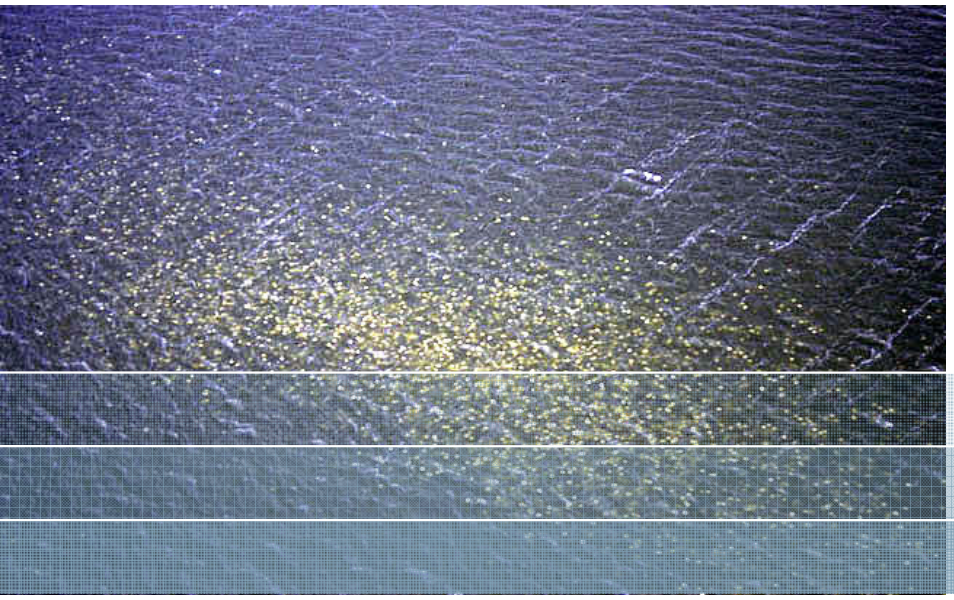

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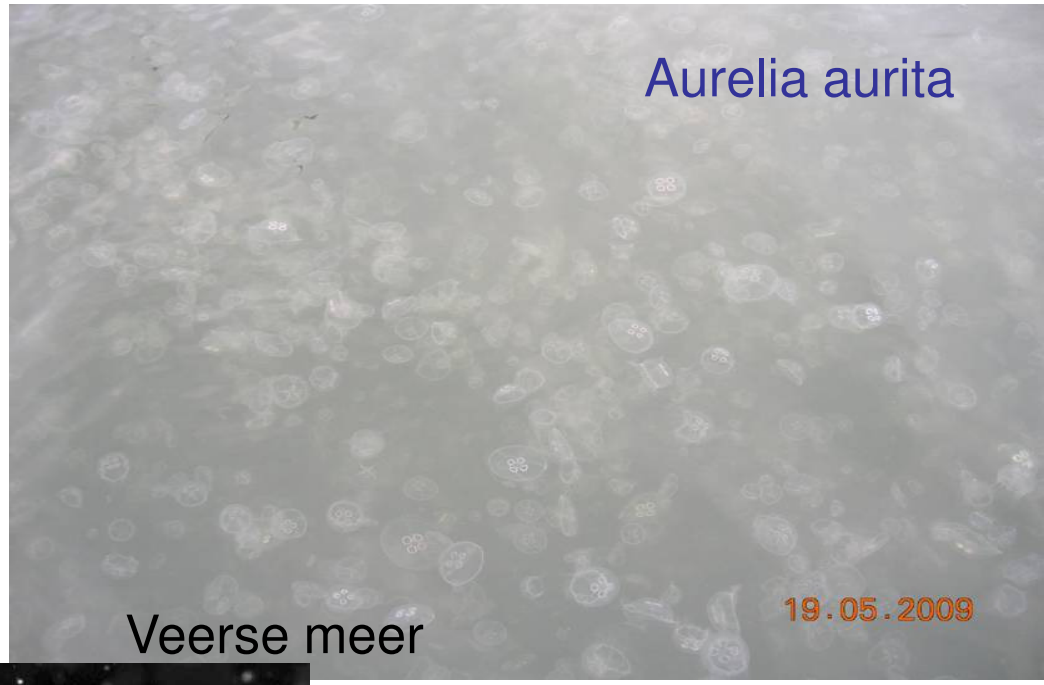
Enabling Delta Life

Natural and anthropogenic impact on North Sea gelatinous zooplankton population dynamics:

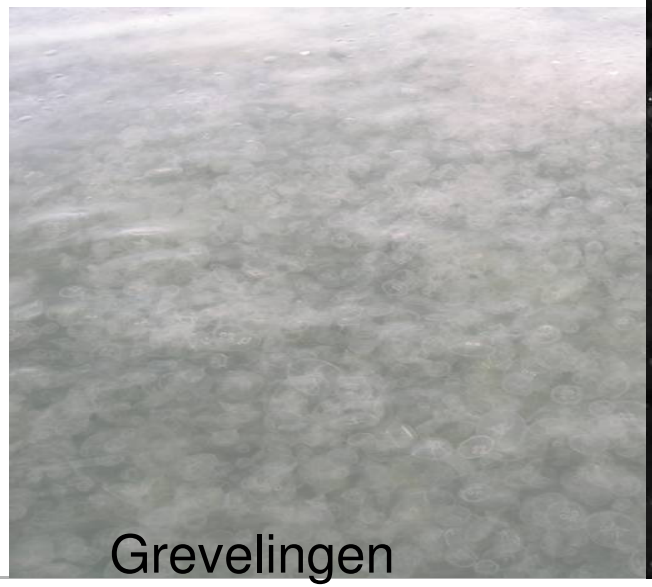
implications for ecosystem structure and functioning

