



UNIVERSITY OF TARTU

Cooperation in Marine Science around the Baltic Sea and beyond: a contribution to Europe's Societal Challenges

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Societal challenges for Estonian marine science

Economy

- Need for sustainable economic growth including marine sectors
- Utilization of marine space and traditional and new resources – Blue Growth
- Renewable energy production

Environment

- Continuous degradation of marine environment and biodiversity on local, regional and global scale
- Overexploitation of marine resources
- Climate change

Social development

- Education & knowledge including marine topics
- Cultural development
- Development of coastal communities, regions and municipalities



EESTI MEREINSTITUUT
ESTONIAN MARINE INSTITUTE



Founded - 1992

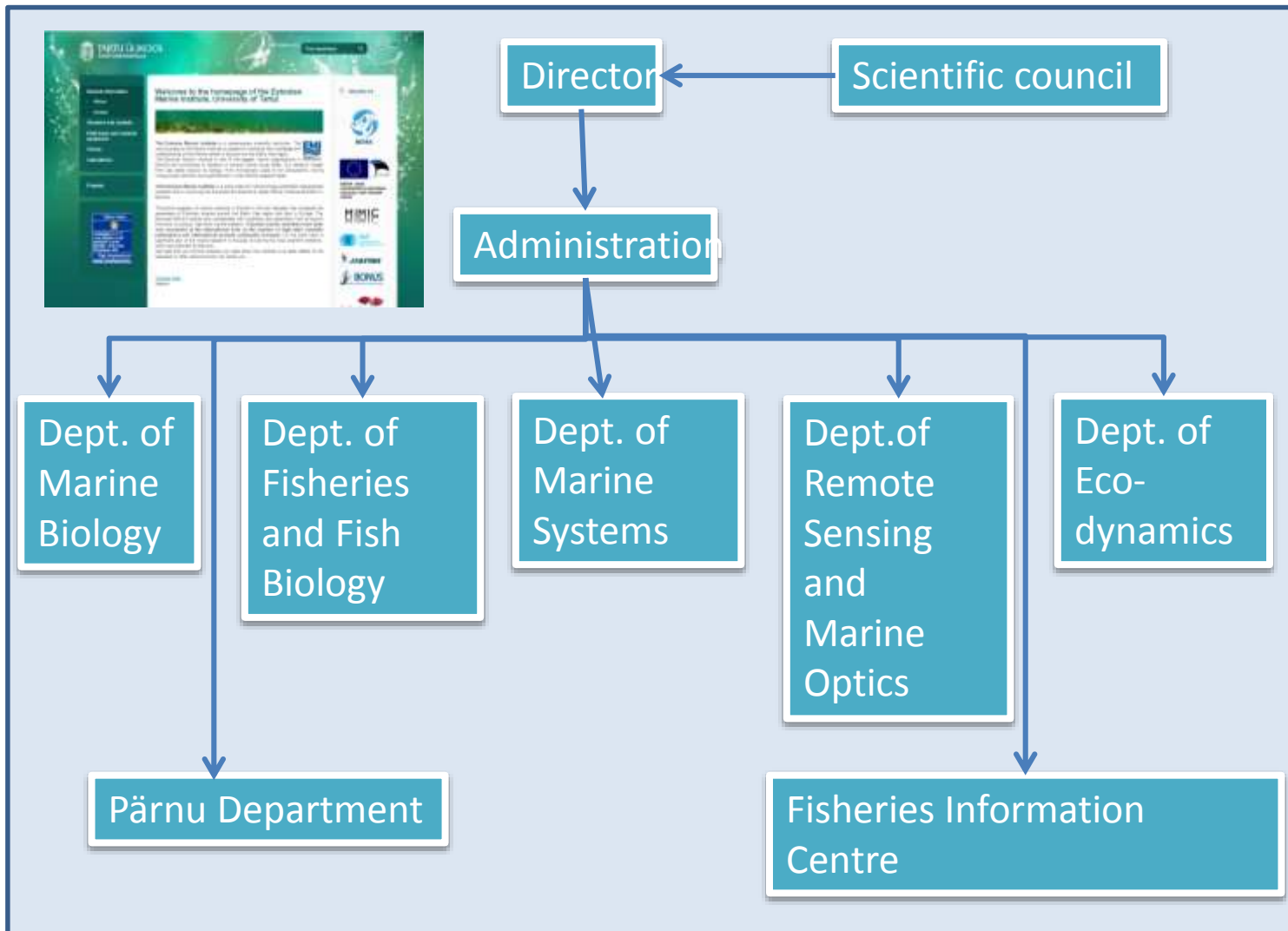
University of
Tartu since 2001

Staff - 120

Address: Mäealuse
14, 12618, Tallinn,
Estonia

ESTONIAN MARINE INSTITUTE

University of Tartu



453 papers

2000-2015

Research focus

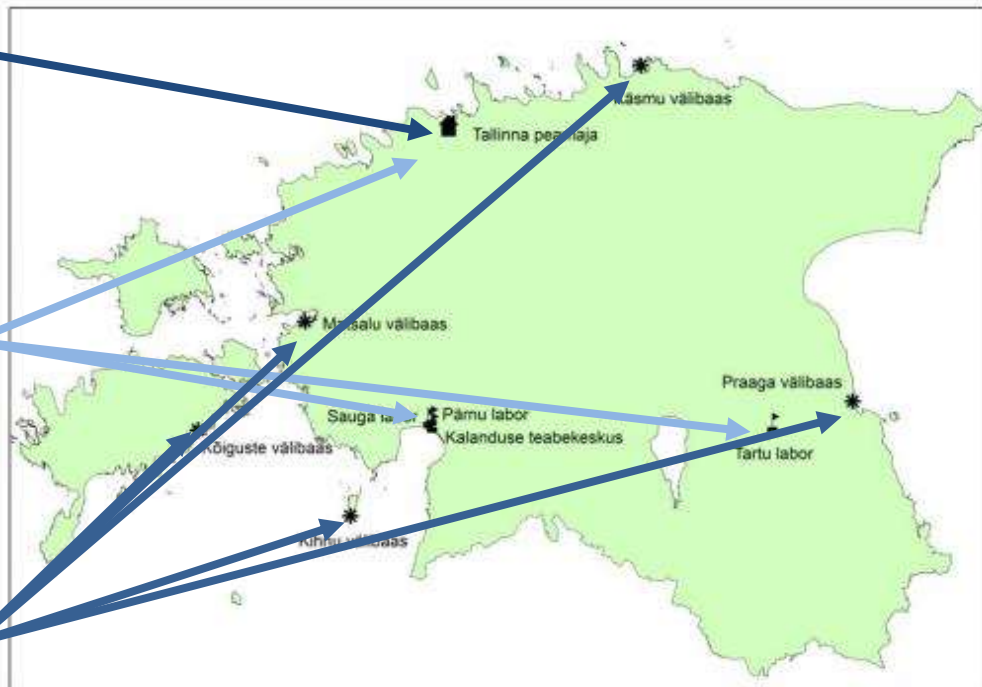
- Diversity and geographical distribution of marine life in the Baltic Sea
- Effect of eutrophication, sea water acidification and other human activities on structure and function of Baltic Sea ecosystem
- Productivity, cycles of matter and energy, population dynamics of marine species in the Baltic Sea's ecosystem
- The impact of natural factors and human activity on the Baltic Sea's food chains
- Biodiversity and its relation to ecosystem functioning
- Indicators of status of ecosystems and their application in assessment
- Spatiotemporal distribution of non-native species and the impact of ecological bio invasions
- Optical properties of Baltic Sea waters and remote sensing applications

