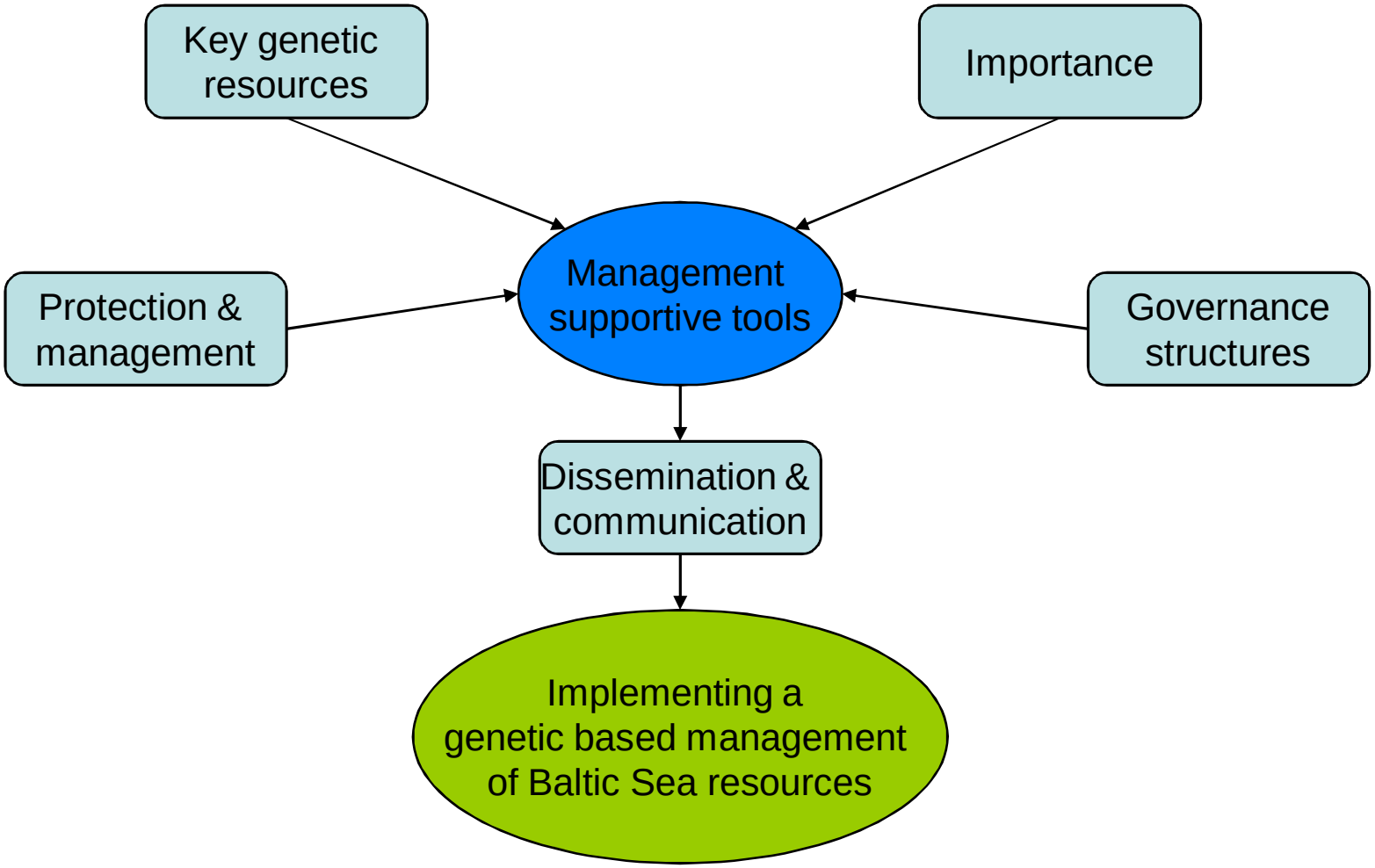
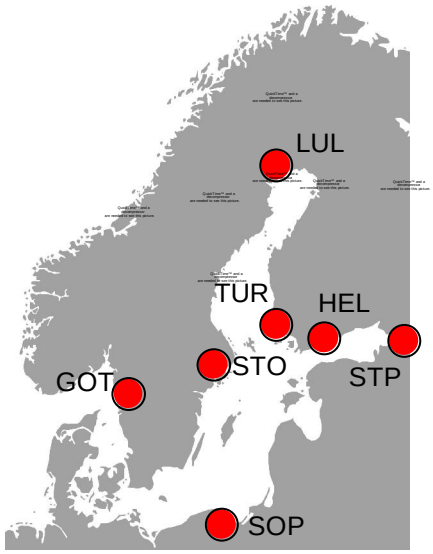
Baltic Sea Genetic Biodiversity
BaltGene

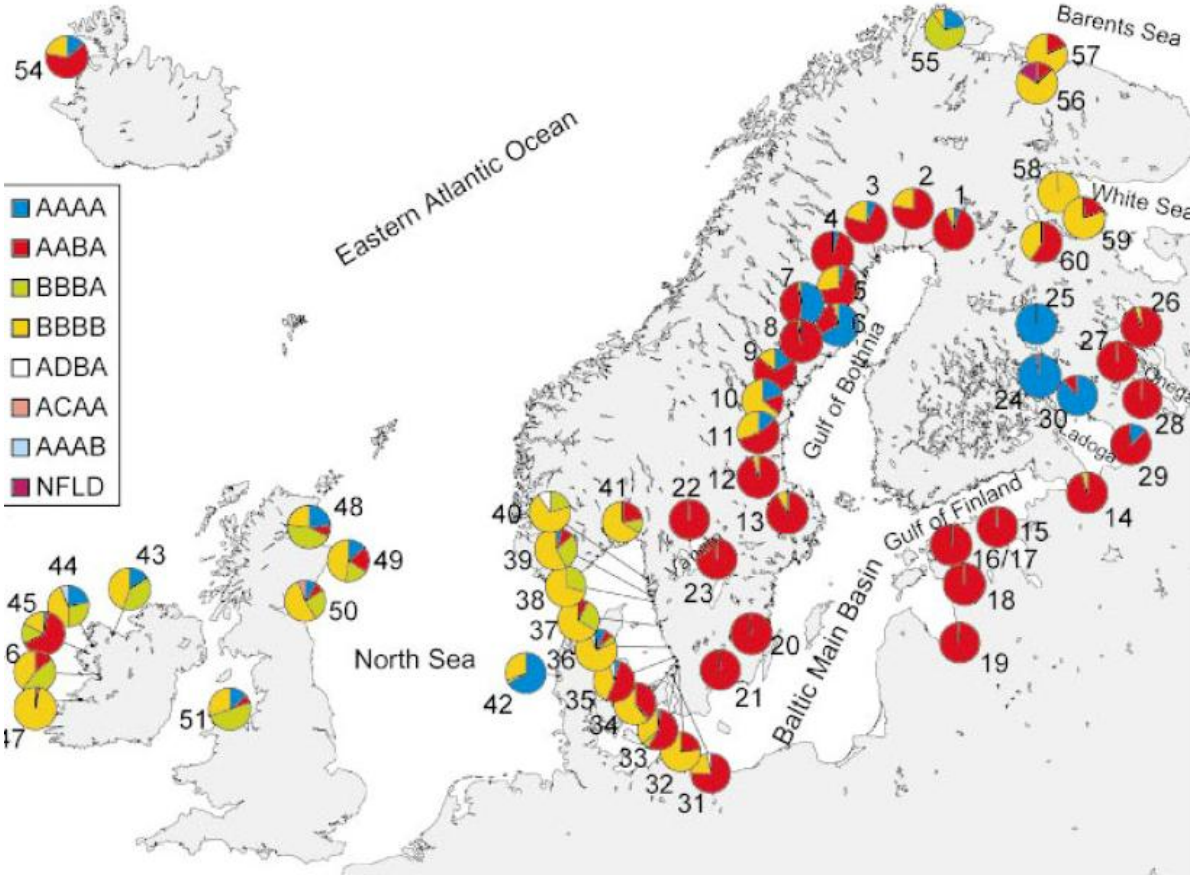


Partners (PIs)