V.T. Langenberg, L. van Walraven and H.W. van der Veer

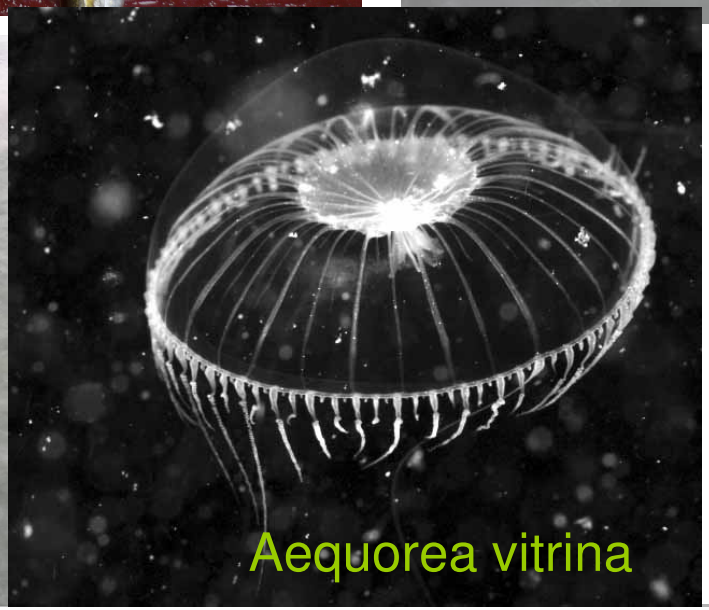
Netherlands 2009



Veerse meer



Grevelingen



Aequorea vitrina

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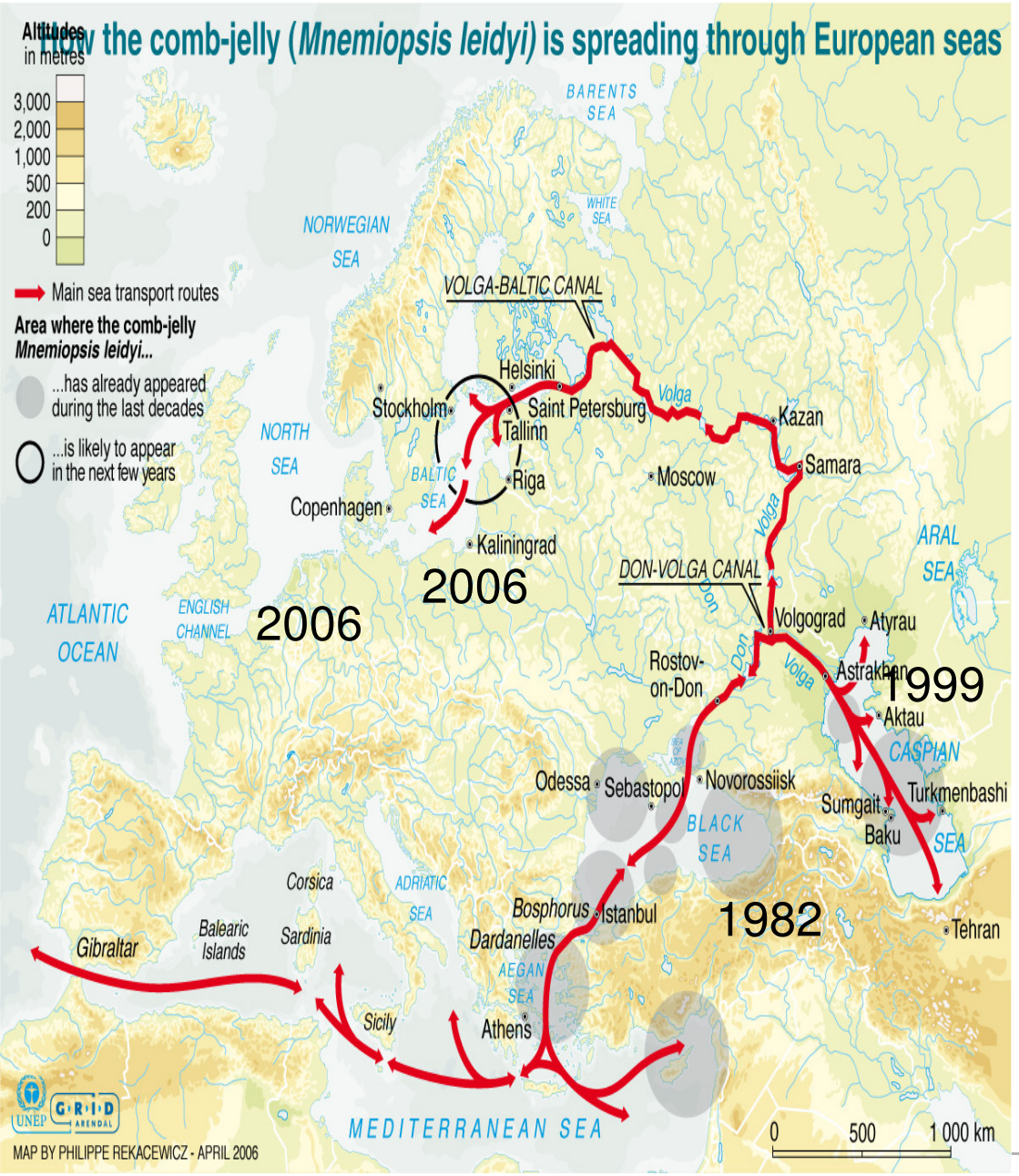
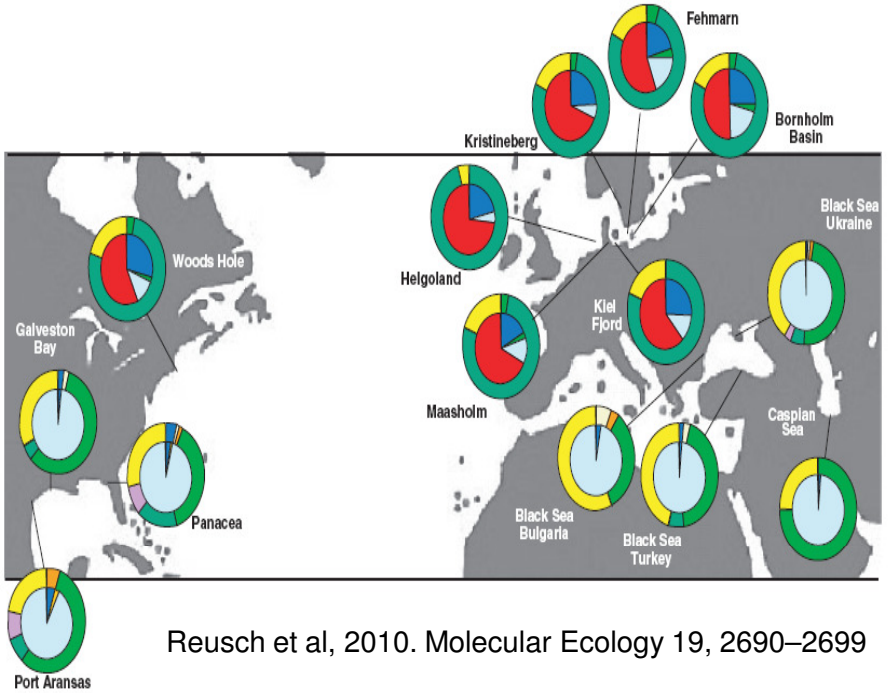
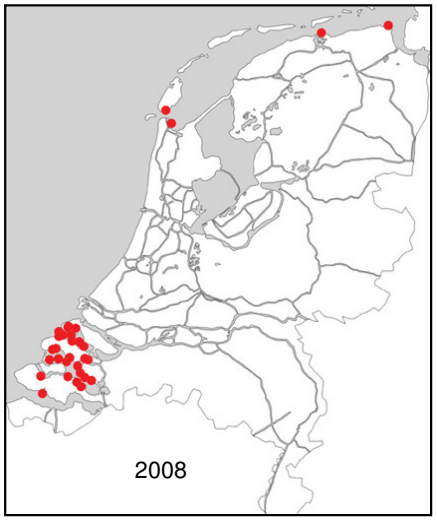
Mnemiopsis