Research infrastructure

Main office

Laboratories

Field stations



Research infrastructure

Research vessels: 6

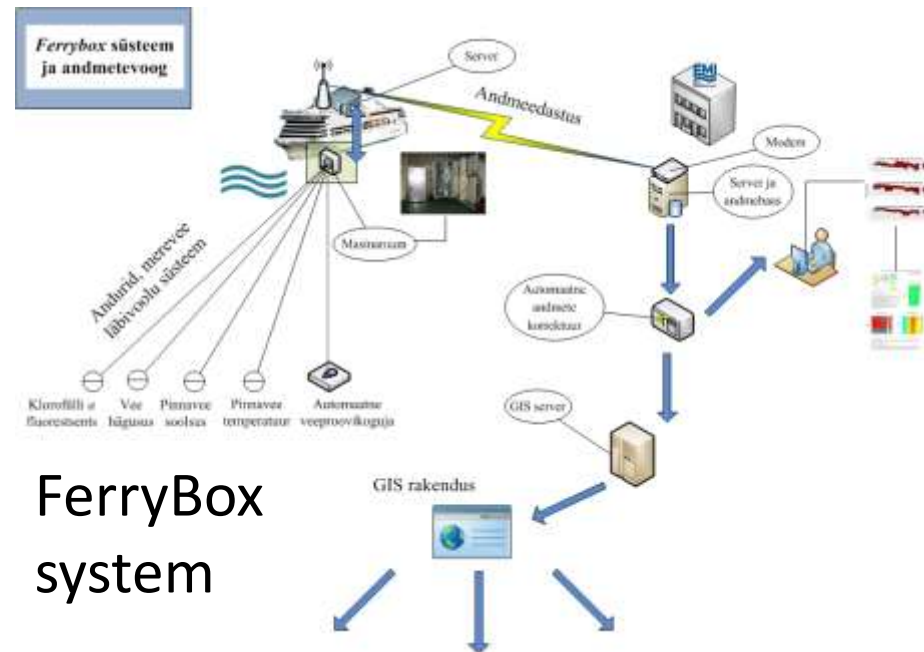
Location:

- Tallinn
- Pärnu



Research infrastructure

Laboratory and field equipment



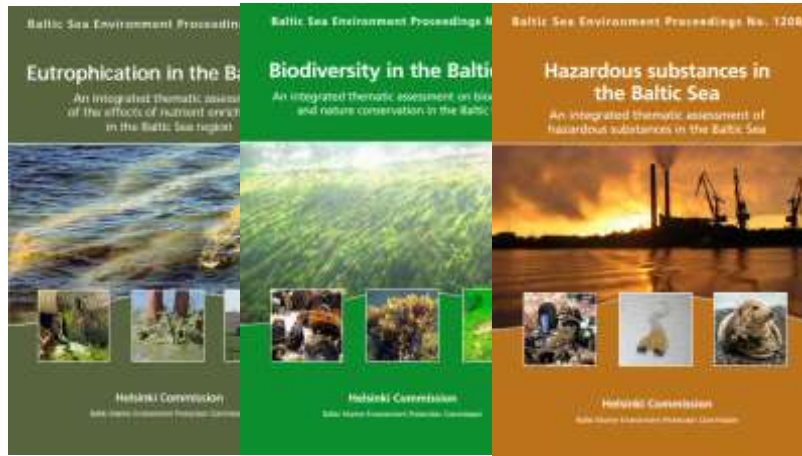
Support for decision making and policy development international cooperation - ICES



ICES coordinates marine science in North-Atlantic

- Chair of ICES Working Group on Introductions and Transfers of Marine Organisms: since 2011;
- Chair of the Strategic Initiative on Biodiversity advice and Science: 2011-2014;
- Chair of the Science Steering Group on Ecosystem Impacts and Pressures: since 2015
- Membership in various thematic WG-s

Support for decision making and policy development RSC- HELCOM



Participating in thematic expert groups and assessments

Chairing:

- Phytoplankton Expert Group
- Intercessional expert network on benthic habitat monitoring
- ICES/HELCOM Steering Group on Quality Assurance of biological measurements in the Baltic Sea
- WG on development of Biodiversity segment of BSAP

Support for decision making and policy development

MSFD international projects - MARMONI

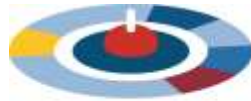


LIFE + project (2010-2015) to develop concepts for assessment of conservation status of marine biodiversity, including species and habitats and impacts of various human activities.