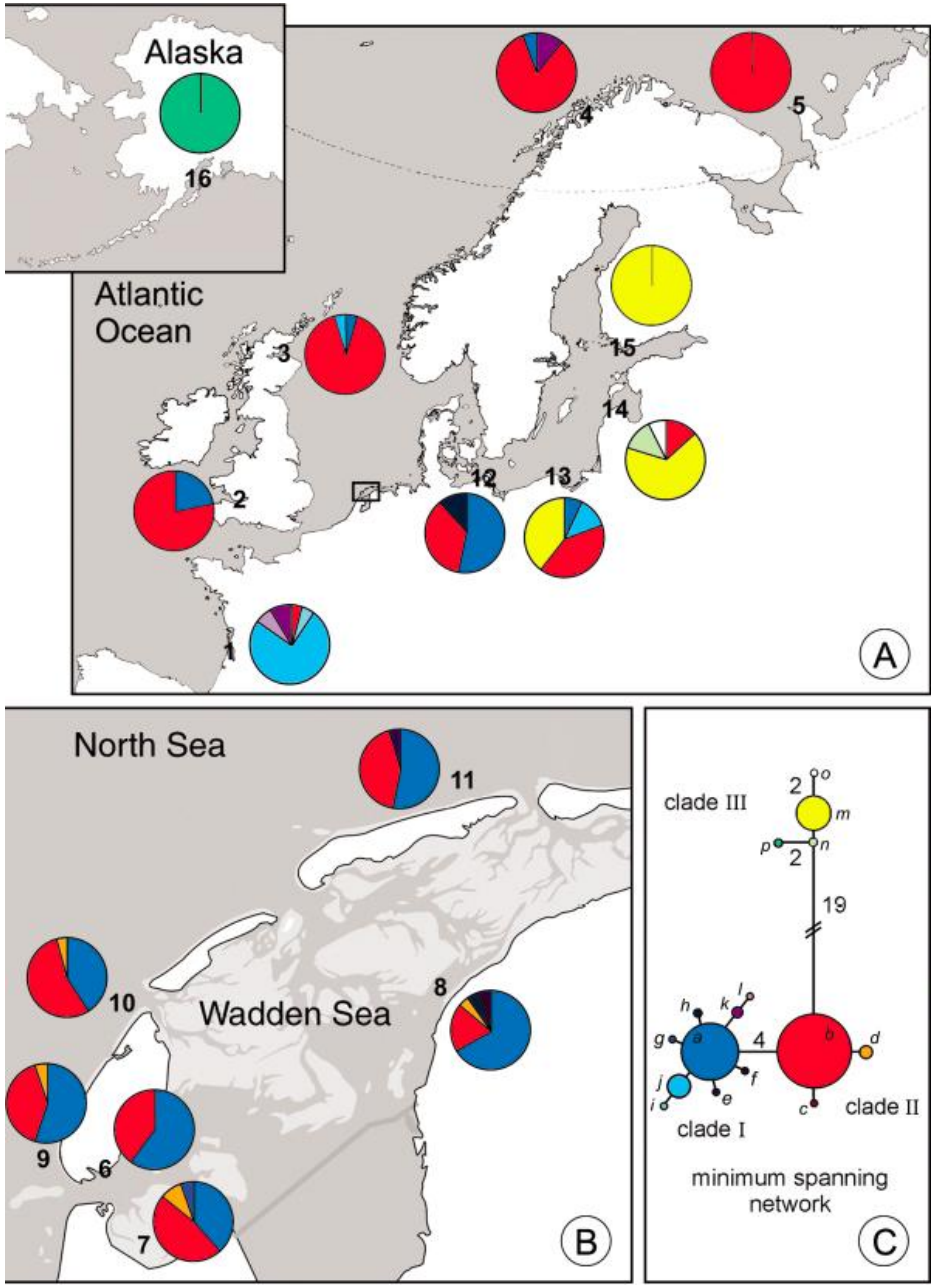
- Helsinki: Juha Merilä
- Turku: Craig Primmer
- St Petersburg: Natalia Mikhailova
- Gdansk: Roman Wenne
- Luleå: Carl Rova
- Stockholm: Linda Laikre, Nils Ryman, Lena Kautsky
- Göteborg: Carl André, Per Jonsson, Kerstin Johannesson
- End-user panel: Teijo Aho (chair)

Genetic biodiversity of Baltic Sea populations



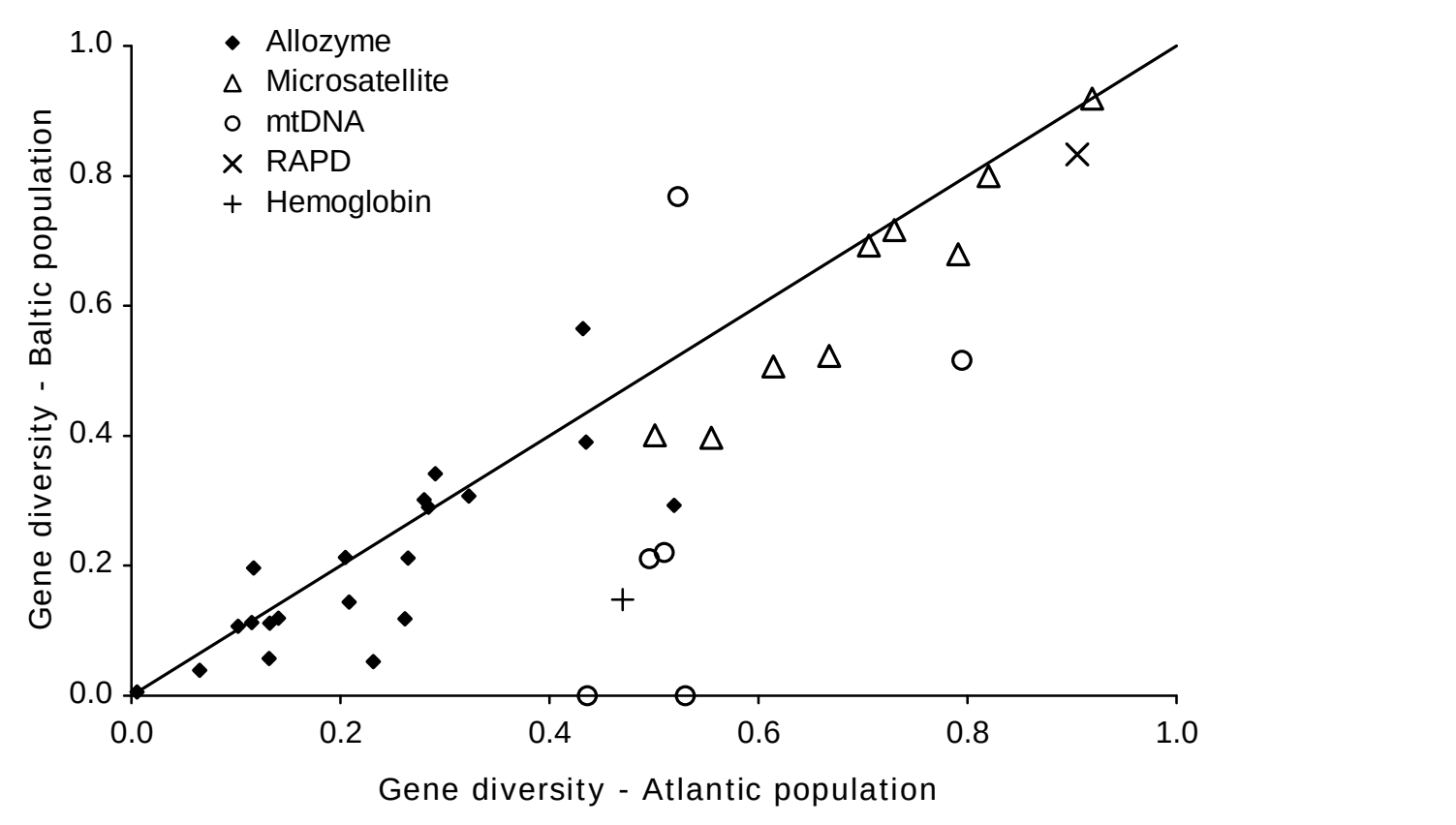
PHYLOGEOGRAPHY OF BALTIC SALMON, NILSSON et al. 2001