Reusch et al, 2010. Molecular Ecology 19, 2690–2699



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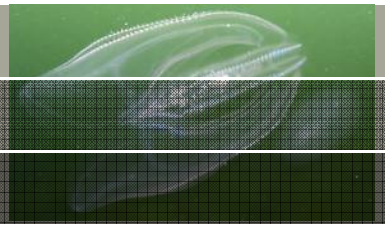
Research



Research questions

1. Spatial and temporal distributions of the main gelatinous zooplankters? Are there seasonal patterns?

2. What is the role of the meteorological, hydrodynamical and physicochemical regimes on the distribution of gelatinous zooplankton? E.g., how are they affected by changes in circulation, turbulence, stratification and winter harshness?

3. How does gelatinous zooplankton relate to total biological production Ecosystemic, structures and functioning?

1. What are the top-down and bottom-up controlling mechanisms? How will they modify with projected climatic change and increased resource exploitation rates?

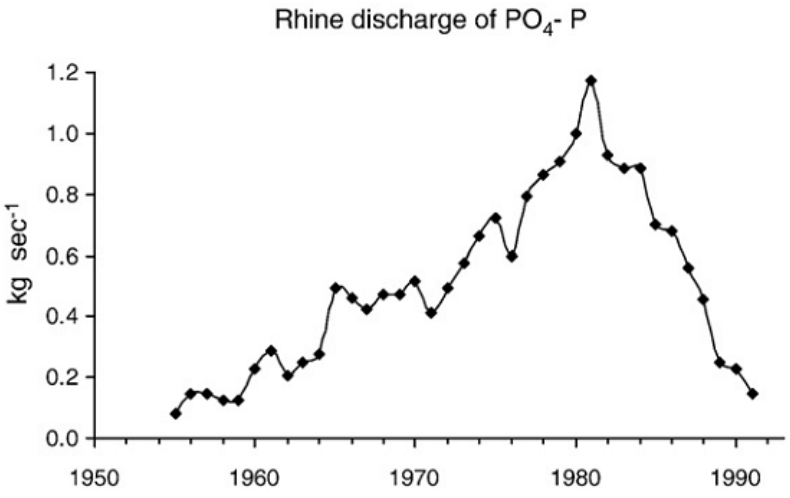
2. Nutrient enrichment vs. proliferation of gelatinous zooplankton in the North Sea?

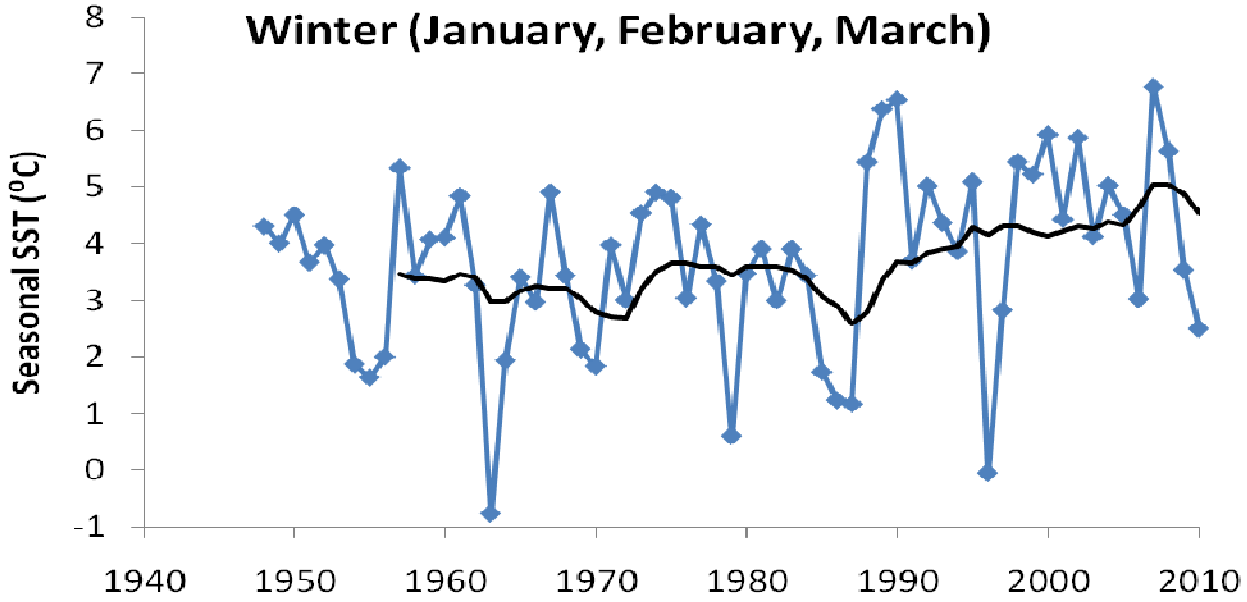
3. Will, with projected climatic and other anthropogenically induced changes in the North Sea, the importance of gelatinous zooplankton populations increase?