- Set of innovative/cost-effective indicators and methods for assessment of marine biodiversity
- MSFD compatible marine biodiversity assessment Tool
- Policy recommendations on development of monitoring and assessment programmes

Support for decision making and policy development

MSP international projects - HISPARES

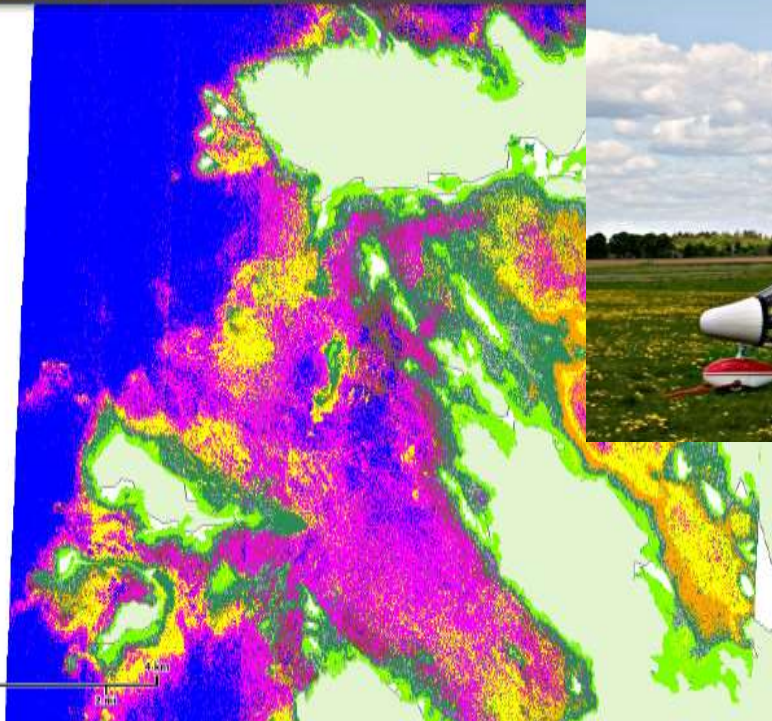


CENTRAL BALTIC
INTERREG IV A
PROGRAMME
2007-2013



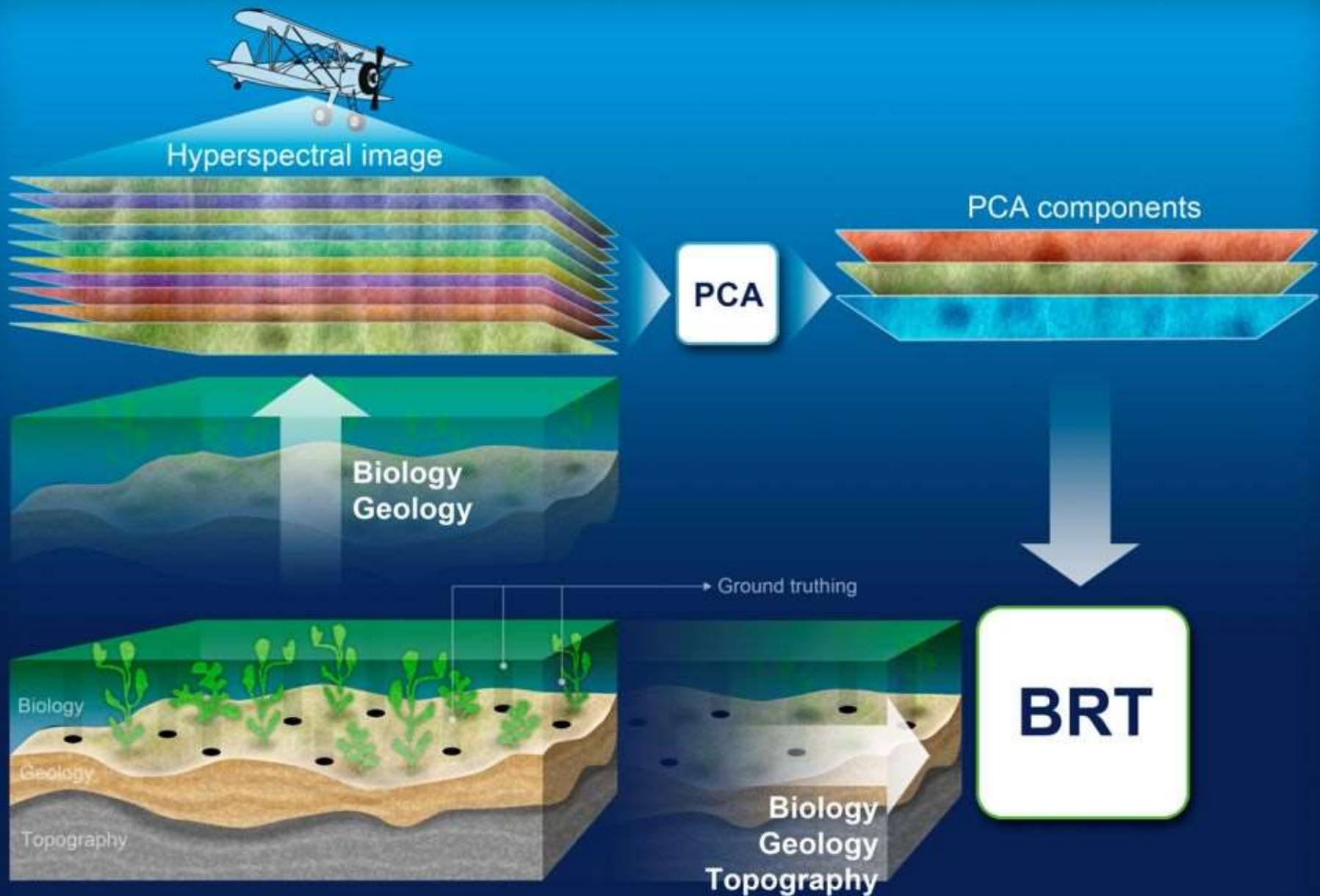
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

Spatial planning in archipelago waters by high spatial resolution remote sensing
Habitats of HISPARES



- Bare sand, no vegetation
- Areas > 5m, no information
- Fucus vesiculosus community
- Bare limestone, no vegetation
- Thick charophyte community, substrate not visible
- Thick filamentous algae, substrate not visible
- Higher plants on sandy substrate
- Green filamentous algae on limestone cobbles-pebbles and rock





Support for decision making and policy development

MSFD international projects - BALSAM

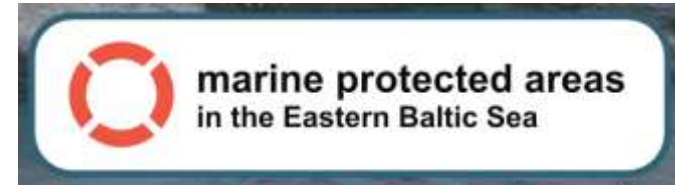


Baltic Sea Pilot Project (2014-2015): Testing new concepts for integrated environmental monitoring of the Baltic Sea (BALSAM) to enhance the capacity of the Baltic Sea member states to develop their marine environmental monitoring programs.

- Monitoring manual for extent of benthic habitats
- Recommendations to harmonize the monitoring and sampling methods for non-indigenous species to meet the needs of the MSFD as well as the Ballast Water Management Convention (BWMC).