Macoma balthica



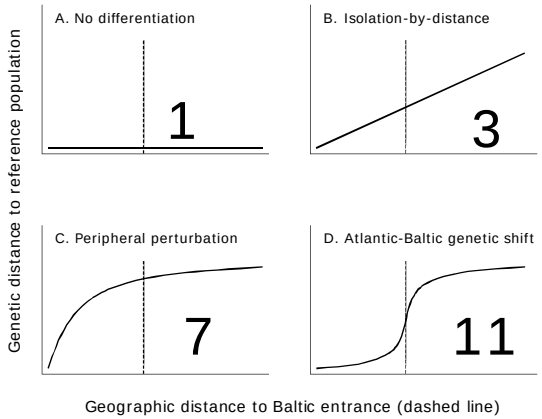
From Luttikhuizen et al 2003

General loss of genetic variation in Baltic populations



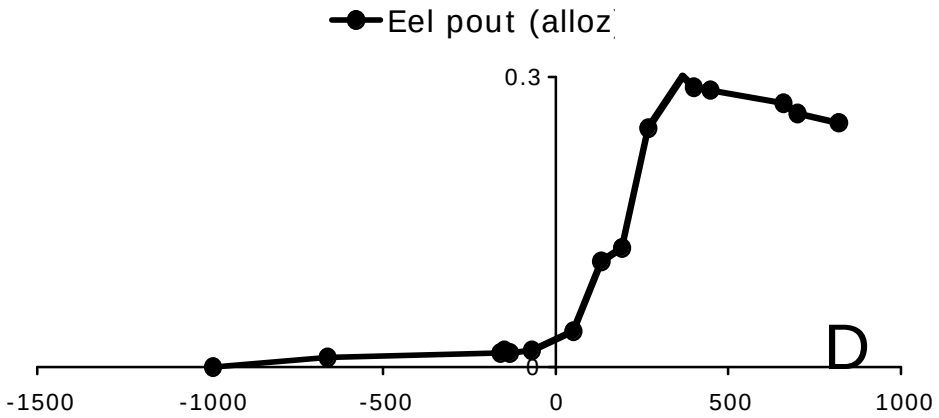
From Johannesson & André 2006

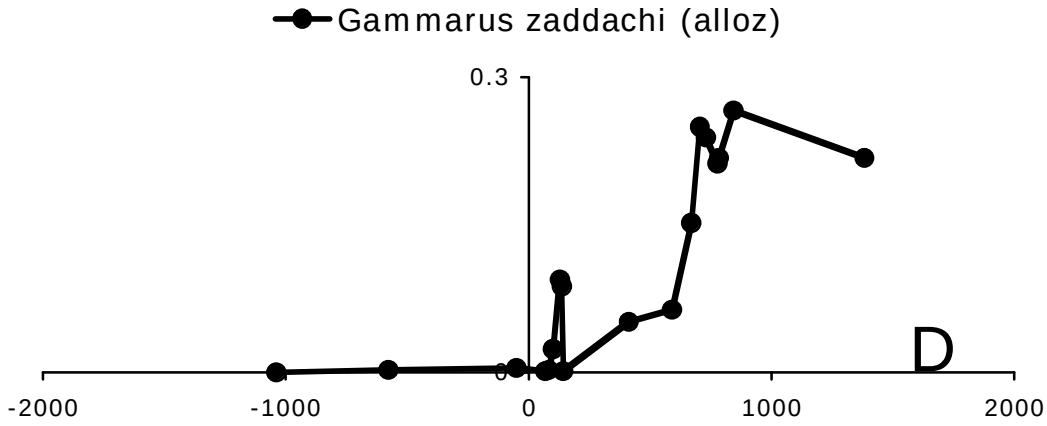
Genetic trajectories



k = 18

Atlantic-Baltic genetic shifts

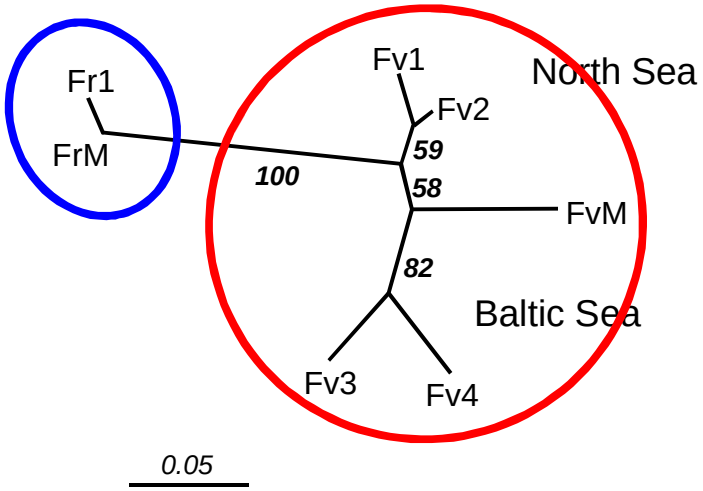


