fi)**

integration issues, communications and international cooperation.  
**email: [signemartisune@hotmail.com](mailto:signemartisune@hotmail.com)**

A total of 16 projects involving over 100 research institutes and universities were funded (totaling EUR 22 million) through a joint call BONUS+ in 2007. It set out to test the mechanisms of collaboration among the national funding institutions. To date these projects are finishing their second year. During the third (final) project year scientists will be busy mostly with analysis of the obtained data and compilation of the research outputs. Nevertheless,

already by the mid-term of the projects, several important suggestions aiming to enhance the Baltic Sea related policy documents and action plans have originated from the BONUS consortia.

In the past three issues of the BONUS newsletter we have introduced seven of the BONUS+ projects: **IBAM** and **RECOCA** in April 2009, **BEAST**, **ECOSUPPORT** and **HYPER** in November 2009

and **PROBALT** and **RISKGVOV** in May 2010. The following pages feature further three: **BALCOFISH**, **BALTIC-C** and **INFLOW**. In the coming year the remaining six projects will take centre stage: **AMBER**, **BALTGENE**, **BALTIC GAS**, **BALTICWAY**, **BAZOOCA** and **PREHAB**.

Furthermore, the full set of 16 BONUS+ projects will feature in a stakeholder event which BONUS

will hold in the last quarter of 2011. There the individual project outcomes and next steps will be showcased, reflecting also the needs of the wider policy and socio-economic landscape. Further information about the stakeholder event and how to get involved will be made available soon on our website [www.bonusportal.org](http://www.bonusportal.org) and detailed in the next issue of *BONUS in Brief* in early part of 2011.

# BALCOFISH

## Investigates chemical pollution by developing fish monitoring

by **Lars Förlin, Anna Lennquist and Noomi Asker**  
Department of Zoology, University of Gothenburg, Sweden

Modern society utilises more man-made chemicals than ever before. The aquatic environment is the ultimate sink for many hazardous substances and chemical pollution is a major threat to life in the Baltic Sea. In BALCOFISH we investigate and map the impact of chemical pollution on fish in the Baltic Sea.

Fish has a top position in the food chain, accumulating chemicals from prey organisms, and then forwarding them to us as consumers. Fish health is therefore important from many viewpoints, including ecology, economy and human health.

**Eelpout provides** an ideal species for environmental monitoring. The Eelpout (*Zoarces viviparus*; tånglake, aalmutter, wegorzyka, kivinilkka, ålekvabbe), can be found throughout the Baltic Sea and is in many ways ideal for environmental monitoring. It lives in stable, relatively stationary populations; therefore any observed effect reflects the environmental situation of the site where the fish is caught. However, perhaps the most unique quality (for a fish species) is that the Eelpout female carries the offspring inside her body, giving birth to living young. We can therefore study reproductive parameters and transference of chemicals from mother to embryo. The Eelpout is an established monitoring species and it is included in several national monitoring programmes. In addition to the Eelpout, we study also a few other fish species to give a more complete picture.

### BIOMARKERS AS "EARLY-WARNING" SIGNALS OF CHEMICAL IMPACT

To investigate whether chemicals are actually taken up and affecting living organisms, we use biomarkers as

"early-warning" signals. Biomarkers can inform us about health disturbances potentially affecting the survival of the fish population. Examples of biomarkers include measures of detoxification and antioxidant systems, endocrine disruption and damages in proteins or genetic material. We measure these biomarkers in fish samples from coastal sites of interest.

**In BALCOFISH** we use a broad set of well established biomarkers, but we also aim to develop new ones of high relevance for the Baltic Sea. In the search for new biomarkers, and also for increasing the understanding of molecular mechanisms behind physiological changes, we combine classical biomonitoring of the Eelpout with modern genetic technology.

### ECOTOXICOGENOMICS FOR GLOBAL ANALYSES

Ecotoxicogenomics is a new and comparatively underutilised discipline. The development of high throughput techniques for DNA sequencing, and for comparison

and analysis of genetic information has been extremely rapid during the last decade. This has opened new important possibilities for genetic studies in ecologically relevant species, such as the Eelpout.

**In BALCOFISH** we have successfully developed and optimised an oligonucleotide microarray platform to study gene expression from Eelpout caught at different sites or at different time points. These gene expression studies give us information to describe and characterise affected functions in Eelpout caught in polluted and non-polluted sites around the Baltic Sea.

We also use genetics to study gene flow between different geographical areas and to identify genetic populations. Population dynamic modelling is an important part of these studies. We can use changes in genetic diversity to assess whether contamination causes effects on the longer time-scale of generations.

