2nd BONUS BIO-C3 periodic report, publishable summary

Brief description of the project's overall goals and expected final results

Recent international research programs, such as the Census of Marine Life (CoML) and Marine Biodiversity and Ecosystem Functioning (MARBEF) have emphasised that marine biodiversity remains largely unexplored and that diversity at the genotype, species, population, habitat and functional levels is closely linked to pivotal ecosystem features, such as stability and functioning. BONUS BIO-C3 targets all of the above levels in the Baltic Sea, and adopts a dynamic view on biodiversity by accounting for the evolutionary potential of populations and species to adapt. Key project objectives are to i) determine linkages between biodiversity and ecosystem functioning, ii) assess effects of interacting natural and anthropogenic drivers on biodiversity and ecosystem functioning as well as provision of goods and services in the past, present and future, and iii) evaluate implications and develop tools for an integrated, adaptive management of the Baltic Sea. In doing so, it goes beyond traditional biodiversity inventories, and will allow us to use insights derived from the analysis of past and recent changes to improve predictions of possible futures of the Baltic Sea.

Work performed in 2015

All BONUS BIO-C3 work packages are now running, including disciplines from molecular genetics, eco-physiology, community and food web ecology, macro-ecology, fisheries biology, oceanography to socio-economics. Process oriented experimental studies, molecular genetic analyses, ship based surveys and analysis of long-term data series have taken large strides in 2015, and results have been applied in trait, community based, and ecosystem modelling.

Main results achieved in 2015, and their impact and use

The scientific output from the project has multiplied, and resulted in >20 accepted or published peer-reviewed publication as well as ~100 conference/public presentations in 2015 alone, addressing amongst others the quantification of environmental drivers, the distribution, spread, impacts and management of invasive species, the better quantification of top-down control and predator-prey mismatch, and the dynamics of Baltic key species in response to environmental drivers. This progress was also mirrored by the acceptance of the first four scientific deliverables of BONUS BIO-C3, D1.1 "*Review of environmental factors influencing distributions of selected Baltic species*", D1.2 "*Documentation of key drivers and physiological tolerance limits for selected resident and invasive species*", D2.1 "*Report on effect of changing drivers on pelagic and benthic speices composition and production*" and D3.1 "*Report on patterns and dynamics of drivers of biodiversity across Baltic Sea ecosystems in space and time including socio-economy*" by the

BONUS secretariat, accessible via the BONUS BIO-C3 website www.bio-c3.eu/publications. Deliverable D2.2 "*Report on effects of changing predation pressure on benthic and pelagic species*" was also completed and submitted at the same time as this report.

We have made strong efforts to pass on the expertise of project personnel, and to use the project output, to inform stakeholders and policy makers in the Baltic realm and beyond. This includes contributions to the implementation of the MSFD, and the design of the Ballast Water Management Convention and EU marine fisheries research priorities, as well as advice to national policy makers and stakeholders on several occasions. The role of BONUS BIO-C3 in the science-policy interface was reflected in the membership and participation of project personnel in a total of 102 committees and working groups in 2015, including ICES, HELCOM, EC, MSFD, UN, and OSPAR. Another benefit of the project activities has been the improved coordination of large-scale scientific activities in the Baltic Sea. This included the optimization of the temporal and thematic coverage of research cruises of the consortium in the Baltic (9 in total in 2015) and the continuation and expansion of other collaborative activities. Examples for the latter were sampling initiatives of invasive combjelly *Mnemiopsis leidyi* and invasive round goby *Neogobius melanostomus* across the Baltic Sea, and the assembly, data harmonization and collaborative use of long-term data series on meso-zooplankton, which has resulted in first publications (http://kodu.ut.ee/~riina82/).

2015 highlights from our consortium included the highly successful special BONUS theme session "*From genes to ecosystems: spatial heterogeneity and temporal dynamics of the Baltic Sea"* at the ICES Annual Science Conference 2015 in Copenhagen in Sept 2015, which we convened jointly with BONUS INSPIRE and BAMBI. It brought together more than 80 scientists from both within and outside the BONUS community, as well as stakeholders and policy makers. The session also resulted in an invited guest column in the BONUS in Brief December newsletter on "*Finding bridges between biodiversity research and ecosystem–based management*", thus mirroring the central approach and interest of BONUS BIO-C3. A second key event in 2015 was the very well received BONUS BIO-C3/BAMBI/INSPIRE Summer school "*The Baltic Sea: a model for the global future ocean?*" that took place in July in Glücksburg, Germany, with 32 participating PhD students and postdocs and 13 lecturers from 8 nations (see event summary: www.bio-c3/links). The seed planted at this school will continue to grow with a cross BONUS project concept paper writing workshop in fall 2016 on the same topic as part of the BONUS Clustering activities.

For detailed information on BONUS BIO-C3, up-to-date information on all project output, and on past, present and future project activities and initiatives, please visit us at www.bio-c3.eu.

Acknowledgements
The research leading to these results is part of the BIO-C3 project and has received funding from BONUS, the joint Baltic Sea research and development programme (Art 185), funded jointly from the European Union's Seventh Programme for research, technological development and demonstration and from national funding institutions.