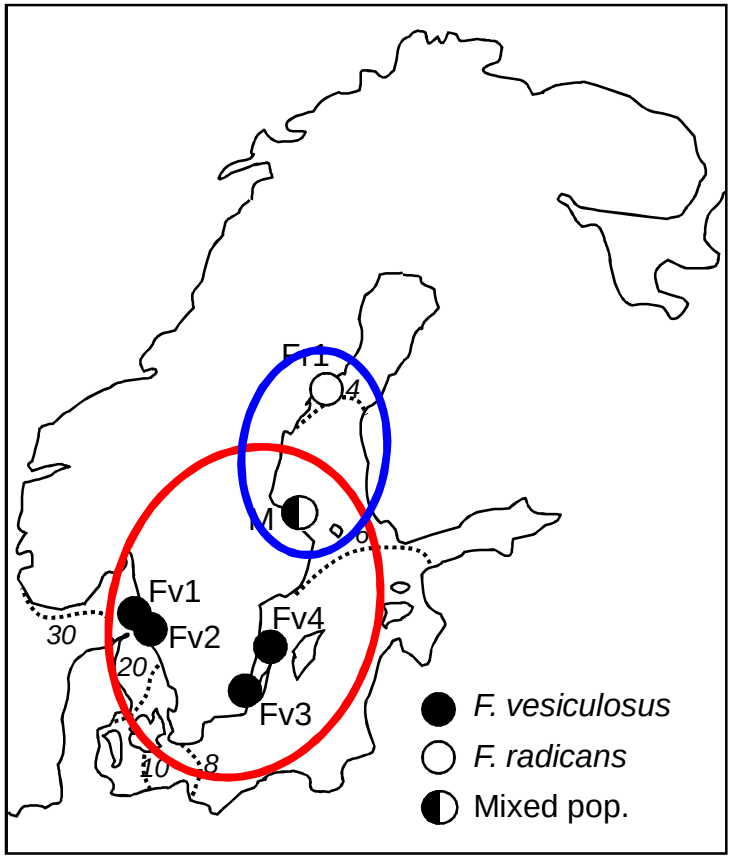


From Johannesson & André 2006

A new and intriguing Baltic Sea species

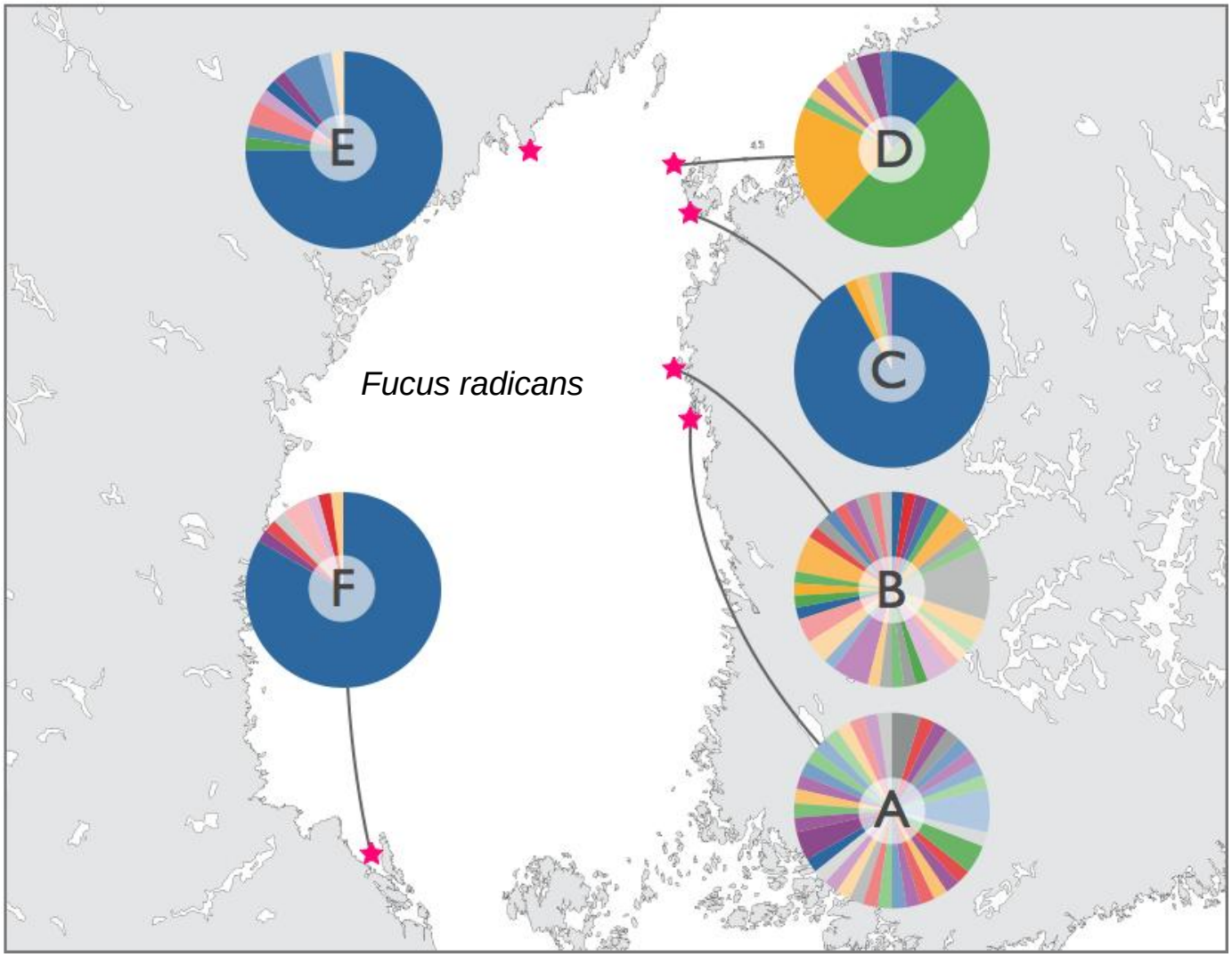
Fucus radicans *Fucus vesiculosus*





From Tatarenkov et al. 2005

Dramatic shifts between sexual and asexual populations



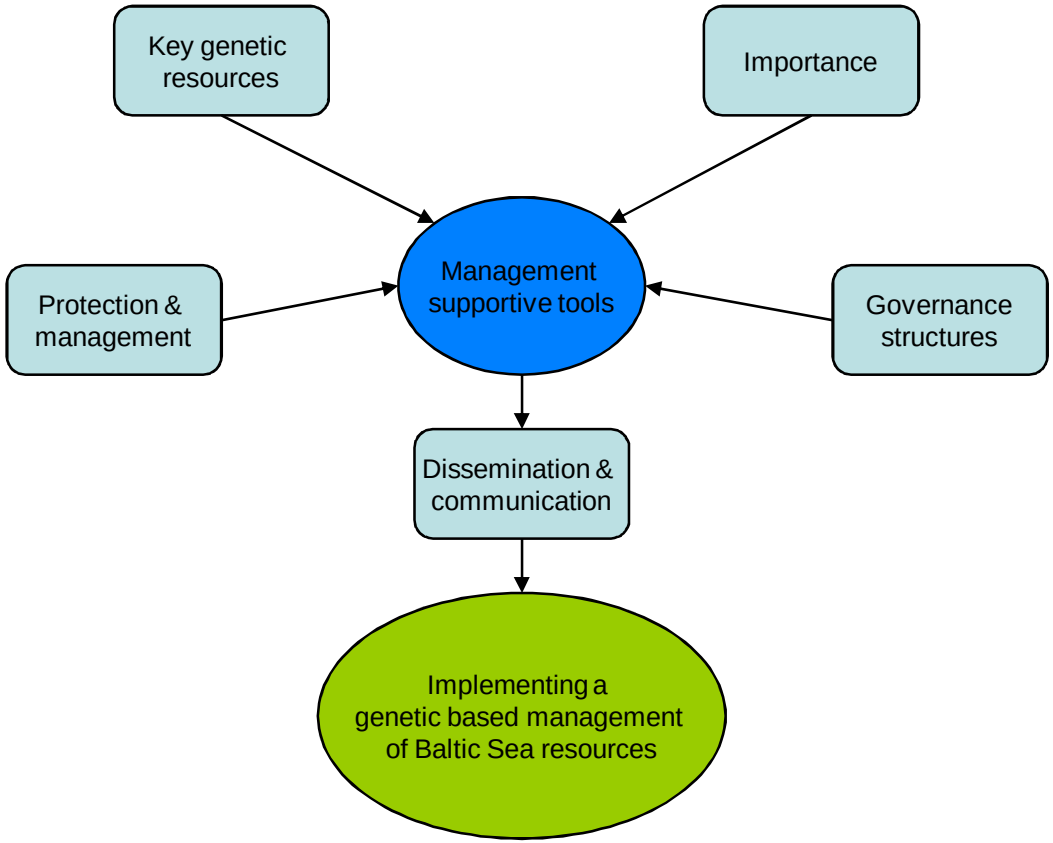
From Pereyra et al. In prep.