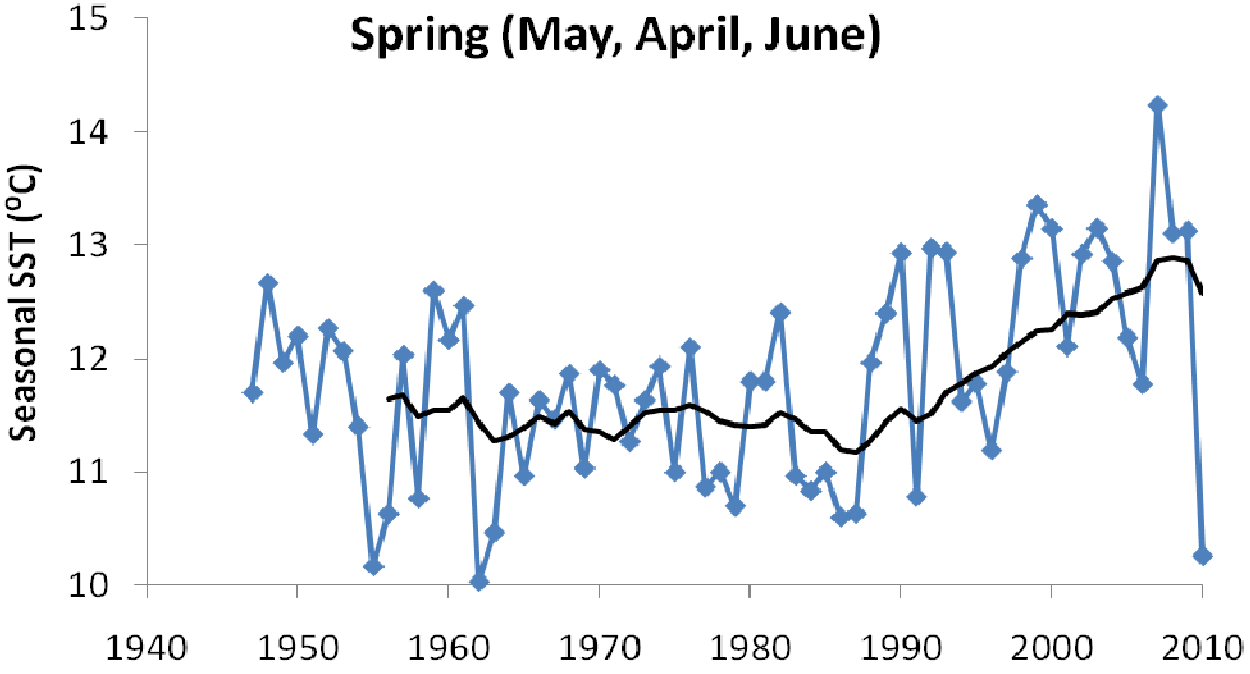
Changes?

1 Wadden Sea SST has increased in all seasons in the last 25 years (van Aken, 2008).

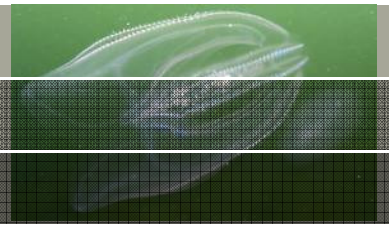
2 Eutrophication has decreased (Cádee and Hegeman, 1994)

