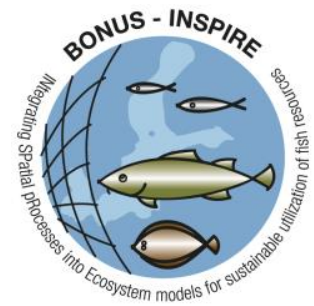




TARTU ÜLIKOOL  
UNIVERSITY OF TARTU



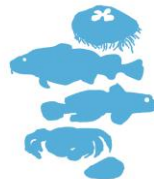
# BONUS projects BIO-C3 & INSPIRE

Henn Ojaveer



**BONUS**

SCIENCE FOR A BETTER FUTURE OF THE BALTIC SEA REGION



**BIO-C3**



# The projects

- Biodiversity changes – causes, consequences and management implications (BIO-C3)
- Integrating spatial processes into ecosystem models for sustainable utilization of fish resources (INSPIRE)

# Application phase

- There is no single equation for the success
- BIO-C3:
  - Planning about ½ year
  - participants ‘according to availability’
  - ‘classical’ biodiversity project covering wide array of issues
  - Locates the science into global perspective
- INSPIRE:
  - planning about 2 years
  - All key scientists and leading institutes involved
  - Baltic orientation only
  - New methods tested/applied

**STRATEGIC PLANNING, pan-Baltic coverage!**



# BIO-C3

**What are major causes for biodiversity changes in the Baltic Sea and why should we care?**

# The Baltic Sea

The Baltic is...

Young

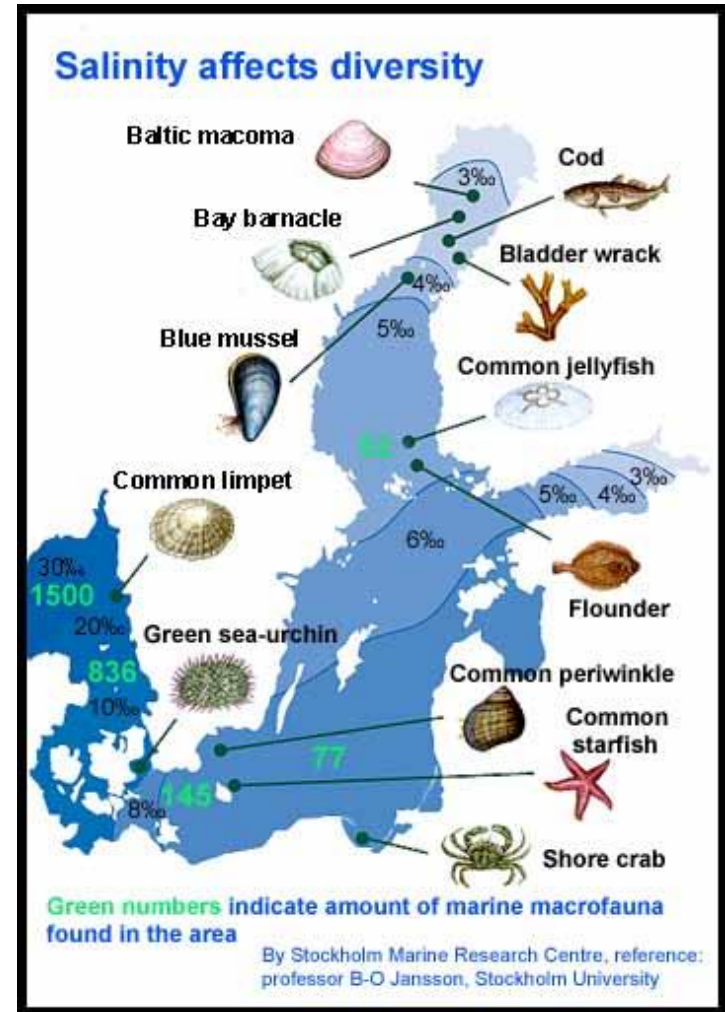
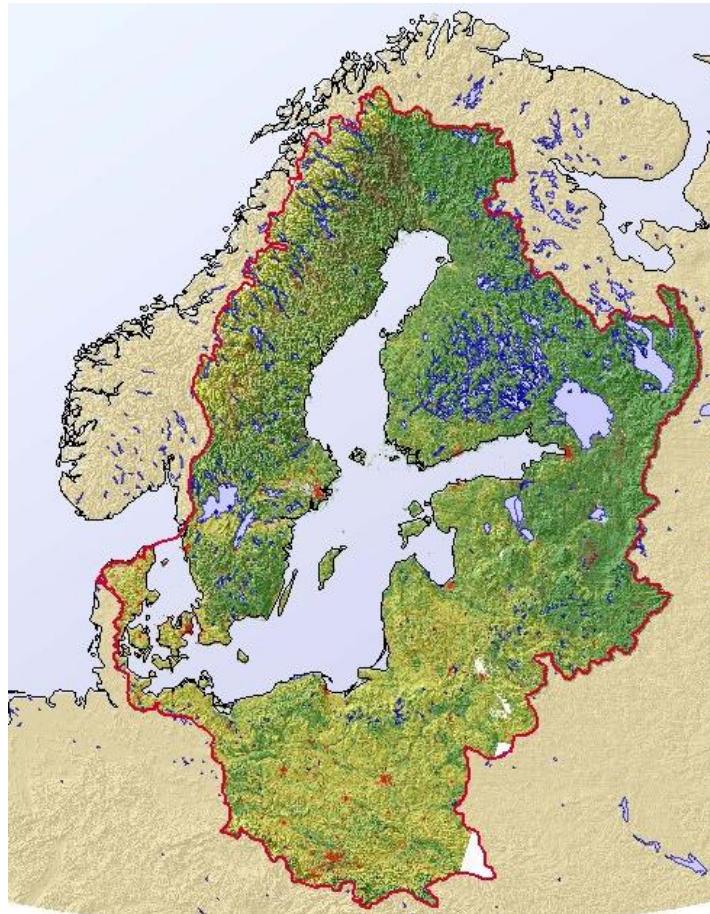
Enclosed