Support for decision making and policy development

HD/Natura 2000 international projects - Baltic MPA project



Objectives were (2005-2009):

- to get better information about species and habitats of European importance in the coastal waters of the Baltic States;
- to assess if major threats endanger them;
- to propose new areas with special nature values to be designated by the national authorities for protection under the European Natura 2000 frame;
- to elaborate protection and management proposals for these sites.

Support for decision making and policy development

HD/Natura 2000 international projects –
NEMA project



INVENTORY AND DEVELOPMENT OF MONITORING PROGRAMME FOR NATURE VALUES IN ESTONIAN MARINE AREAS:

- development of criteria for defining the favorable conservation status of marine habitat types,
- development and testing of the monitoring and assessment methods for different habitat types,
- perform inventories of habitats,
- monitoring to define the status/quality of marine habitats,
- detailed inventory of waterbirds in Estonian EEZ,
- develop and test the monitoring method for ringed seals



Support for decision making and policy development

MSP international projects – BaltSeaPlan

BaltSeaPlan (2009-2012) accompanied the EU Maritime Policy by supporting the introduction of Integrated Maritime Spatial Planning and preparation of National Maritime Strategies within Baltic Sea Region:

- Improve the joint information base / stocktaking
- Include Spatial Planning in National Maritime Strategies
- Develop a Common Spatial Vision for the Baltic Sea
- Demonstrate MSP in 8 pilot areas: Danish Straights / T-Route (DK), Pomeranian Bight (DE/DK/SE/PL), Western Gulf of Gdansk (PL), Middle Bank (SE/PL), Lithuanian Coast (LT), Western Coast of Latvia (LV), Pärnu Bay (EE), Hiiumaa and Saaremaa Islands (EE)
- Lobbying and capacity building for MSP

BaltSeaPlan - Towards application of Marine Spatial Planning in the Baltic Sea



Support for decision making and policy development

MSP/CFP international projects – BONUS INSPIRE



INSPIRE conducts pilot ecosystem field surveys that help resolving the habitat requirements of different life-stages of the focal species by combined use of traditional methods and application of modern advanced analysis and modelling techniques.

- What habitat (both pelagic and benthic) conditions characterize the spatial distributions of cod, herring, sprat and flounder?
- To what extent do fishing and species interaction affect the local and basin-scale distribution of exploited stocks?
- What drives spatial connectivity and migrations of different fish species/populations?
- How does stock structure and separation of natural populations impact stock assessment outcomes?

Support for decision making and policy development

international projects – VECTORS



VECTORS seeks to develop integrated, multidisciplinary research-based understanding that will contribute the information and knowledge required for addressing forthcoming requirements.

- To collate understanding of the different current and potential future pressures and vectors of change in the marine environment
- To better understand the mechanisms of changes in marine life and the role of human activity
- To determine the impacts of changes in marine life on ecosystems, their structure and functioning, the services they provide, as well as the economic and societal implications
- To project the future changes and consequences of multi- sectoral human activity in the marine environment under future possible scenarios of adaptation and mitigation
- To synthesize the derived information into innovative, predictive management tools and strategies targeted to different policy makers

Support for decision making and policy development international projects – BAMBI



BAMBI overall goal is to assess and improve capacities of marine species to deal with the current challenge of a rapidly changing Baltic Sea environment.

- Will species and ecosystems of marine origin adapt and survive the coming 50-100 years inside the Baltic Sea?
- If so, what is needed in terms of population sizes, population connectivity and genetic variation?
- What governance structures, policy instruments and management measures can mitigate losses of marine Baltic Sea species?