### REPRODUCTIVE STUDIES OF HIGH RELEVANCE

By using the Eelpout, we can study reproductive success as an important indicator of fish health. In addition, our observations at polluted sites have repeatedly shown disorders and malformations among Eelpout fry. We have put forward a classification system for these malformations. We have also seen skewed sex ratios in contaminated areas as well as intersex, the development of female sex characters in males.

**In BALCOFISH** we study reproductive success and want to identify maternal transport of chemicals and other routes or causes of reproductive disorders. The studies are based on comparison of parent fish and offspring using classical biomarkers and ecotoxicogenomics.

With years of experience and data as a base, and with the rapid development of new technologies as a driving force, BALCOFISH will provide important information to support actions for a cleaner Baltic Sea.

For more information visit the **BALCOFISH** website at [www.balcofish.science.gu.se](http://www.balcofish.science.gu.se) or contact Professor **Lars Förlin** Tel. +46-31 786 3676



Female Eelpout carrying living young



Standardising sampling of Eelpout, 2009 workshop in Denmark

### BALCOFISH in action

- Provides a platform for scientists working with fish to exchange existing knowledge and data
- Develops new techniques for better understanding of chemical impact on coastal fish populations and combines classical biomonitoring with modern genetic technologies
- Monitors the current situation in the coastal areas of the Baltic Sea:
  - Large campaigns have generated samples currently being analysed in participating laboratories
  - A joint BALCOFISH/BEAST workshop in 2009 established a common standardised procedure on how to dissect, store and analyse samples
- Collects available Eelpout data into the BonusHAZ database, to be reported to ICES, providing a unique source of information that will soon enable us to follow chemical impact on fish in the Baltic Sea from both historical and geographical perspectives
- Generates sound knowledge to support actions for a cleaner Baltic Sea

### BALCOFISH participants:

- Department of Zoology, University of Gothenburg, Sweden
- Department of Marine Ecology, National Environmental Research Institute, University of Aarhus, Denmark
- Institute of Coastal Research, Swedish Board of Fisheries, Sweden
- Institute for Applied Ecology Ltd, Germany
- Department of Biomedical Sciences and Veterinary Public Health, Swedish University of Agricultural Sciences, Sweden
- Department of Contaminant Research, Swedish Museum of Natural History, Sweden
- Institute for Neuroscience and Physiology, the Sahlgrenska Academy at the University of Gothenburg, Sweden

# BALTIC-C

## Building predictive capability regarding the Baltic Sea organic/inorganic carbon and oxygen system

by **Anders Omstedt**, University of Gothenburg, Department of Earth Sciences: Oceanography

**Seawater pH** is among the most important factors controlling life in marine systems, and acidification could severely alter and threaten marine ecosystems. Rising atmospheric carbon dioxide levels attributable to human activity have been demonstrated to have already reduced ocean pH by approximately 0.1 units, and are likely to reduce it even more in the future.

According to recent estimates, a reduction of up to 0.4 pH units over the coming 100 years is

possible. The effects of acid precipitation and changing loads from rivers may also influence the acid-base (pH) balance. Therefore, it is crucial to understand pH changes in coastal regions characterised by high biological production and various anthropogenic mechanisms, such as climate change, land-use change, eutrophication, and overfishing.

Predicting the integrated consequences of climate change and eutrophication for the physical, chemical, and biological characteristics of Baltic Sea

water resources is a difficult area of environmental science. Fortunately, catchment-scale research has been established in the Baltic Sea through, for example, BALTEX and BNI activities.

### DEVELOPMENTS IN THE RESEARCH PHASE

During the initial Baltic-C research phase, the scientific meetings have focused on weathering, marine and sediment observations, research cruise design and modelling. An advanced summer course was held 27 July-5 August 2009 together with DTU-Aqua, University of Gothenburg, BALTEX secretariat, Nordic Marine Academy, and BONUS. Also, the cooperation between University of Gothenburg and Leibniz Institute for Baltic Sea Research in Warnemuende has been strengthened by the appointment of Dr. Bernd Schneider as a Visiting Professor at University of Gothenburg.

In order to determine total  $\text{CO}_2$  ( $C_T$ ) and total alkalinity ( $A_T$ ), several research cruises took place in 2008, 2009 and 2010. The investigations covered all major sub-basins of the Baltic Sea between the Kattegat and Bothnian Bay. These data, together with surface water  $\text{pCO}_2$  and  $\text{O}_2$  measurements from VOS "FINNMAID", form a unique basis for research and model validation data. River input data on river flow, alkalinity, total inorganic carbon, total organic carbon, pH, temperature,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Cl}^-$ , and  $\text{SO}_4^{2-}$  have been collected in a database and will also help form the basis for model development and validation.