Brackish

Eutrophic

Species poor

Changing!



U. Jansson

# *The Baltic: naturally few resident species*



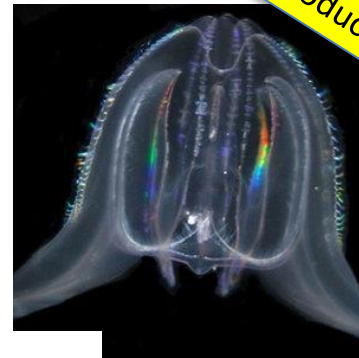
## *Extinctions, invasions and range shifts change life in the Baltic rapidly*



Range expansion



Range expansion



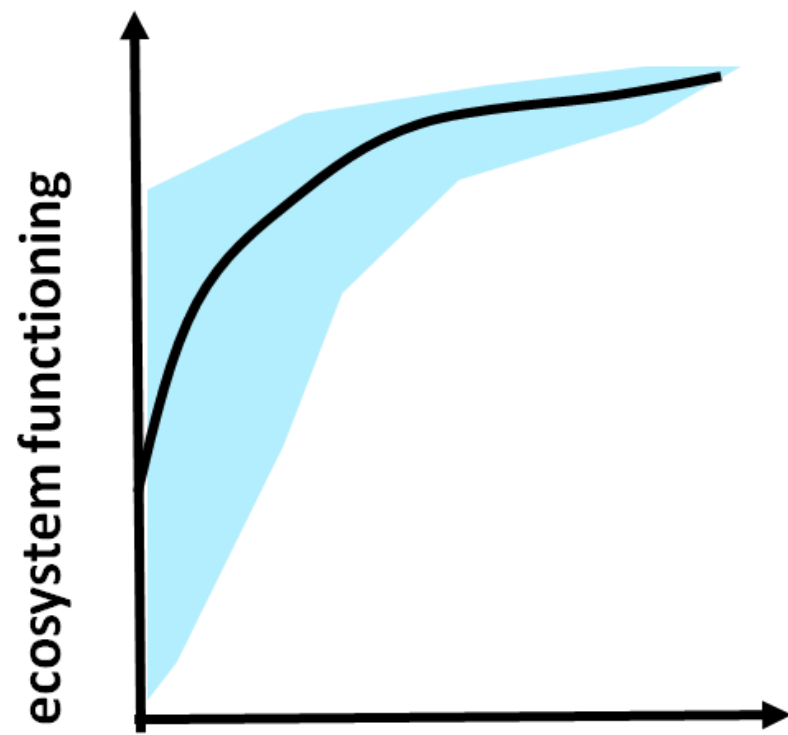
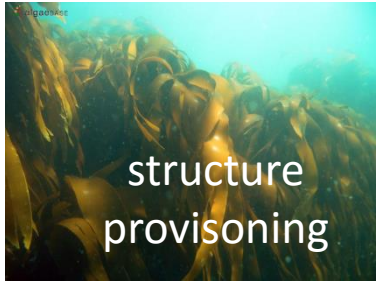
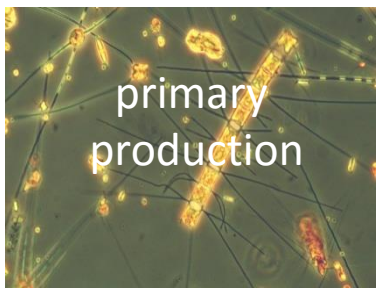
introduced