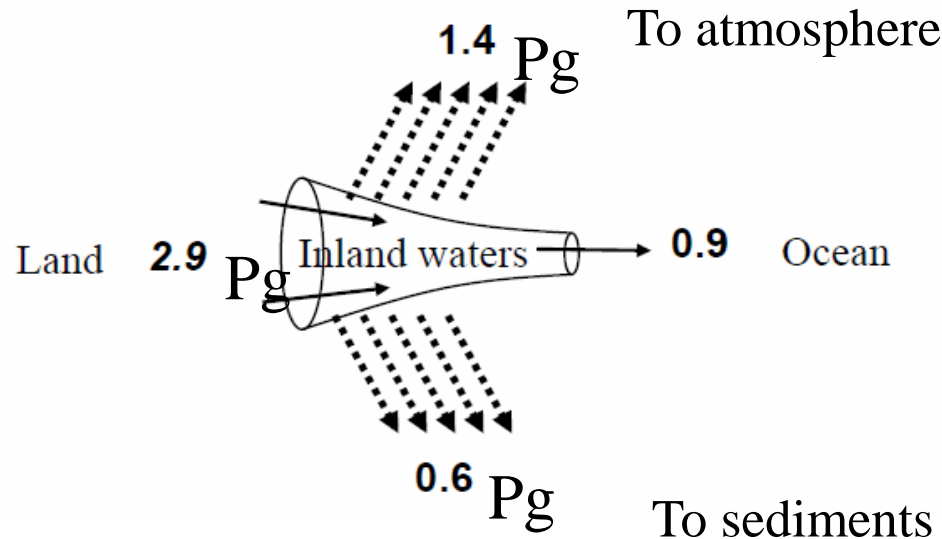
Scientific cooperation - global issues

Role of lakes in global carbon cycle



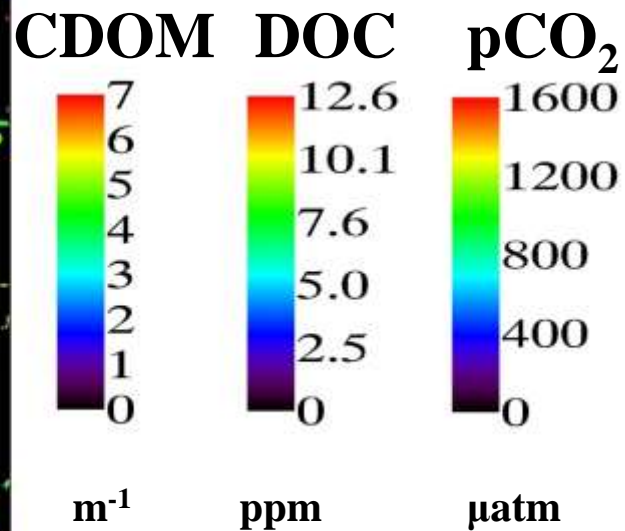
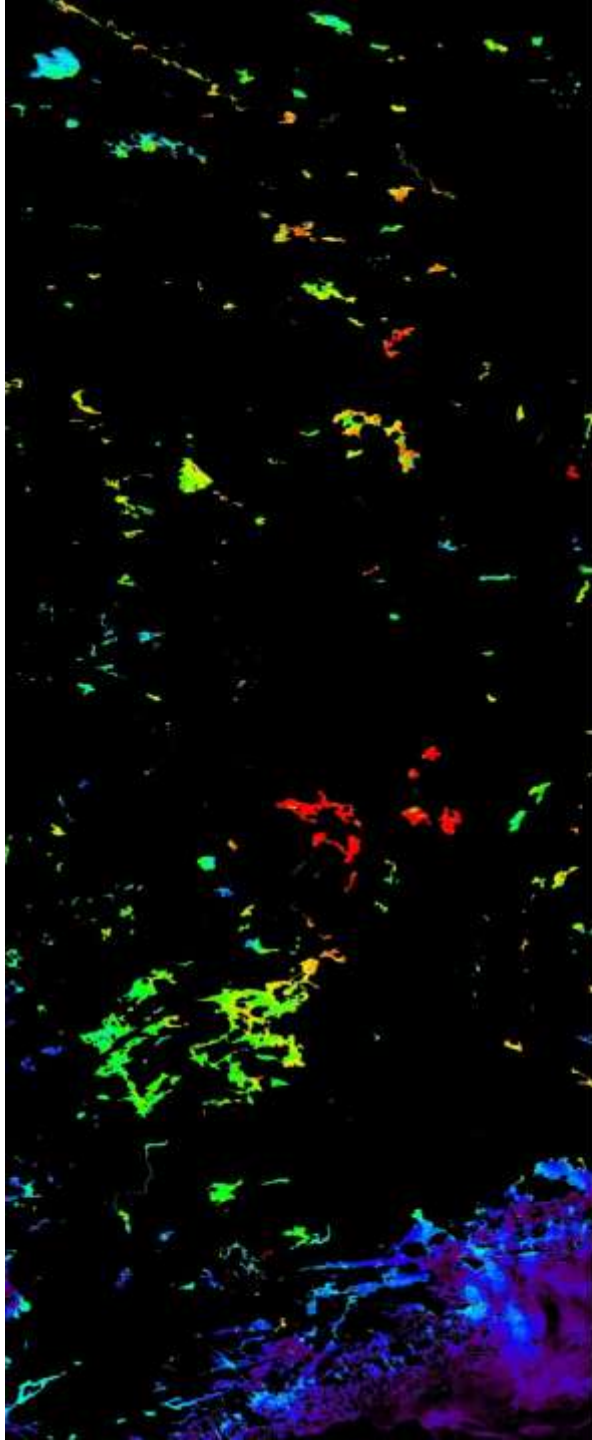
Land **0.9** → Inland waters → **0.9** Ocean

IPCC 2007

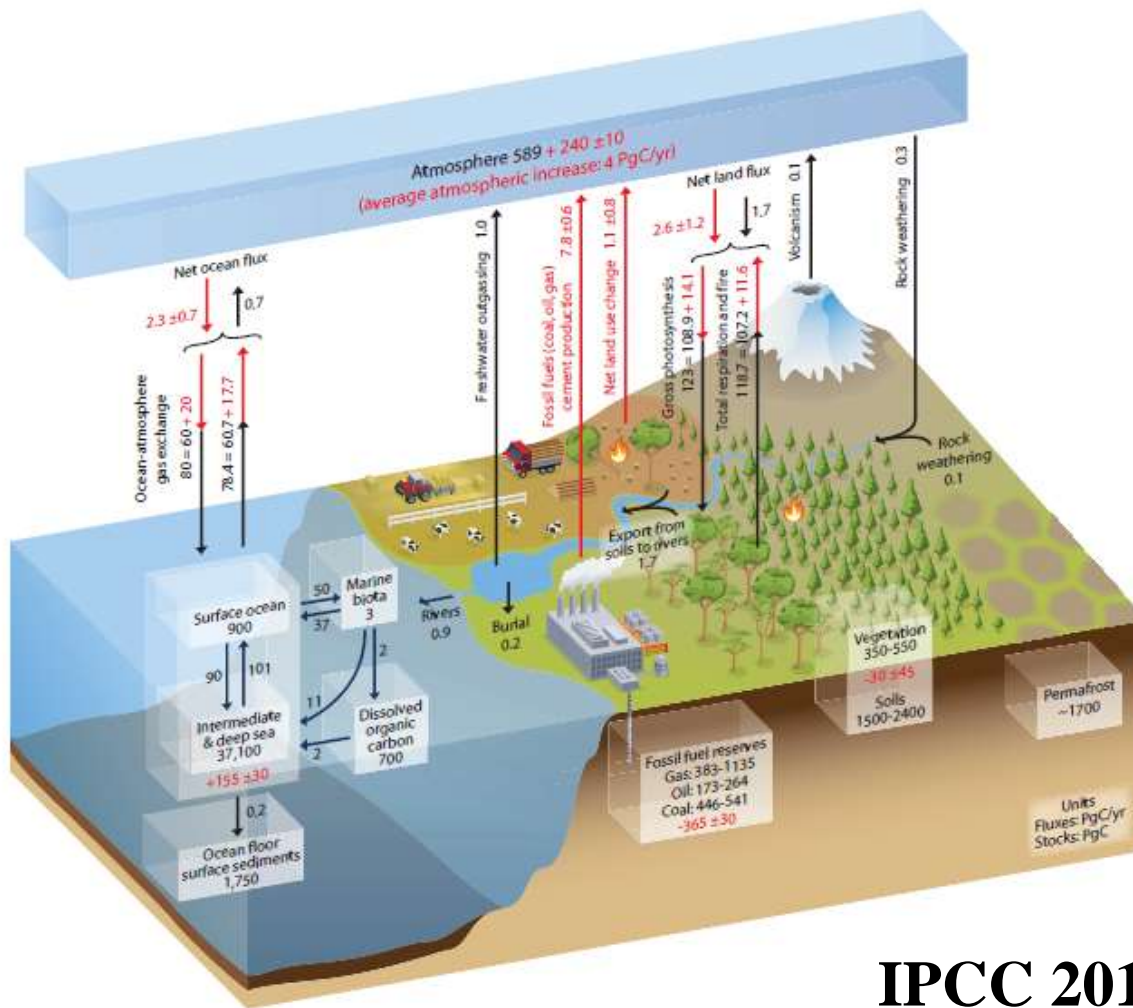


Cole *et al.* 2007
Tranvik *et al.* 2009

Mapping lake carbon with ALI (prototype of Landsat 8)