Balt Gene Goals

- Provide genetic information needed for sustainable management of Baltic Sea biodiversity

- Find ways to make genetic information useful in governance structures

Issues



- Identify key genetic resources
- Assess importance of the genetic biodiversity to ecosystem function
- Suggest protection and management measures
- Find out how governance structures must be changed to incorporate genetic biodiversity
- Communicate results to scientists and end-users

Addressing several BONUS themes

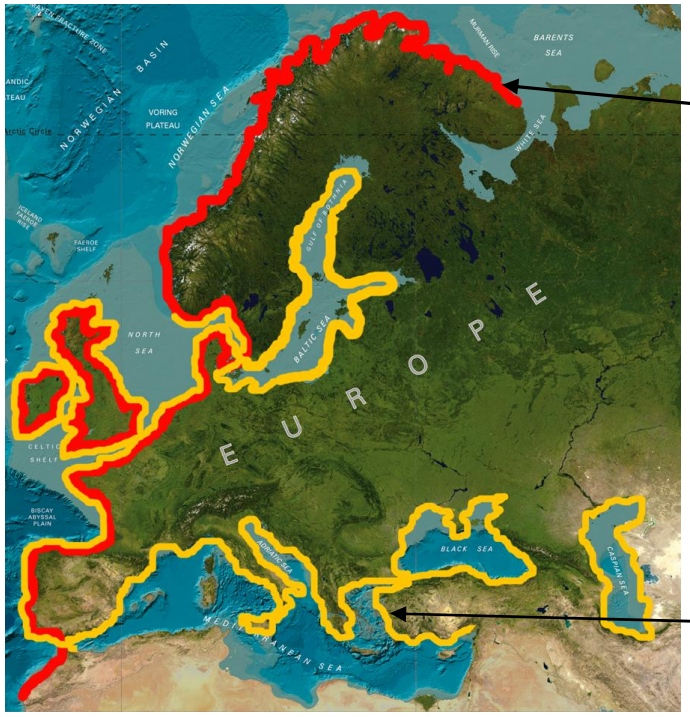
- 1. New genetic data for strategic samples (e.g. time-series) and key organisms (e.g. cod, herring, sculpin, *Monoporeia* - a benthic amphipod, bladderwrack) needed in mapping, modelling and in understanding mechanism underlying biodiversity changes. (Themes 4 & 5).
- 2. Maps of genetic landscapes for key species and identification of management units based on genetic data. (Theme 5).
- 3. Examples of processes of rapid evolution, local adaptation and speciation inside the Baltic Sea, as well as assessments of local adaptation by gene expression profiling. (Theme 4 & 5).
- 4. A general assessment of the degree of genetic isolation of Baltic Sea populations. (Theme 5).
- 5. Assessments of the importance of genetic diversity to ecosystem functions and to population resilience towards environmental changes (pH, salinity, temperature). (Themes 2, 4 & 5).
- 6. Suggestions for genetic biodiversity monitoring programs. (Themes 1, 4 & 5).
- 7. Evaluating effects on genetic biodiversity of marine protected areas, and fisheries management strategies. (Themes 1, 4 & 5).
- 8. Identification of governance system obstacles for incorporating genetic biodiversity into management strategies, and suggested measures to eliminate these obstacles. (Themes 1 & 7)
- 9. A web-based management advisory tool and end-user workshops for dissemination of research results and dialogue over implementation of the results. (Theme 1).

Workpackages and tasks

WP	Task		GOT	LUL	STP	HEL	TUR	SOP	STO
1. Key genetic resources	1:1	Genetic landscapes	X		X				X
	1:2	Identifying management units	X					X	X
	1:3	Evolution of Baltic genes	X			X		X	
2. Importance of genetic biodiversity	2:1	Genes and ecosystem function	X						X
	2:2	Local genetic adaptation	X		X	X	X		
	2:3	Evolution of expressions	X				X	X	X
3. Protection & management	3:1	Monitoring genetic diversity	X				X	X	X
	3:2	Effects of MPAs	X						X
	3:3								
	3:4	Modelling fisheries management	X			X		X	X
4. Governance structures	4:1	Capacity of governance systems		X					X
	4:2	Fitting governance systems		X					X
5. Communication	5:1	Advisory tool	X	X	X	X	X	X	X
	5:2	Enduser workshops	X	X	X	X	X	X	X
	5:3	Dissemination of science	X	X	X	X	X	X	X

Examples

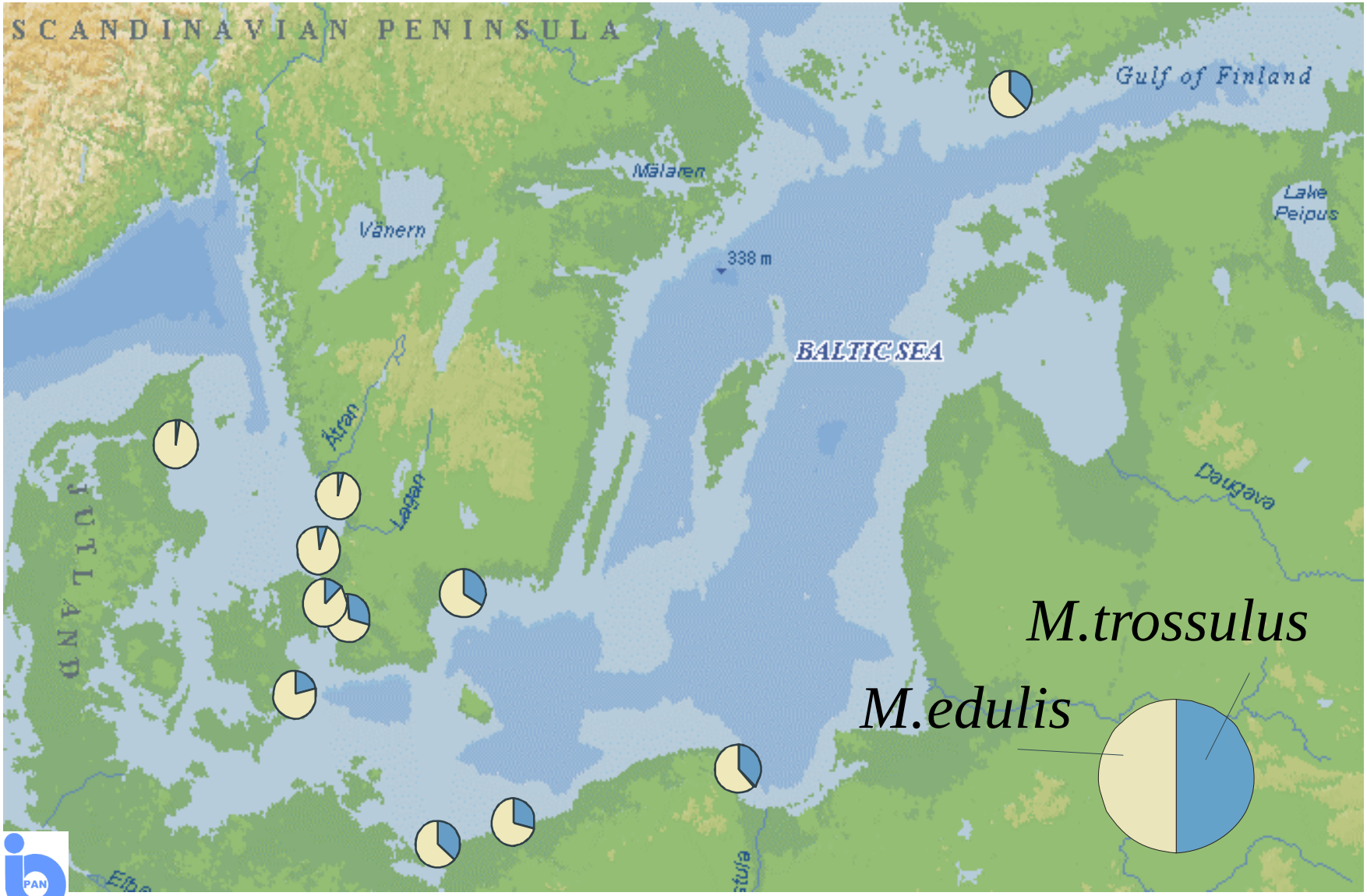
WP 1: Generating new genetic data for key species