introduced



# The diversity paradox in the Baltic Sea



New status?

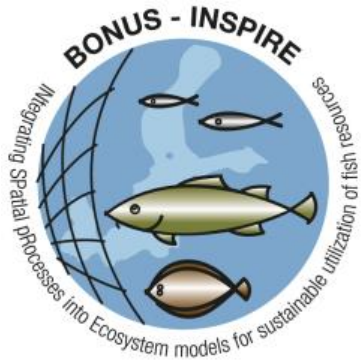
# *The Baltic Sea: a model for the global future ocean?*

*Present conditions in the Baltic are already as severe as conditions predicted for the global future ocean in 2100*

→ Time machine of how organisms/systems may cope in the future.

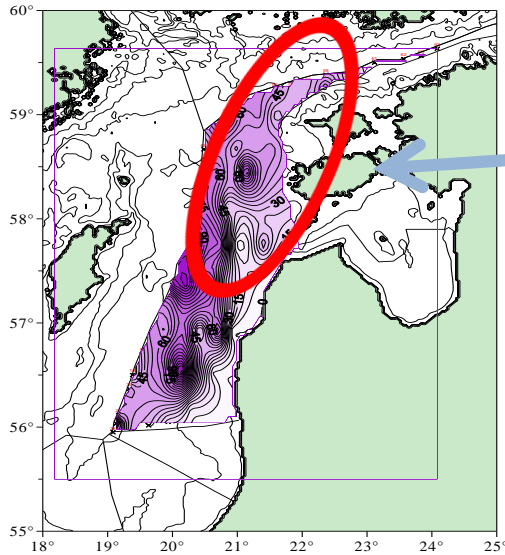
→ Test case for resource management strategies.





**What is the difference: prior and after INSPIRE?**

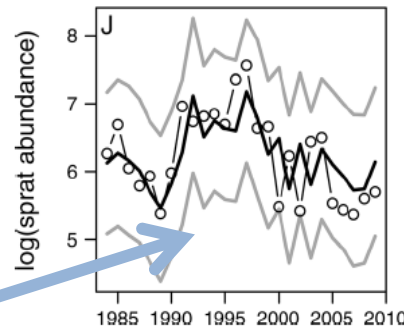
# Sprat: filling in gaps and developing tool



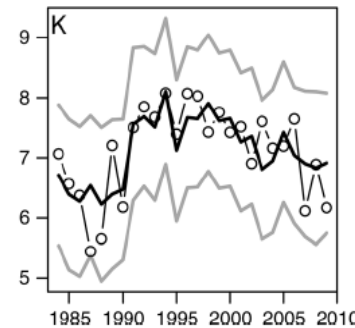
Amount of sprat eggs at the 1st stage of development per 1 day, n/day-1m<sup>2</sup>. F/V "Dzintari". 15-21 June 2014. INSPIRE BONUS project.