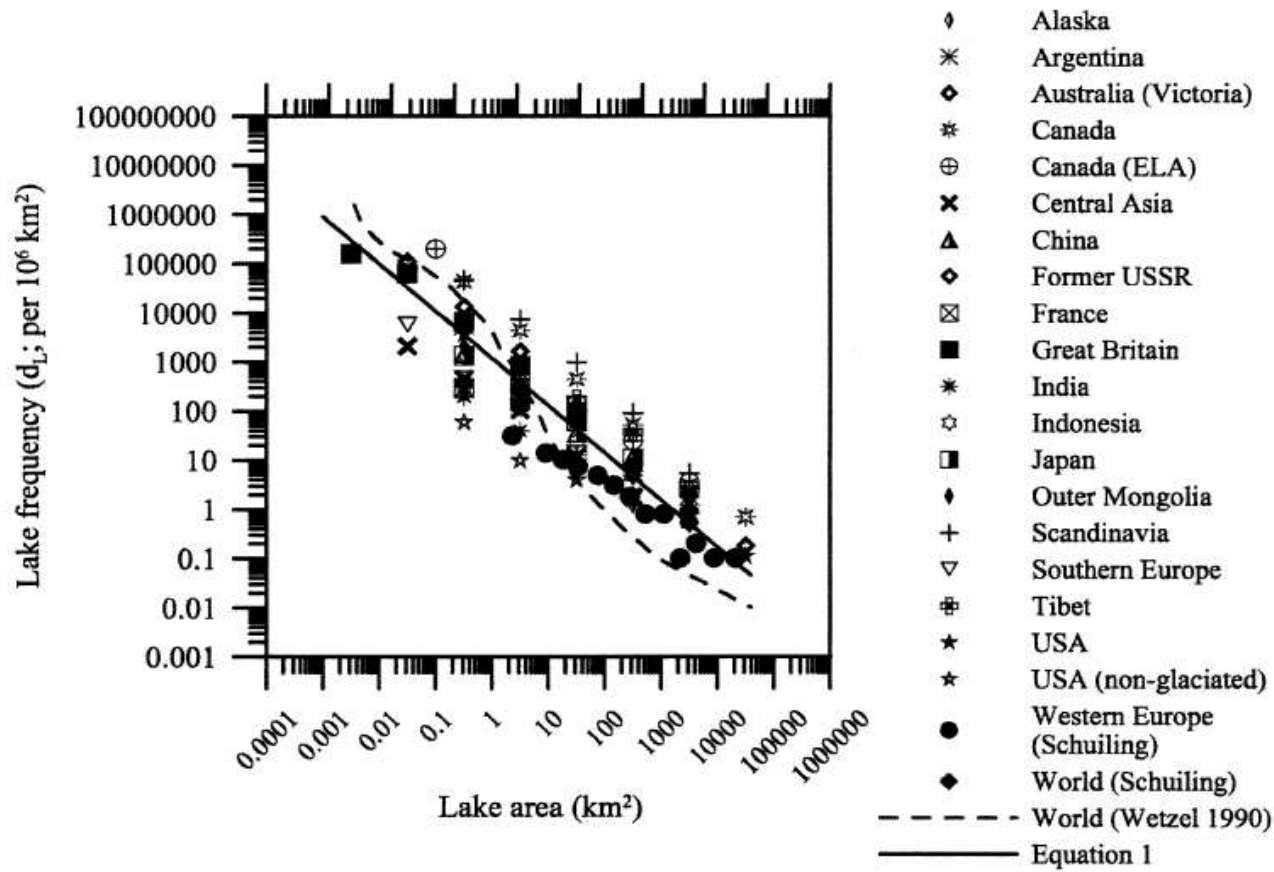
Kutser et al. 2005a,b



Our results
taken now
into account
by the IPCC

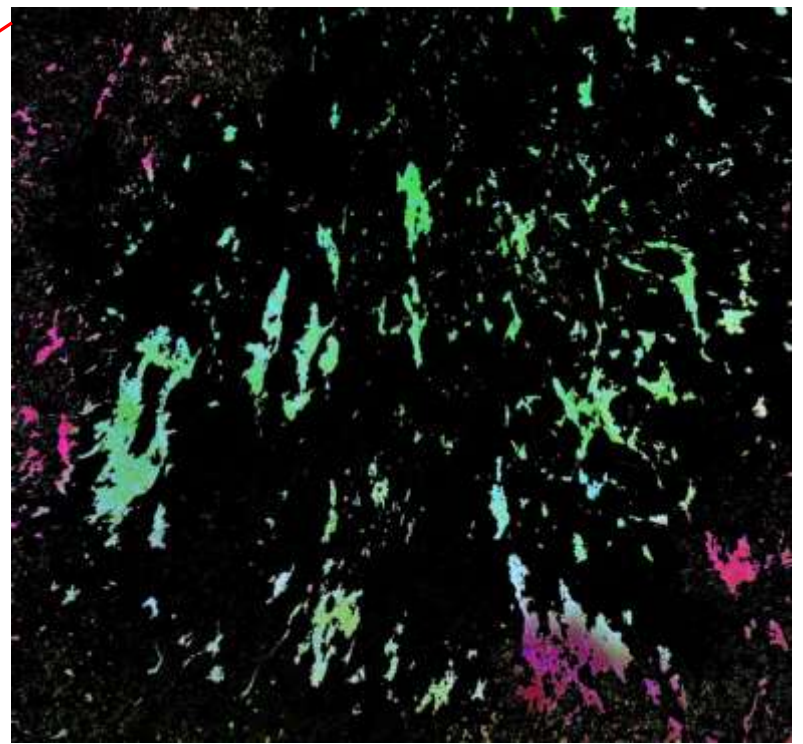
IPCC 2013

BUT, both our and IPCC estimates on the role of lakes based on upscaling *in situ* results from a few thousand lakes to statistical estimate of lake abundance



Previous estimate 304 million lakes, 4.2 million km²
 Downing et al. , L&O 2006

The number of small lake significantly overestimated
Seekell and Pace, 2011; Lewis, 2011; Seekell et al., 2013