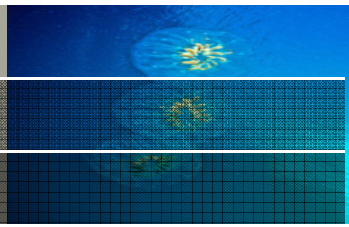




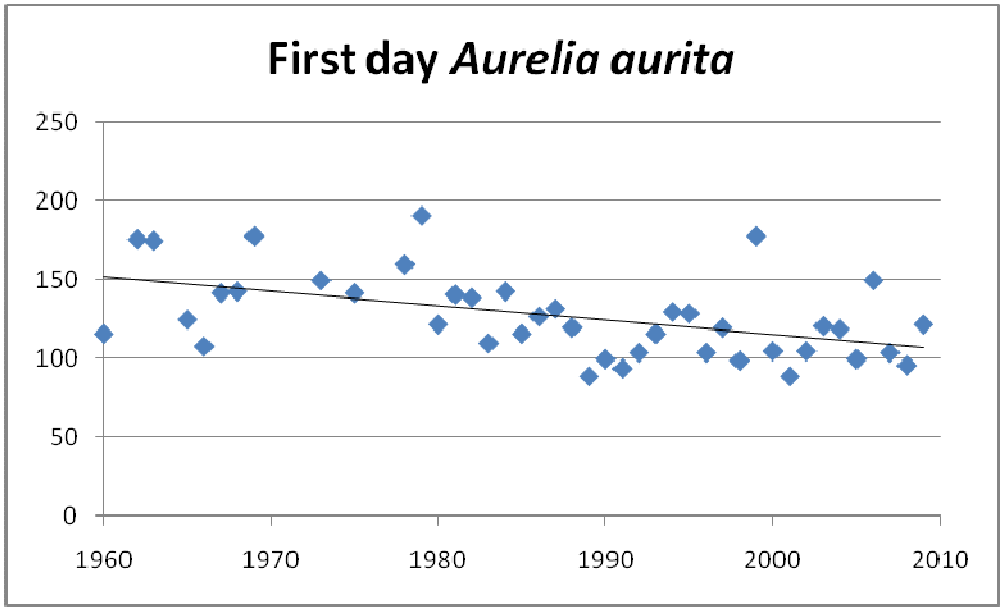


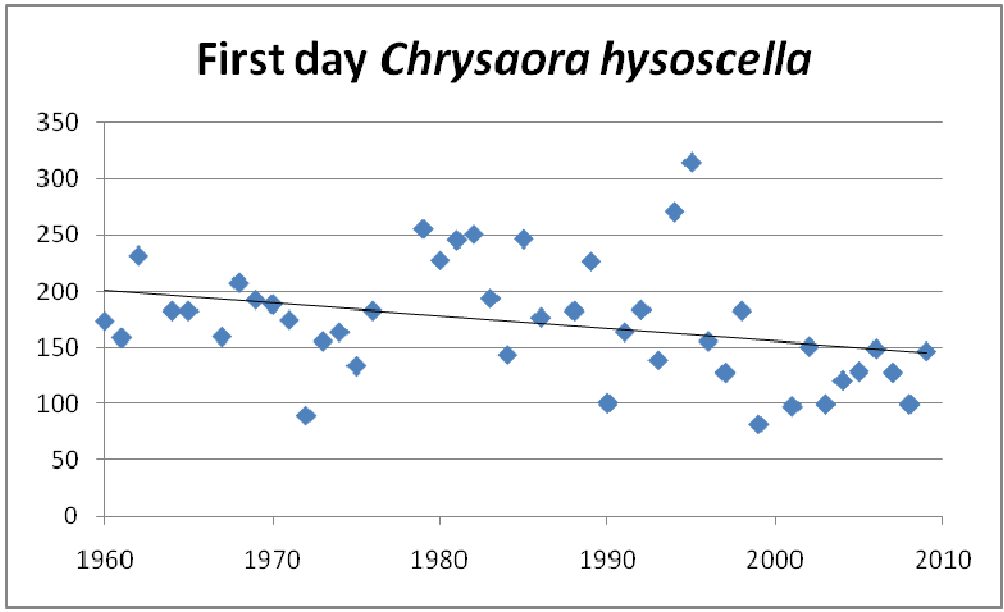
Trends in first occurrence

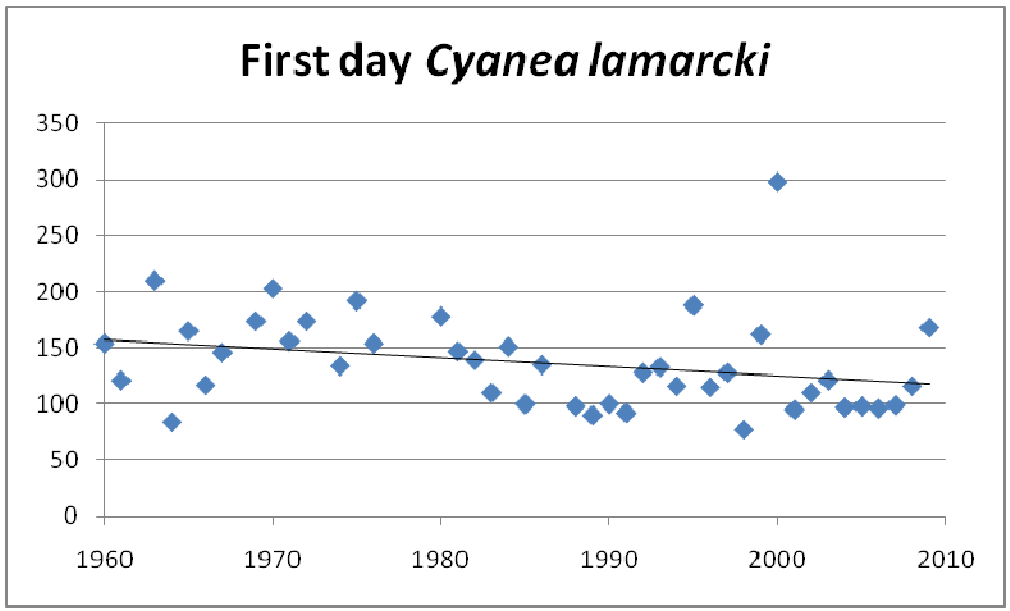


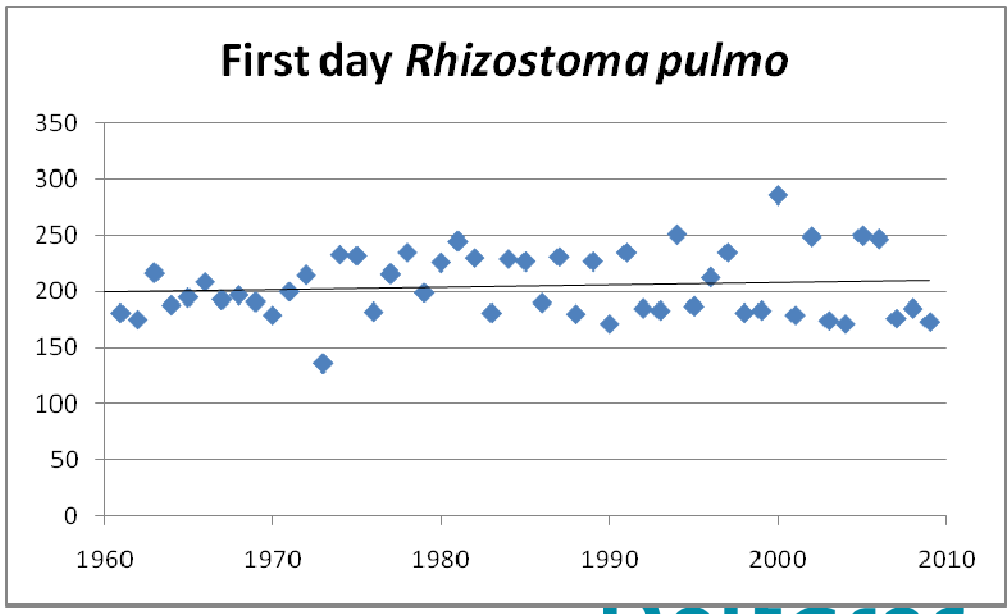


First day caught









Year

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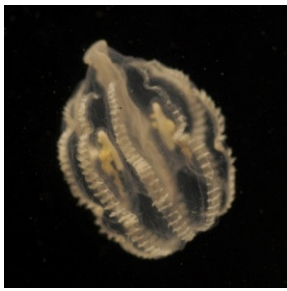
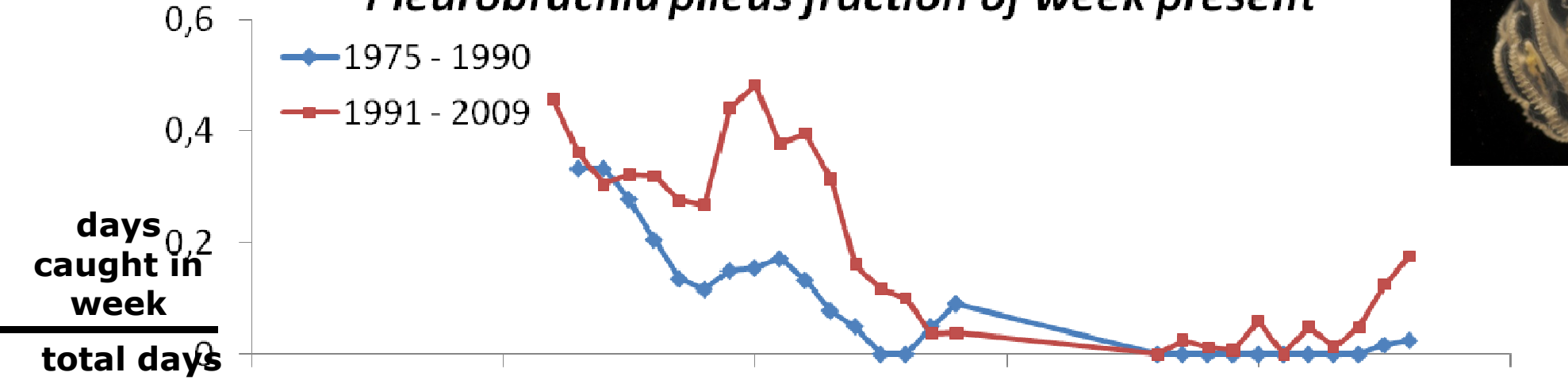
Trends 1