However, the data are in many instances incomplete, especially in the case of river monitoring data from Russia, despite approaches to Russian authorities at various organisational levels. Several sediment cores have been taken and analysed. Large efforts have also been made to collect and analyse meteorological forcing data for present and possible future developments. The development of models of the Baltic Sea drainage basin and the Baltic Sea itself that include  $\text{CO}_2$  dynamics is now underway.

### INFORMATION ABOUT THE MODEL SYSTEM

The Baltic-C model system involves two land surface models (LPJ-GUESS and CSIM) and one Baltic Sea model (PROBE-Baltic). Meteorological forcing data and scenarios have been extracted from available sources.

### About Baltic-C

The objective of BONUS funded Baltic-C project is to improve our understanding of the Baltic Sea carbon system, including the acid-base (pH) balance.

BALTIC-C aims to achieve this by

- developing and applying a new integrated ecosystem model framework based on the cycling of organic carbon ( $C_{\text{org}}$ ) and carbon dioxide ( $\text{CO}_2$ ) in the Baltic Sea water and drainage basin
- providing ultimately a tool that supports the management of the Baltic Sea

Baltic-C participants are:

- University of Gothenburg, Sweden
- Leibniz Institute for Baltic Sea Research Germany
- Finnish Meteorological Institute, Finland
- Institute of Oceanology, Polish Academy of Sciences, Poland
- Uppsala University, Sweden
- Lund University, Sweden
- Stockholm University, Sweden.

The terrestrial vegetation/biogeochemistry model LPJ-GUESS has been enhanced by incorporating a sub-model for  $C_{\text{org}}$  production in organic wetland soils. The model has been set up for application across the  $50 \times 50$  km simulation grid on which climate atmospheric data are used.

The Baltic Sea catchment model CSIM has been expanded by including base cations, anions,  $C_{\text{org}}$  and  $C_T$  (taking into account the outputs of LPJ-GUESS), and now calculates parameters such as river runoff, nutrient load, total alkalinity, pH and  $\text{pCO}_2$  for the Baltic Sea sub-basins.

The Baltic Sea model PROBE-Baltic has been expanded by including  $\text{CO}_2$  dynamics (Omstedt et al., 2009), and present and past conditions have been studied extensively.

Climate scenario data have been extracted for the Baltic Sea drainage basin and for the various Baltic Sea sub-basins for a period representing the climate change between 1960 and 2100. Data from three emission scenarios (A1B, A2, and B1) and from different global climate models (ECHAM 5, HadCM3, and CCSM3) have been downscaled using one regional climate model (RCA) and used for forcing the various model components of the Baltic-C project.

For further information, visit the website [www.baltex-research.eu/baltic-c](http://www.baltex-research.eu/baltic-c) or contact Anders Omstedt by email: [Anders.Omstedt@gvc.gu.se](mailto:Anders.Omstedt@gvc.gu.se)

### References:

- Beldowski, J., Löffler, A.Q., Schneider, B., and Joensuu, L. (2010). Distribution and biogeochemical control of total  $\text{CO}_2$  and total alkalinity in the Baltic sea. *Journal of Marine Systems*, 81, 252–259.
- Omstedt, A., Gustafsson, E., and Wesslander, K. (2009). Modelling the uptake and release of carbon dioxide in the Baltic Sea surface water. *Continental Shelf Research* 29, 870–885. DOI: 10.1016/j.csr.2009.01.006.
- Omstedt, A., Edman, E., Anderson, L., and Laudon, H. (2010). Factors influencing the acid-base (pH) balance in the Baltic Sea: A sensitivity analysis. *Tellus B*, DOI: 10.1111/j.1600-0889.2010.00463.x

### Baltic-C – Illustration of an observation made:

For the first time, a synoptic view of the Baltic Sea  $C_T$  system is now available, due to the R/V Merian cruise in June/July 2008 undertaken by Bernd Schneider's research group. The transect indicates that  $C_T$  distribution is controlled by total alkalinity distribution and biological activity. These and other data are now used for model development and represent a major resource for developing a new generation of biogeochemical models that can handle the  $\text{CO}_2$  system.