Sprat has been recently found in surprisingly high numbers in unusual habitat – the NE Baltic Sea. **What is the role of the area in reproduction of the fish?**

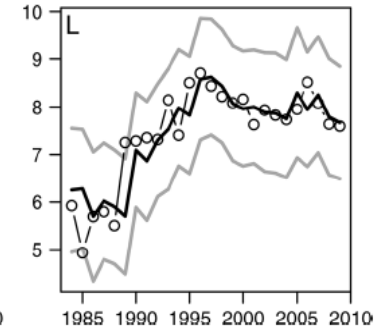
Bornholm Basin



Gdansk Deep



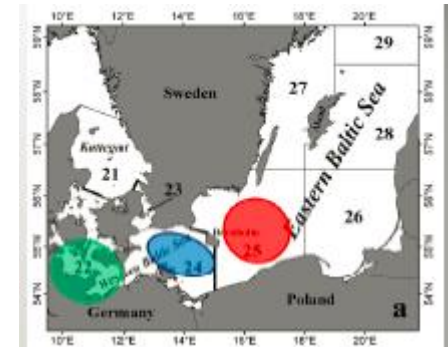
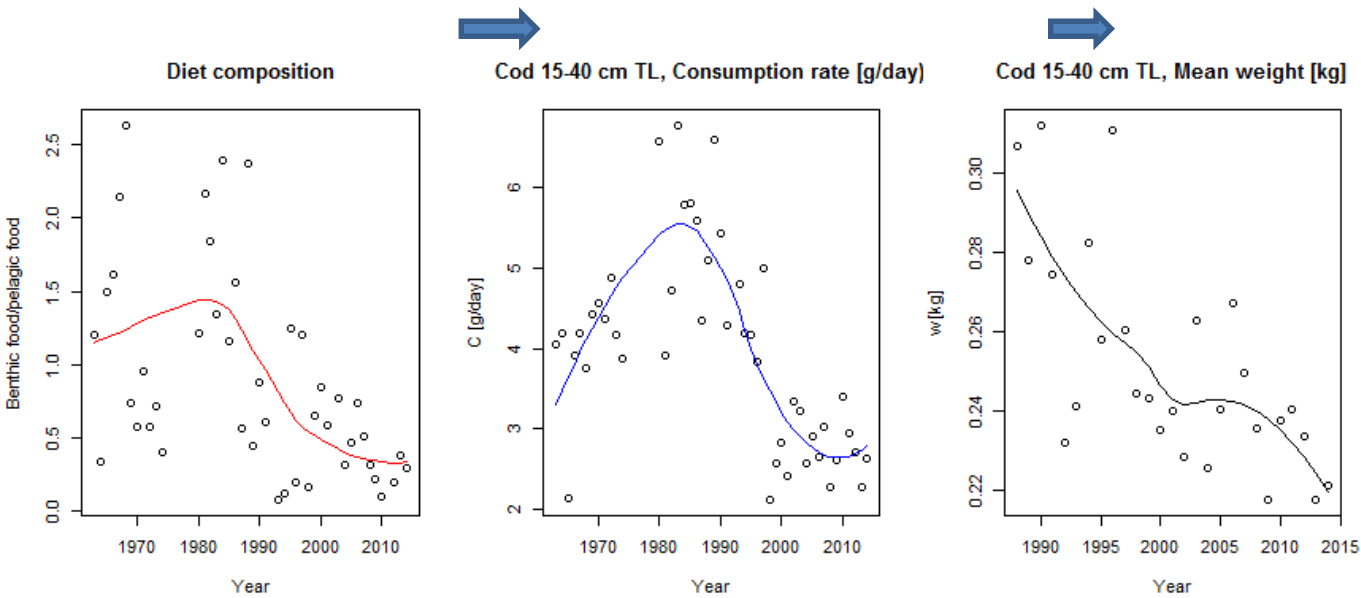
Gotland Basin