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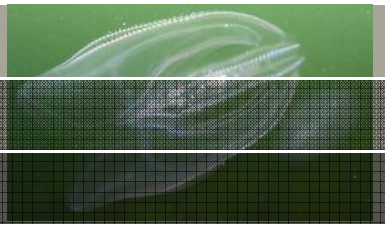
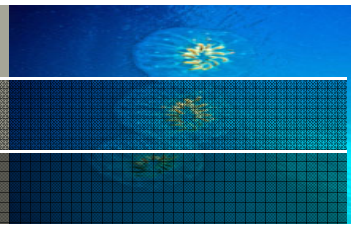
Trends 2





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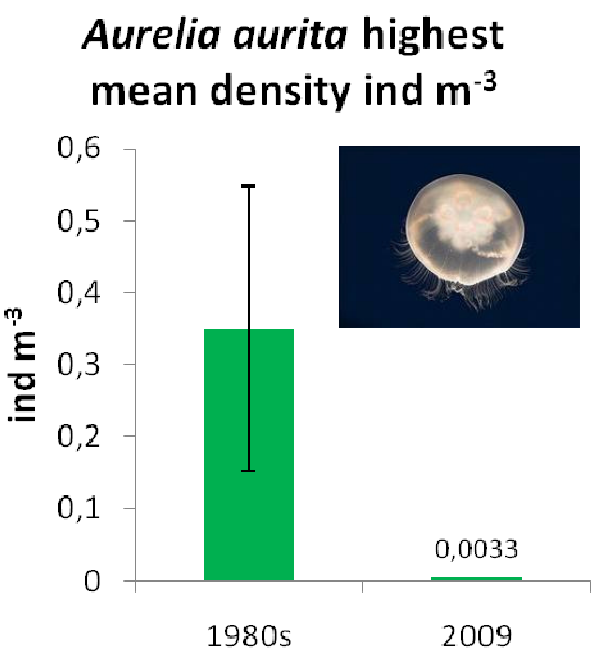
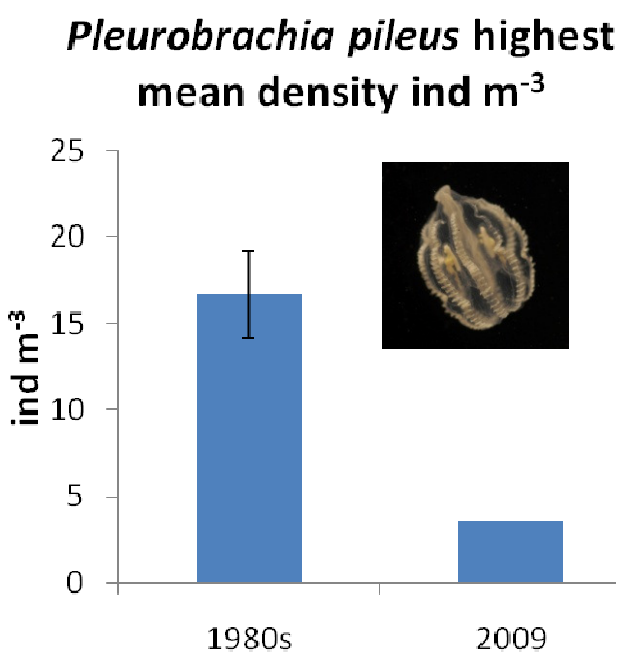
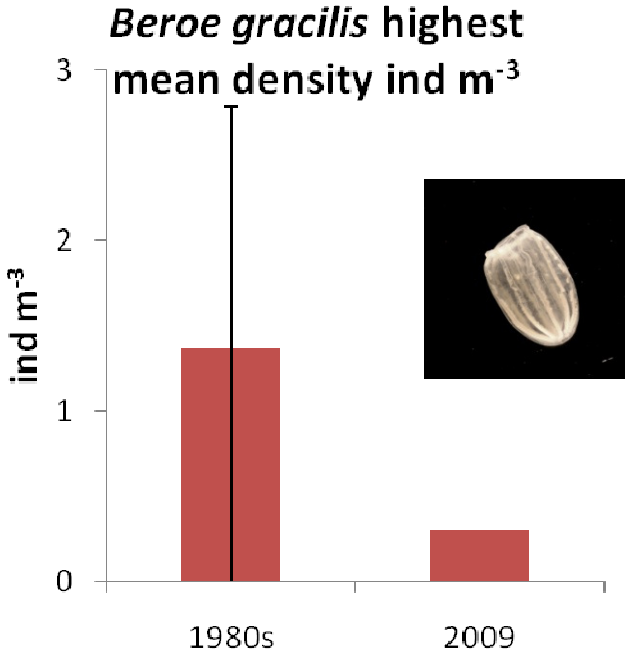
Comparison of 2009 with early 1980s







1981/1982: van der Veer and Sadée (1984)