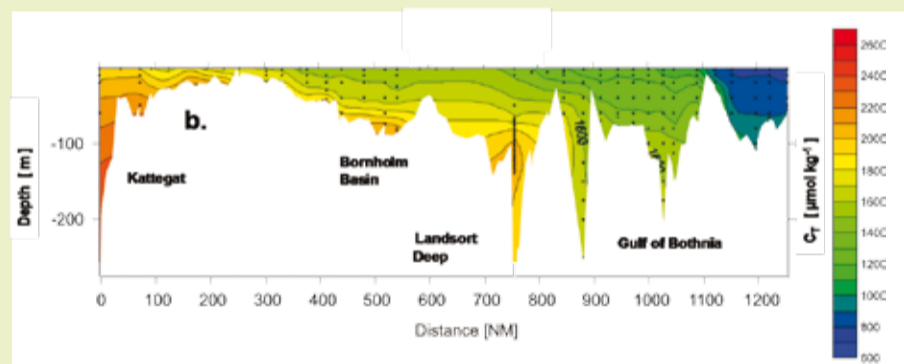


Figure 1. Depth distribution of total inorganic carbon ( $C_T$ ) along a transect through the Baltic Sea (from Beldowski et al., 2010).

### Baltic-C – Illustration of a modelling made:

Using calculations based on Baltic Sea modelling and the marine carbon system, the sensitivity of surface pH has been examined (Omstedt et al., 2010). The results of this sensitivity study indicate, for example, that acidification due to river transport of dissolved organic carbon ( $C_{\text{org}}$ ) into the marine system seems marginal. However, the mineralisation of terrestrial  $C_{\text{org}}$  may cause extra marine acidification, though this effect has yet to be quantified. Fossil fuel burning will likely have both direct and indirect effects through increasing  $\text{CO}_2$  levels, altering seawater pH, and changing river chemistry. This may severely threaten some species in the Baltic Sea, particularly in the Northern Baltic.

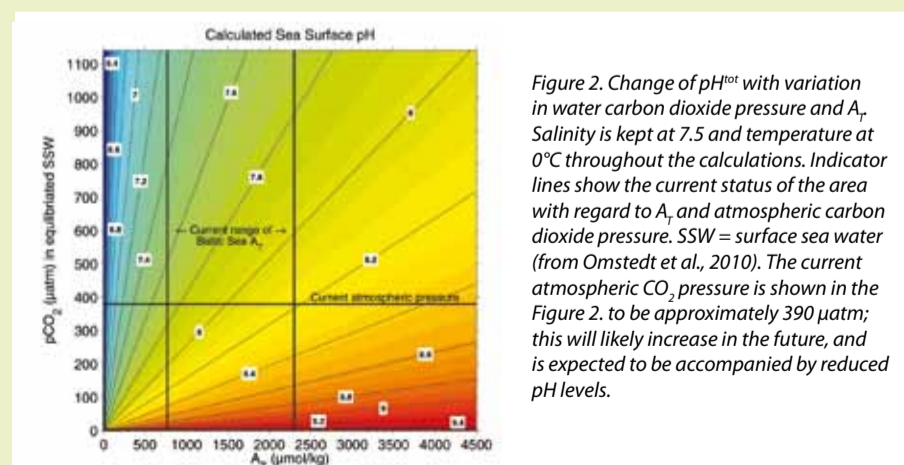


Figure 2. Change of  $\text{pH}^{\text{tot}}$  with variation in water carbon dioxide pressure and  $A_T$ . Salinity is kept at 7.5 and temperature at  $0^\circ\text{C}$  throughout the calculations. Indicator lines show the current status of the area with regard to  $A_T$  and atmospheric carbon dioxide pressure. SSW = surface sea water (from Omstedt et al., 2010). The current atmospheric  $\text{CO}_2$  pressure is shown in the Figure 2. to be approximately  $390 \mu\text{atm}$ ; this will likely increase in the future, and is expected to be accompanied by reduced pH levels.

**The nine partners of INFLOW** are located in seven countries of the Baltic Sea region:

- Denmark: Geological Survey of Denmark and Greenland – GEUS
- Finland: Geological Survey of Finland – GTK (*as the co-ordinator of the project*), and Department of Geosciences and Geography, University of Helsinki
- Germany: Leibniz Institute for Baltic Sea Research Warnemünde – IOW
- Norway: Unifob AS, Bjerknes Centre for Climate Research – BCCR
- Poland: Faculty of Earth Sciences, Department of Paleoceanology, University of Szczecin
- Russia: A.P Karpinsky Russian Geological Research Institute – VSEGEI
- Sweden: Department of Earth and Ecosystem Sciences – Division of Geology, Lund University and Swedish Meteorological and Hydrological Institute – SMHI



**The last summer** was very warm and the heat waves affected large areas of Europe. On 29 July the measured temperature in Finland rose to +37.2°C, an all-time record for Finland. According to predictions the ongoing global warming and consequent climate change will increase the frequency of unusually warm periods here in Europe and in the other regions of the world too.