Common cockle *Cerastoderma edule*

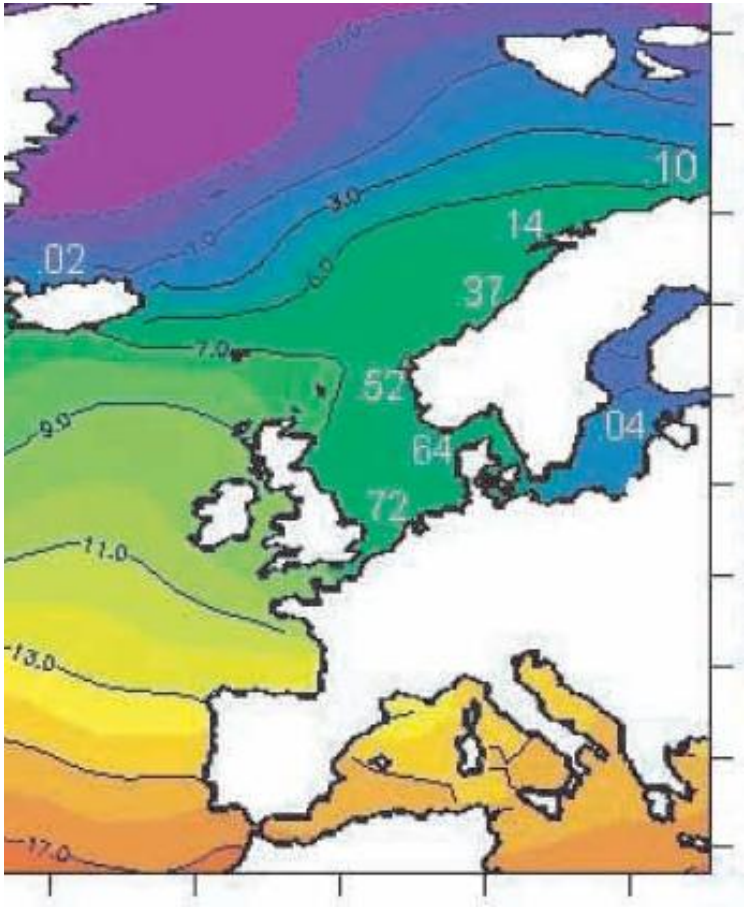
Lagoon cockle *Cerastoderma glaucum*

WP1: Identifying management units; species-specific alleles in Baltic Sea *Mytilus*



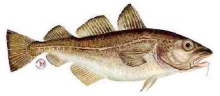
WP1: Evolution of Baltic genes - cod hemoglobin

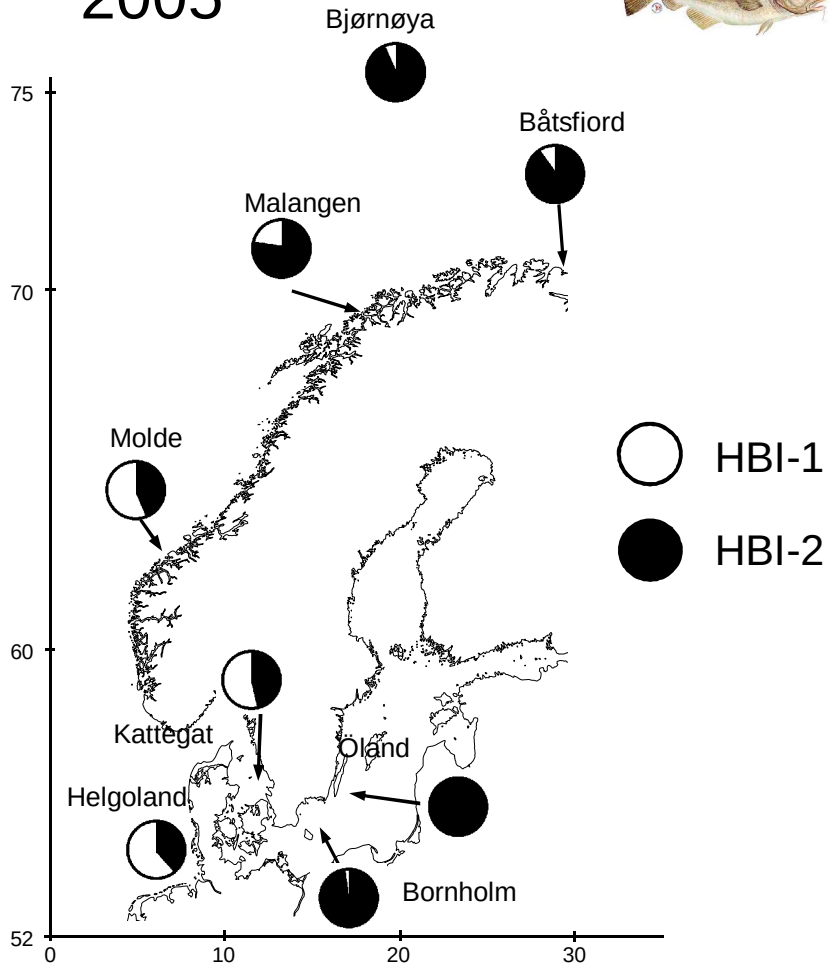
1963



Sea water surface temperature and freq of Hemoglobin I-1 allele in Atlantic cod
(Sick, 1965a,b; Frydenberg et al. 1965).