1983: Kuipers et al. 1990

M. leidyi highest mean density in 2009: 509 ind m^{-3}

Aurelia aurita was almost absent in 2009

Mnemiopsis leidyi in 2009 at Balgzand

Mnemiopsis leidyi density (n m^{-3}) in 2009

2010 quite different again

Long, cold winter

Mnemiopsis leidyi almost absent until present

Pleurobrachia pileus and *Aurelia aurita* very abundant again

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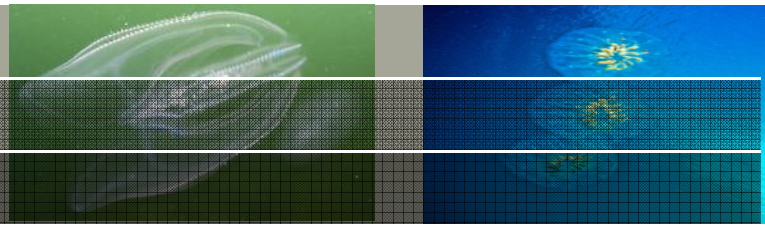
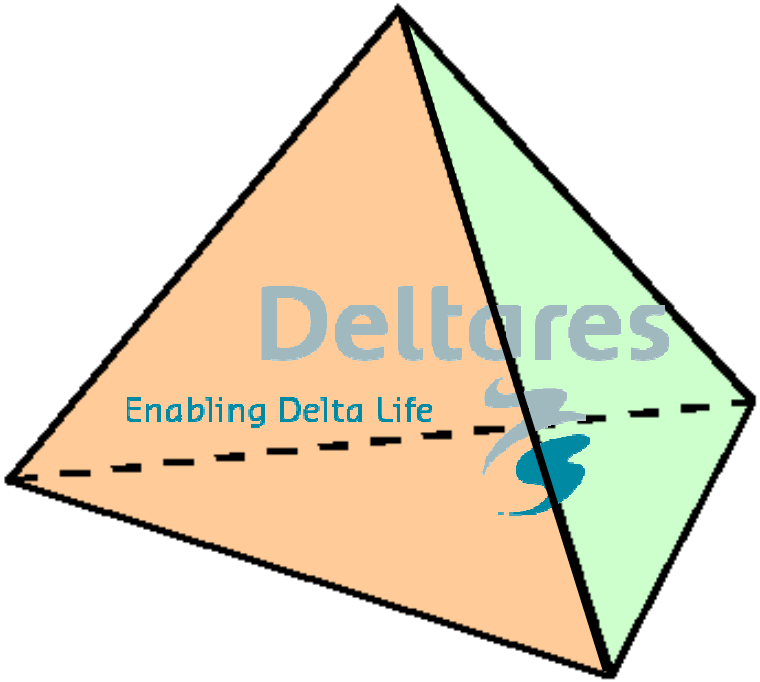
Conclusions



- pring/early summer blooming species occur earlier in the year in recent decades
- Native species were much less abundant or absent in 2009
- Introduction of Mnemiopsis leidyi
- Mnemiopsis leidyi can be present year-round (likely depending on winter harshness)
- The system has become less stable overall
- Possibility of match between fish- and bivalve larvae peaks in density and gelatinous predator blooms has increased

Positioning Deltares

Nongovernmental organisations



government authorities

knowledge instituti

business sector

Deltares

Causes and Urgency to predict

Our Target

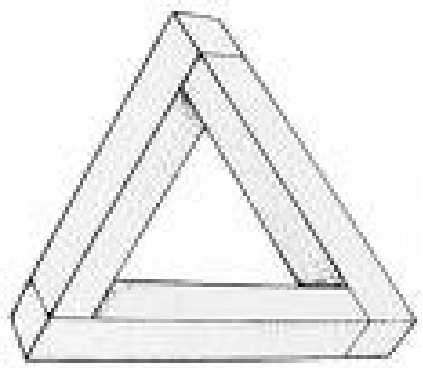
mono -→ multidisciplinary

spreading → integrating sectors

isolation → integrating disciplines

fundamental → applicable system

ecosystem approach at all levels



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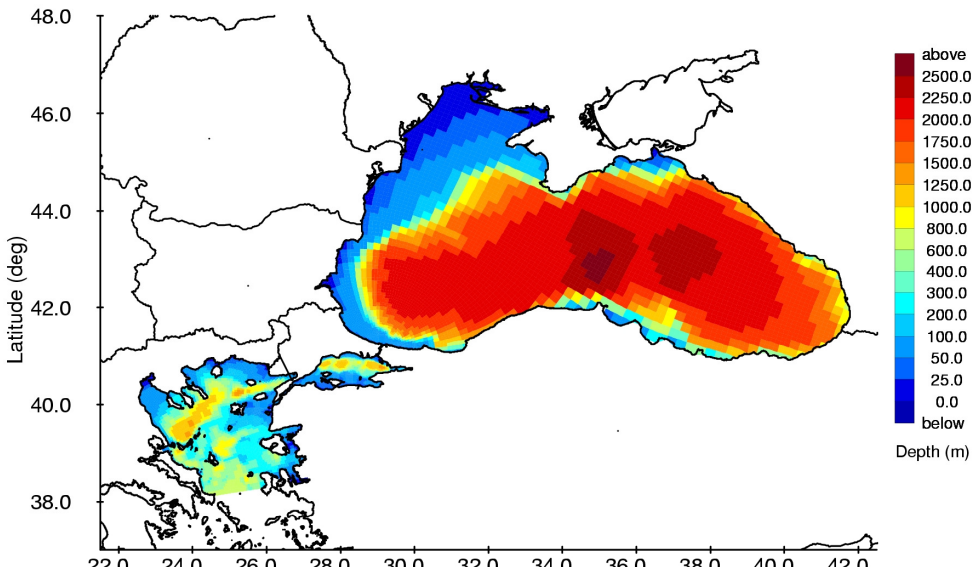
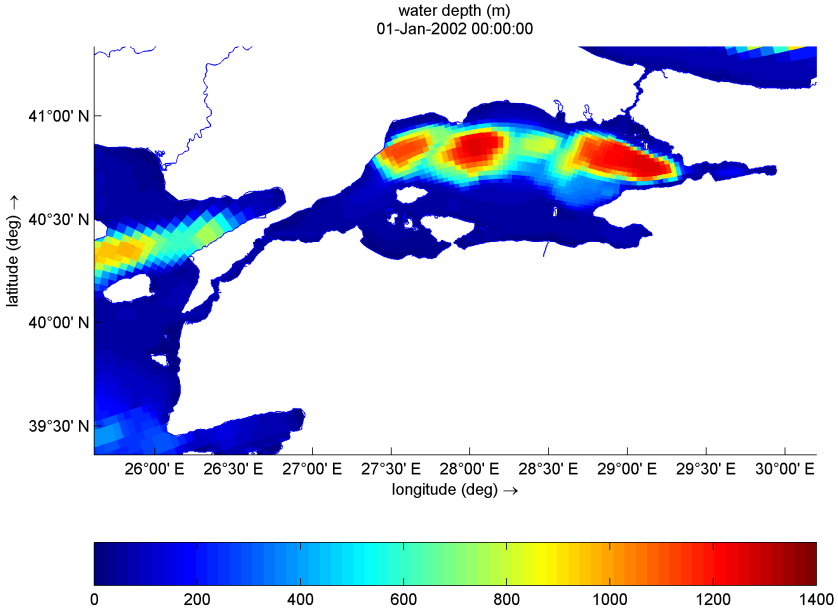
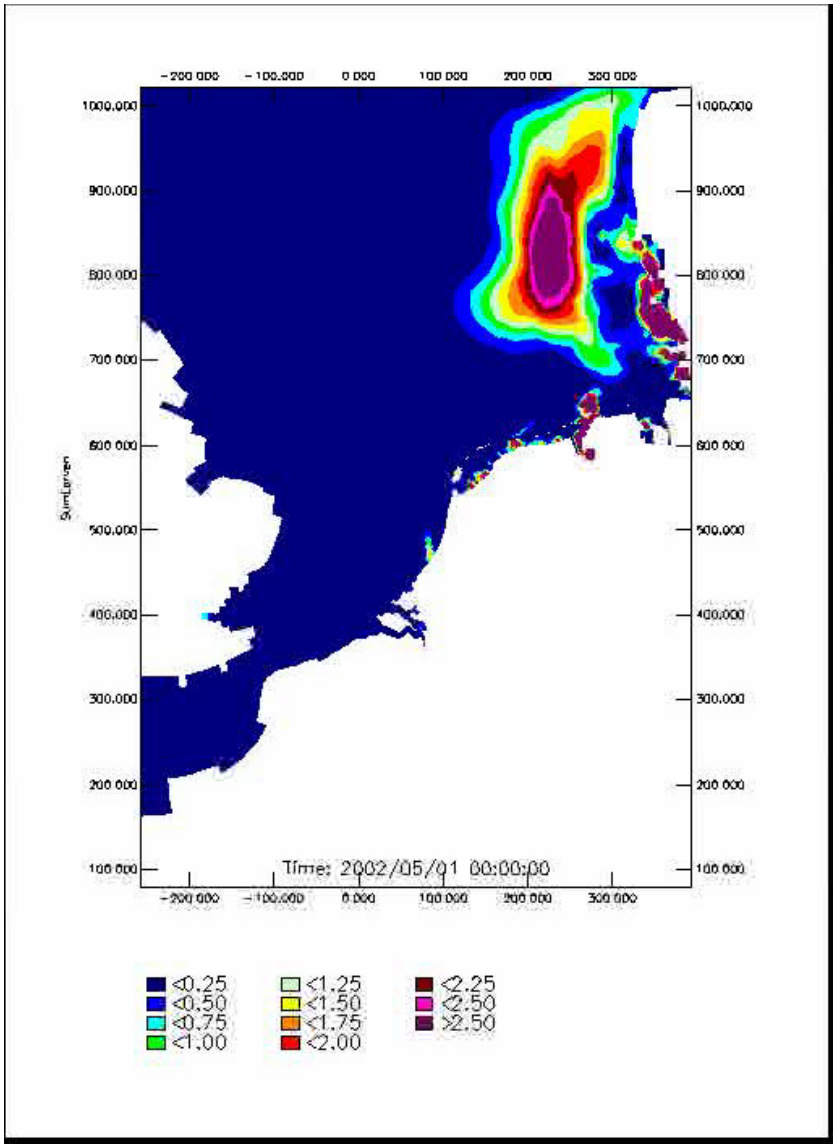
cooperation and to learn