**117 million lakes larger than
0.002 km² (14.25 m x 14.25 m x 9)**

**Total area 5 million km²
(3.7% of the Earth non-
glaciated land area)**

**Verpoorter et al. 2012
L&O Methods**

Scientific cooperation - global issues

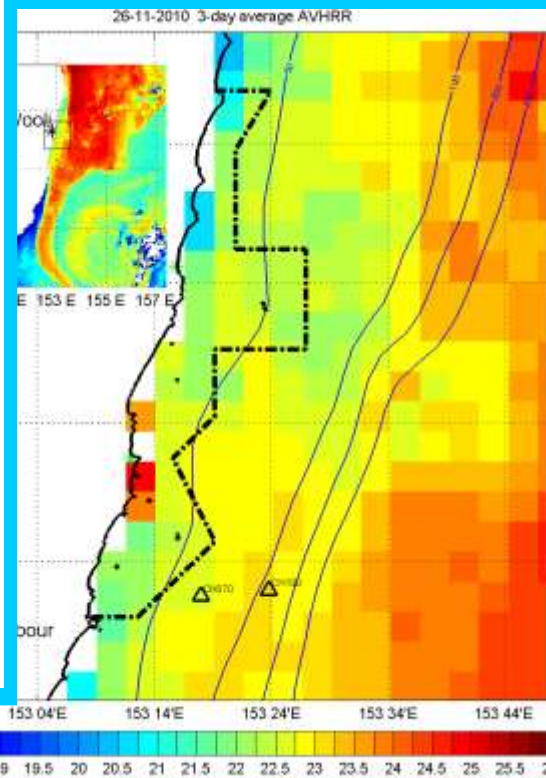
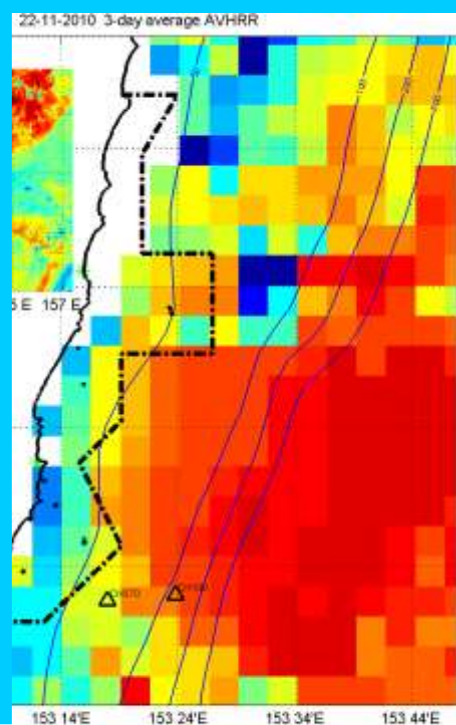
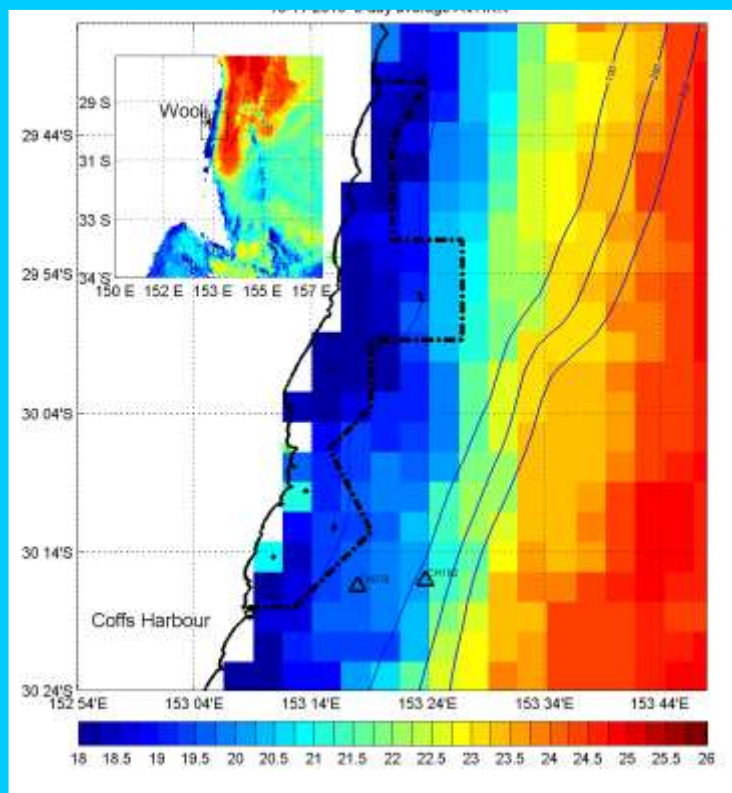
Global patterns of benthic littoral productivity – response to climate change



UNSW
AUSTRALIA



- Climate change will trigger changes in oceans hydrodynamics which has an effect on nutrient regime and potentially on productivity.
- Littoral communities are very plastic in the response and can compensate for the change in nutrient regime – total productivity will remane same.
- Global littoral productivity has very regional pattern