2005



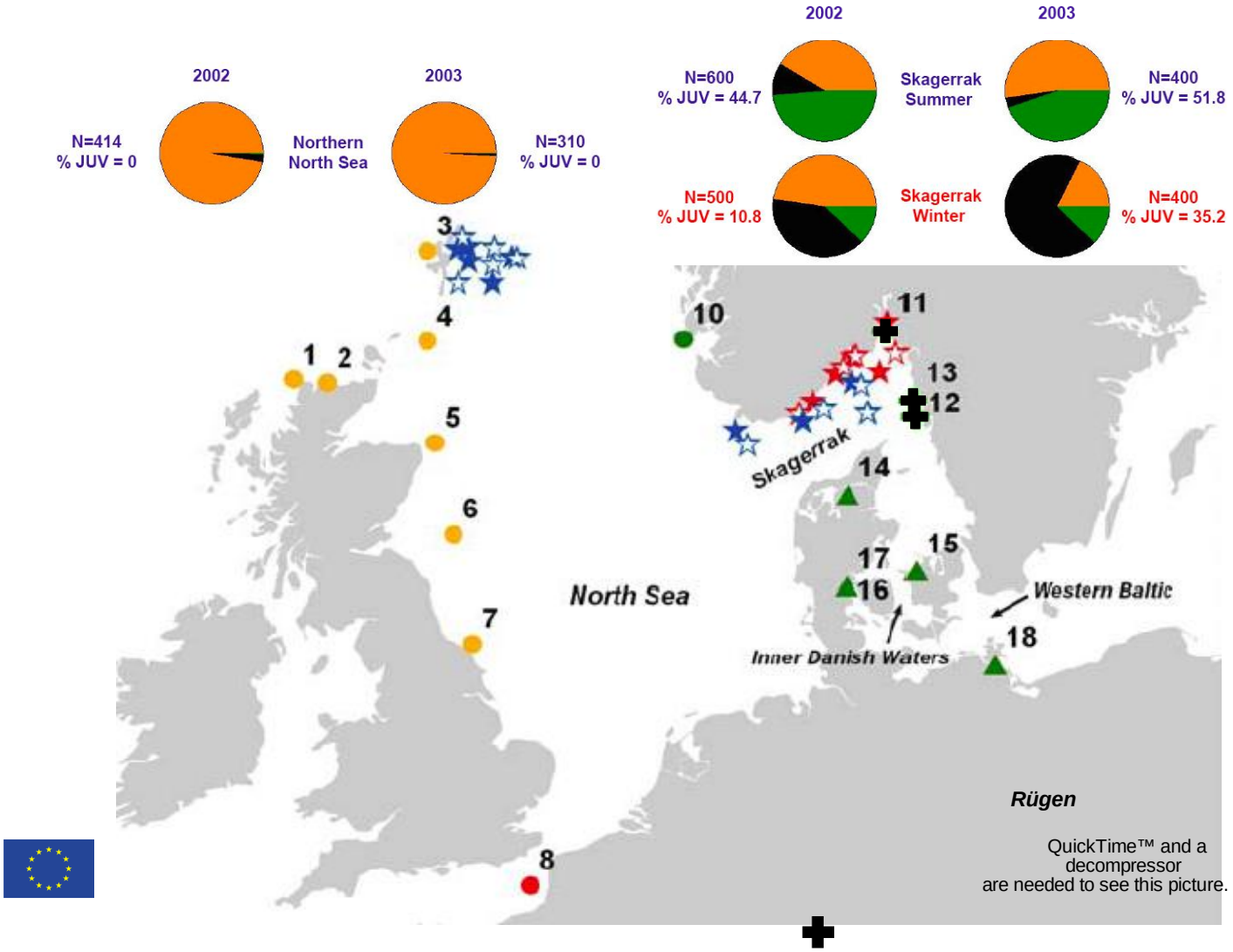


SNP allele frequencies

Andersen…Andre et al PRSB 2008

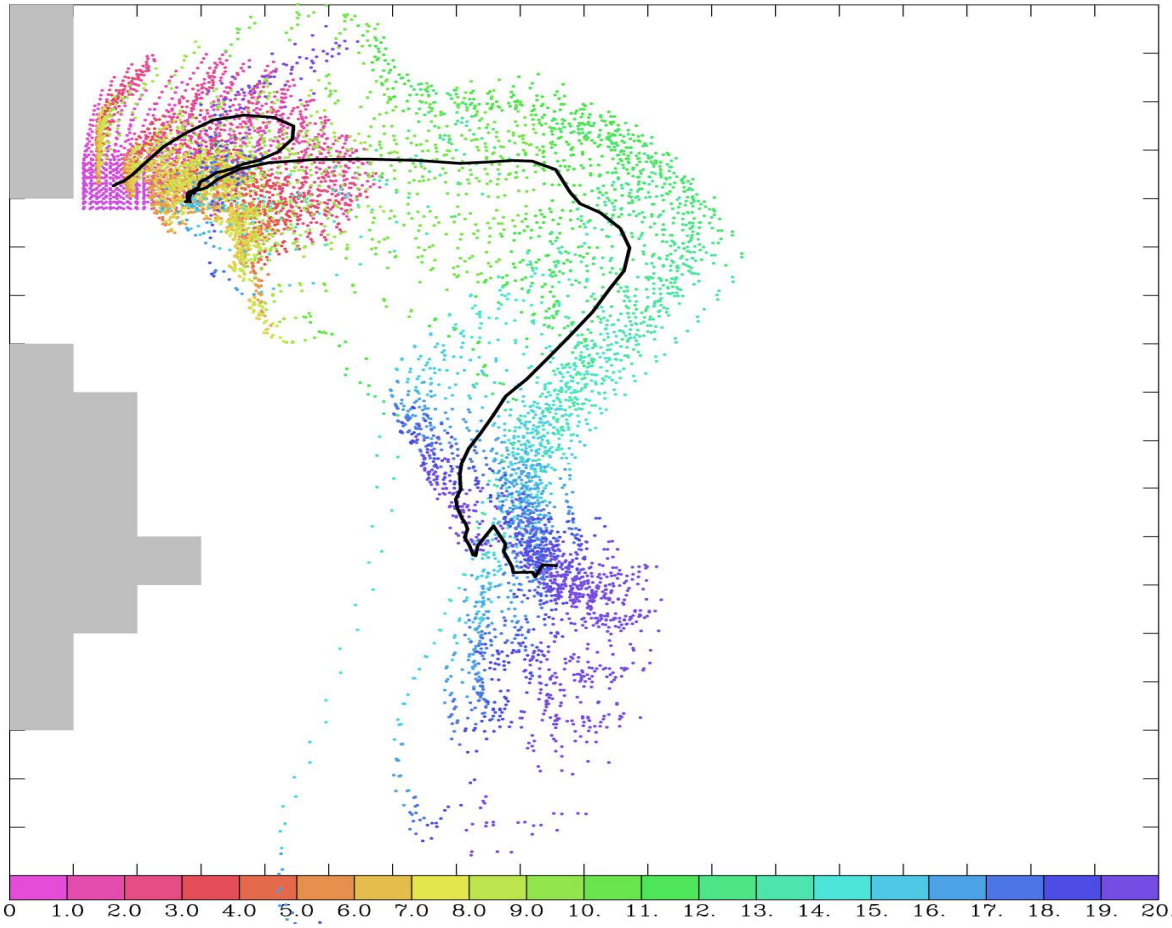

WP 2: Importance of genetic diversity to ecosystem function
Local adaptation
Patterns of gene expression
Photo: Lena Kautsky

WP 3: Modelling fisheries management - Herring
”Mixed stock” analysis based on DNA and otoliths



from Ruzzante et al 2006 PRSB

WP 3: Patterns of dispersal and effects of Marine Protected Areas



Days after release of “larvae”

WP 4: Analysing governance structures

Who collaborate?

Who are the actors?

Dense or fragmented?

What kind of resources are mobilized?