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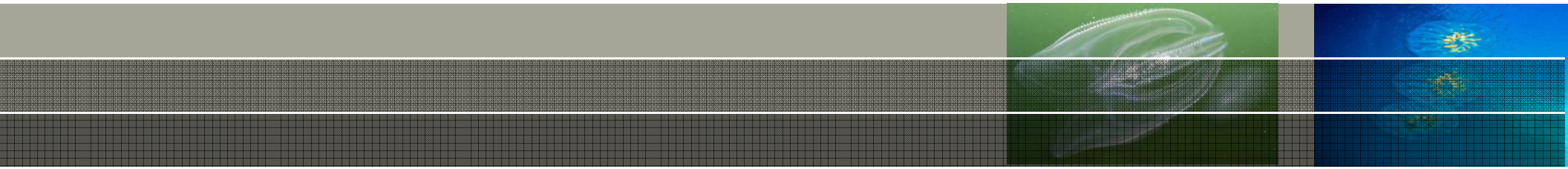
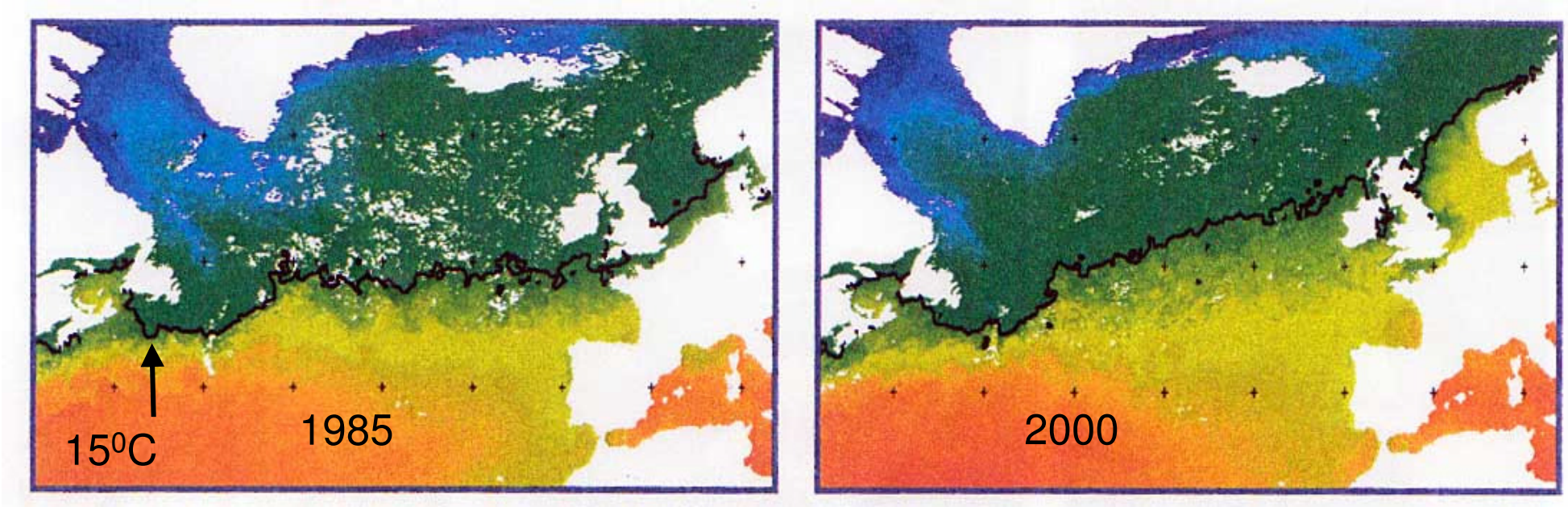


I thank you for your attention

Deltares

Opwarming aardse zeeën



Opwarming zeeën

Milde winters

Snellere reproductie

Langer groeiseizoen

Grotere verspreiding

Deltares