How will future climate change affect the Baltic Sea? Modeled climate scenarios suggest that the Baltic Sea sea surface temperatures will rise and winter precipitation will increase in and around the Baltic Sea. In addition, the length of the ice season in the Baltic Sea may shorten. However, due to complex cause–effect relationships it is difficult to predict how changes in hydrography and biogeochemical processes affect the Baltic Sea ecosystem.

A deeper scientific knowledge and understanding of the factors affecting the long-term changes in the marine environment, including future scenarios, however, provide the basis for improved management and implementation of policy strategies (e.g. the European Marine Strategy Directive) in the Baltic Sea environmental issues. Hopefully we can enjoy hot summer days, and nights, beside a healthy Baltic Sea in the future too.

#### **SEDIMENT MULTI-PROXY STUDIES AND MODELLING APPROACHES**

Geological records of the Baltic Sea, particularly those in the form of muddy sediments that have accumulated on the seafloor, provide information on past environmental changes (e.g., salinity, sea surface temperature, ice cover and even on oxygen content and benthic fauna activity at the seafloor) over millennial, centennial and decadal timescales. The INFLOW project uses sediment proxy data from key sites recovered during the first year of the project. Key sites are situated along a transect across the whole Baltic Sea, from the marine Skagerrak to the freshwater dominated northern Baltic Sea. The selection of key sites for sediment proxy studies is essential. The site selection of the INFLOW project key-coring sites has been based on new high-resolution topographic information (multibeam echosounding), shallow seismic, ecosystem modelling and other relevant data produced by earlier research. The project has also utilized the consortium's long-term experience in working with Baltic Sea sediments.

Modelling results to date indicate that it is crucial to differentiate between surface and deep water processes and their temporal relationships in order to understand the Baltic Sea ecosystem (e.g. redox stages). Critical environmental parameters such as temperature, salinity, sea ice cover, precipitation (river runoff) will be quantified by established numerical proxy methods, which will then be used to constrain the models. The multi-proxy

# INFLOW

## Towards understanding the forcing mechanisms of environmental changes of the Baltic Sea and future scenarios

by **Aarno Kotilainen, Mia Kotilainen, Thomas Neumann, Ian Snowball**

**To provide more reliable predictions of the future Baltic Sea, and to ensure effective and sustainable marine management, it is essential to improve our understanding of the natural elasticity of the Baltic Sea ecosystem, and its response to climate and anthropogenic forcing. The INFLOW project uses sediment multi-proxy studies and modelling to identify the mechanisms that forced the Baltic Sea to change over the past 6000 years and to provide future scenarios of the state of the Baltic Sea.**

approach combines established proxies with new methods such as “TEX86” (a biomarker) for sea surface temperature reconstructions, strontium and sulphur isotopes, DNA studies on foraminifer test linings, Mg/Ca on foraminifera, trace fossils and biogenic mineralization. Transfer functions, based on the modern relationships between species distributions and environmental gradients in the Baltic Sea, will be

used to reconstruct paleoenvironmental conditions from fossil diatom and dinoflagellate assemblages.

The Baltic Sea records produced within the INFLOW project will be linked to available and upcoming high-resolution climatic proxy and modelling data from the wider North Atlantic realm (North Sea, Nordic Seas), which will enable us to identify the mechanisms that

force palaeoenvironmental changes (e.g. North Atlantic Oscillation).

A key issue for high-resolution proxy studies is sound chronological control – or geochronology. Major efforts have been expended on high precision dating of sediment sequences. Results of previous studies have shown that a multi-dating approach is crucial, and thus the INFLOW project uses dating methods like  $^{210}\text{Pb}/^{137}\text{Cs}$ , various AMS  $^{14}\text{C}$ -dating experiments, OSL, and palaeomagnetism.

The better constrained ecosystem models will provide simulated data (hydrographical and biogeochemical conditions) for extreme natural climatic conditions over the past thousands of years (e.g. Medieval Warm Period and Little Ice Age). These model experiments will provide insight into the degree that the ecosystem responds to past natural climate variability and external environmental change. Comparison with the simulated contemporary and future status allows relating the expected changes to conditions in historical times. Validated models will be used to provide scenarios of the Baltic Sea ecosystem state at the end of the 21<sup>st</sup> century for selected IPCC climate change scenarios. Those scenarios of the future development of the Baltic Sea can form the scientific basis for political strategies and adaptation to future climate change.

For more information about INFLOW, visit the website at <http://projects.gtk.fi/inflow> or contact the Project Co-ordinator: Research Professor Aarno Kotilainen, tel. +358 2055011