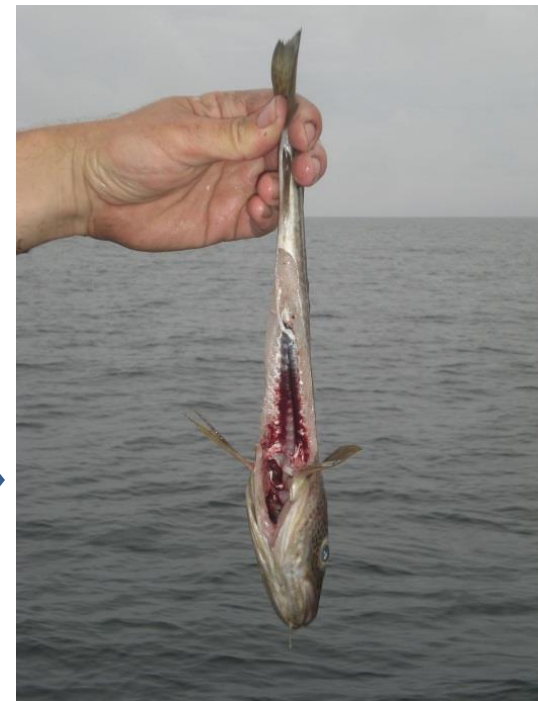
**Spatially explicit multispecies model**

This tool allows **assessing predation and fishing rates** on sprat while accounting for the observed changes in spatial distribution.

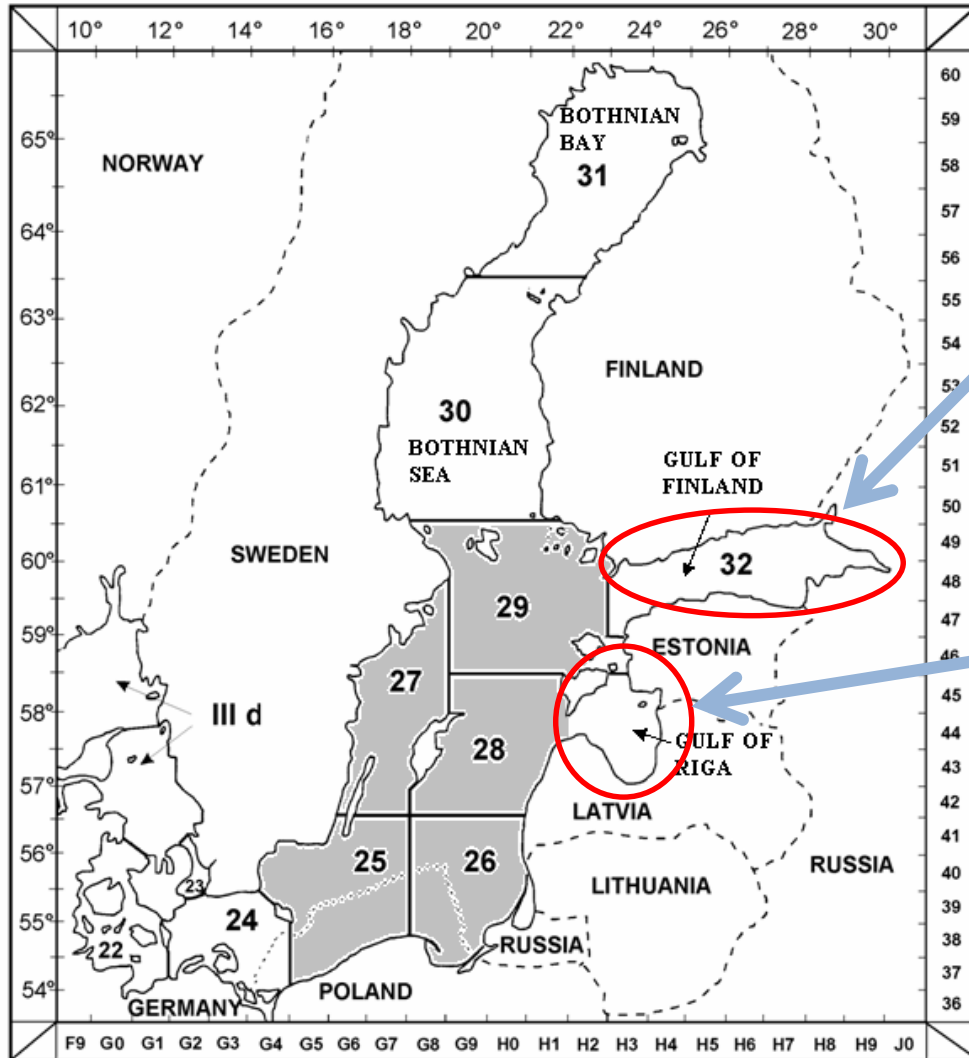
# Cod: resolving the eastern Baltic cod population puzzle