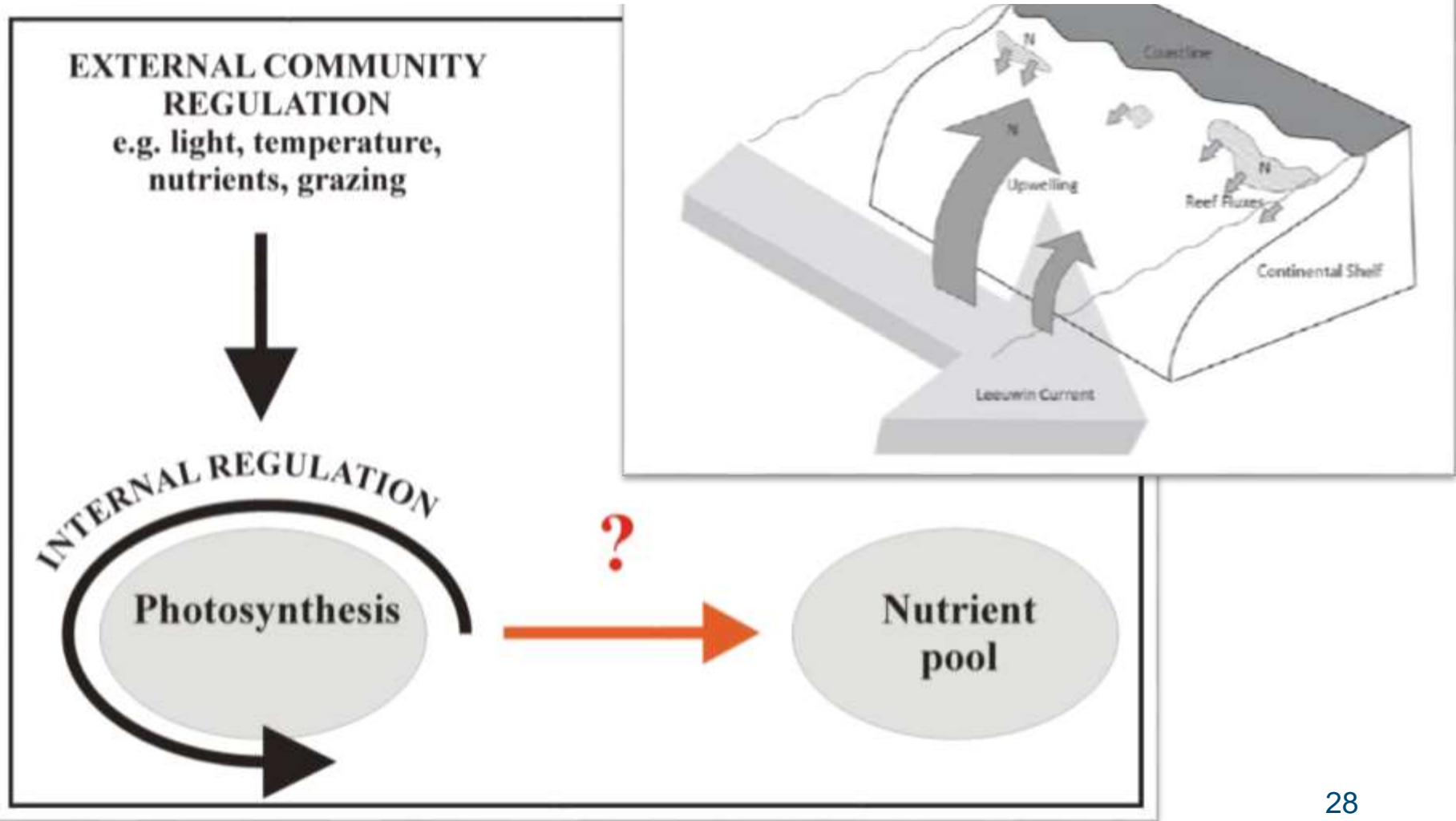


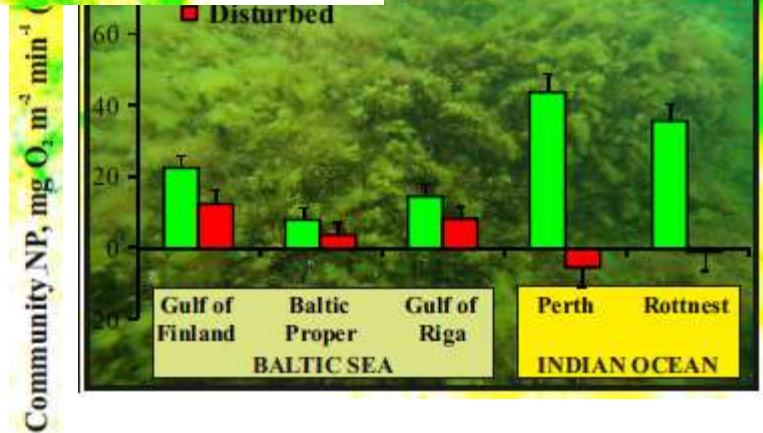
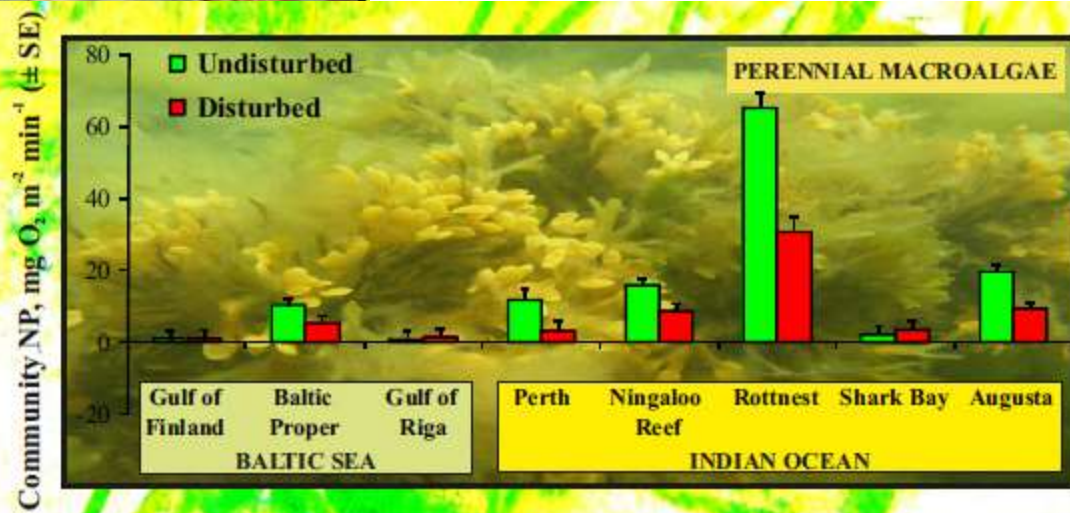
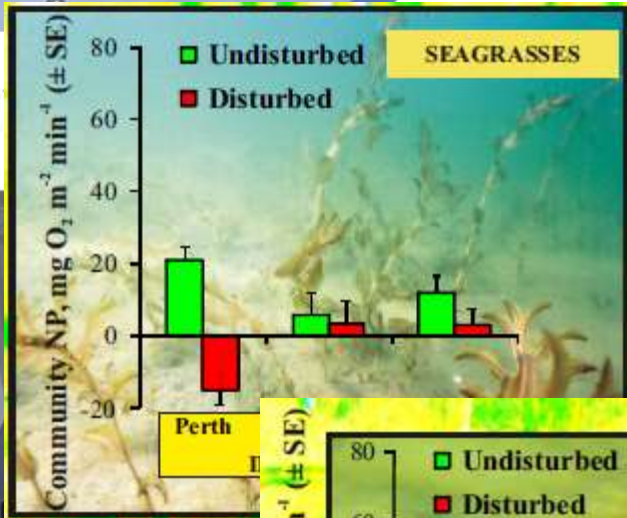
current

transition

future climate

Algal photosynthetic performance may buffer climate change effects







Concluding remarks

- Active international cooperation on regional and global level is a key to effective use of resources, available experiences and knowledge to address common scientific and technical issues
- Modern marine research has a highly interdisciplinary character helping to solve modern complex problems and challenges
- Implementation of existing and new policies on local and regional level needs active contribution from scientific community



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Thank you for your attention!