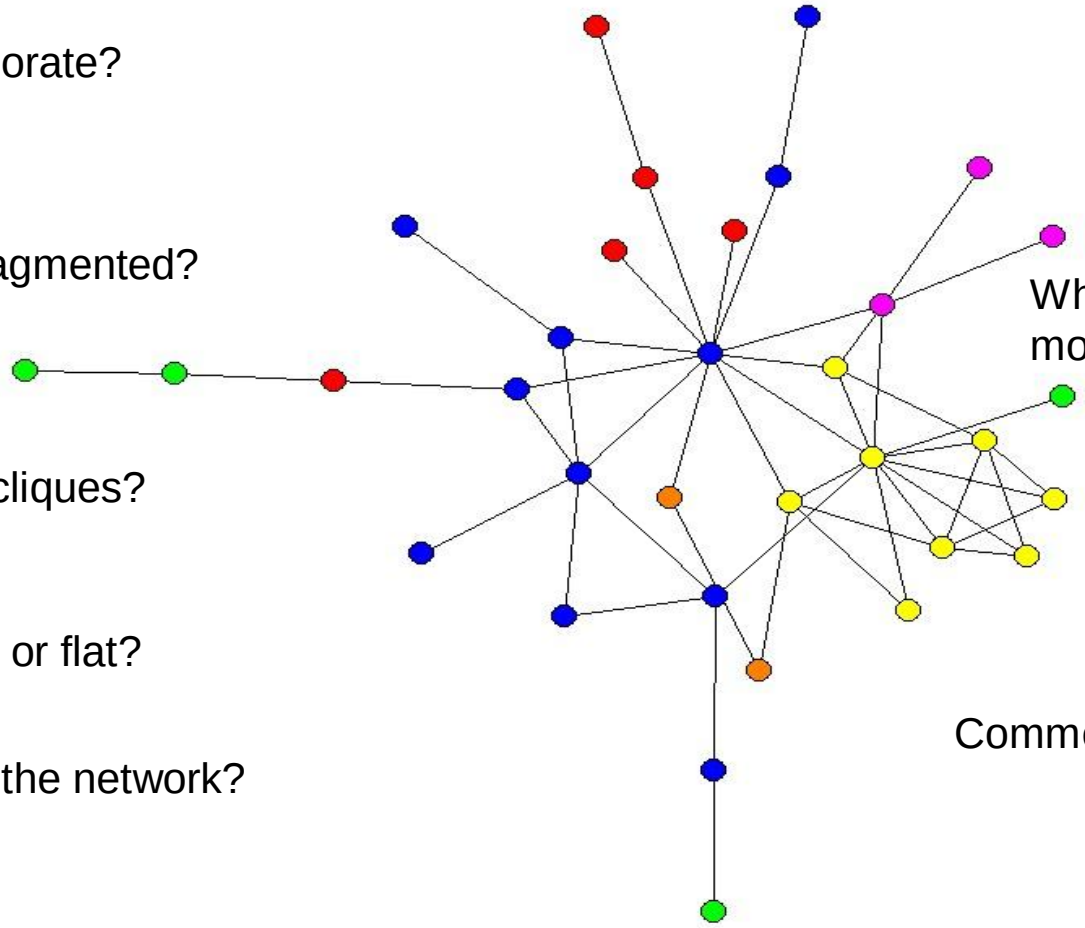
Subgroups/cliques?

Ecological knowledge?

Hierarchical or flat?

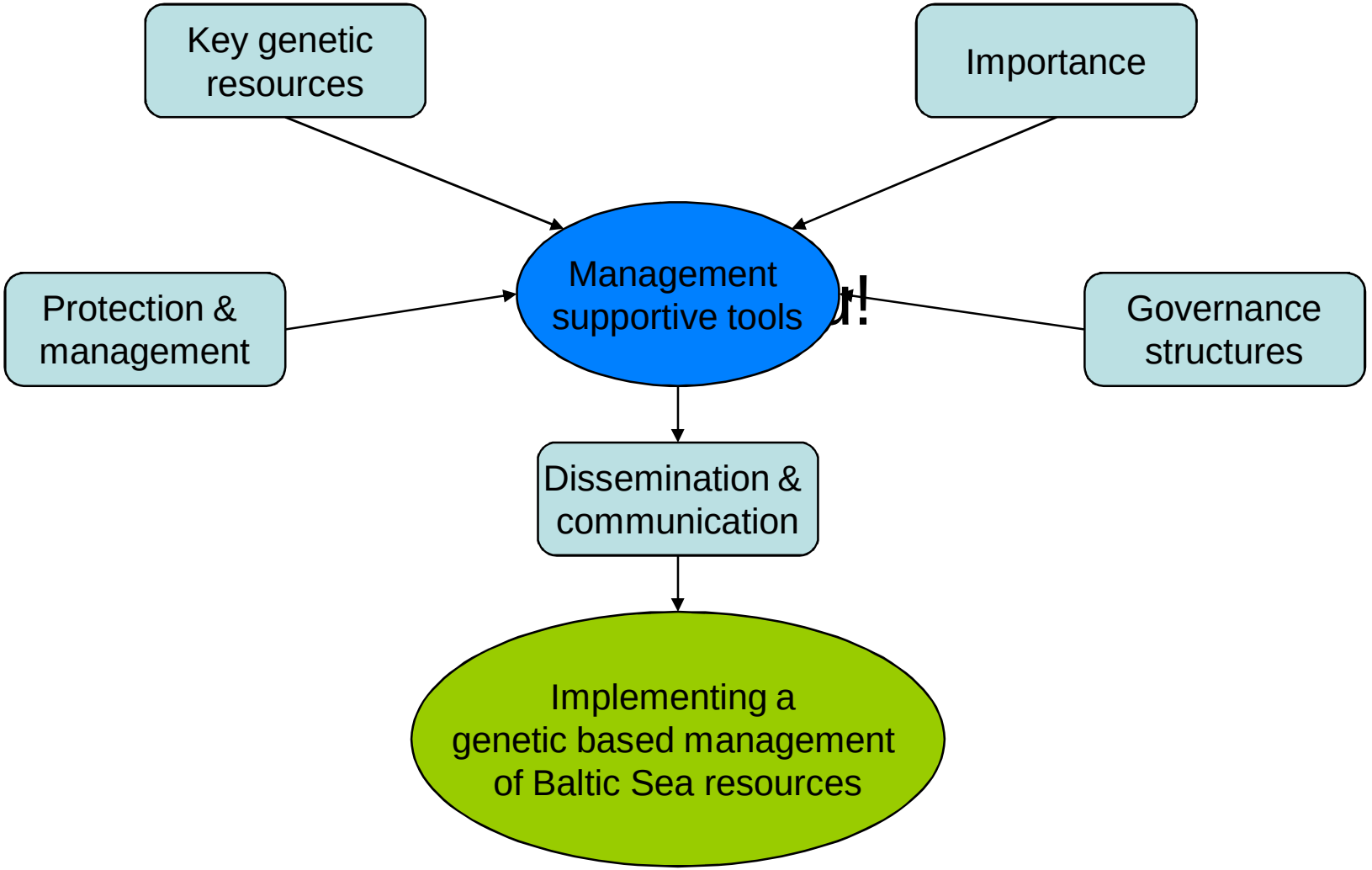
Commercial activity?

The core of the network?



(Sandström 2004)

BaltGene


Key genetic resources
Importance
Management supportive tools
Protection & management
Governance structures
Dissemination & communication
Implementing a genetic based management of Baltic Sea resources