- Decreasing **benthic food availability** after the stagnation of inflows in the 1980s
- Change of the **sprat distribution** towards northeast



# Herring: focus on two gulf populations

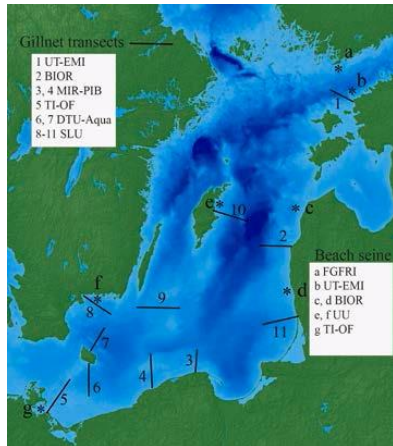


**Separate stock assessment** for the Gulf of Finland herring population

Ecosystem considerations: development of **large larvae indicator** as predictor of recruitment to be incorporated into assessment models

# Flatfish: oriented to management

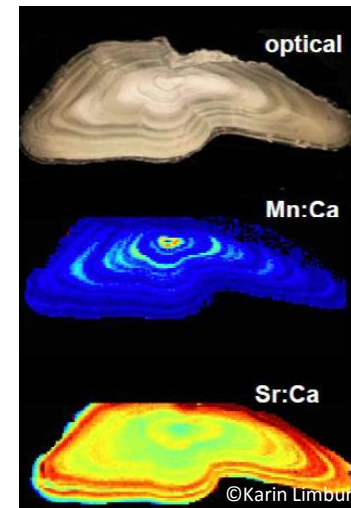
Field sampling



Eggs and spermatozoa



Otolith microchemistry



Morphometry



Defining management units,  
delivering stock assessment

# High-profile paper

- Highlight the major thought behind the INSPIRE project – **spatial heterogeneity in ecosystem-based management**
- Baltic Sea as a case study
- **Policy forum in SCIENCE or comment in NATURE**



## BONUS guest column

This time we publish a guest column inspired by presentations and discussions of the recent ICES Annual Science Conference 2015 session *"From genes to ecosystems – spatial heterogeneity and temporal dynamics of the Baltic Sea"* that was convened by BONUS BAMBI, BONUS BIO-C3 and BONUS INSPIRE projects.

# Finding bridges between biodiversity research and ecosystem-based management

Interactive expert teams take us closer to finding sustainable solutions for the Baltic Sea

by **Jan Dierking** (BONUS BIO-C3), **Karin Hüsey** (BONUS INSPIRE), **Linda Laikre** (BONUS BAMBI)

Today, it appears safe to say that in principle we know enough to improve management actions, but that existing and new knowledge is not applied to the extent needed. Adaptive policy and ecosystem-based management are considered ways forward for the future. To put things simple: this will require including more of what we know in policy and management and continuously reviewing and updating practices. The BONUS programme with projects bringing into contact integrative teams spanning broad areas of expertise from fundamental science to modellers and policy experts, but also ICES with its integrative working groups, foster a much needed basis for such adaptive management. They point the way towards a more generalised integration of the scientific, conservation, resource management and policy domains. These efforts are much needed and, if continued and expanded, will take us closer to a sustainable future for the Baltic Sea. In this article we give concrete examples based on research by three BONUS projects on how scientific information is integrated into adaptive fisheries management.

## Increasing knowledge 2: Genetics of Baltic key species

Though spring and autumn spawning herring are managed as single stocks, we now know that they are reproductively isolated and thus should be managed separately. Genetic patterns in pike in the Baltic suggest long distance gene flow over pelagic regions in this philopatric, coastal species. A likely explanation lies in long-distance transfer of non-native