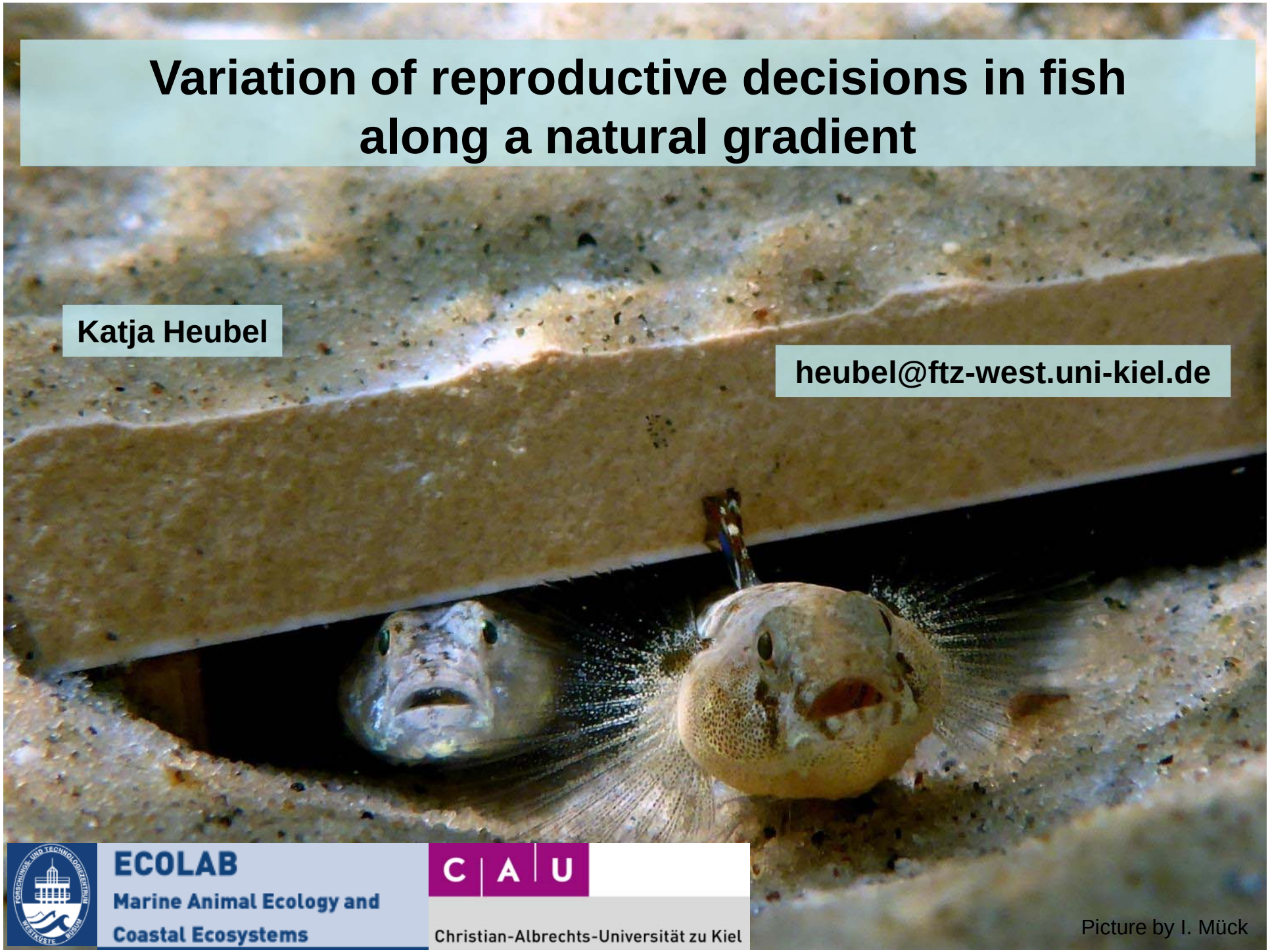
Variation of reproductive decisions in fish along a natural gradient



Katja Heubel

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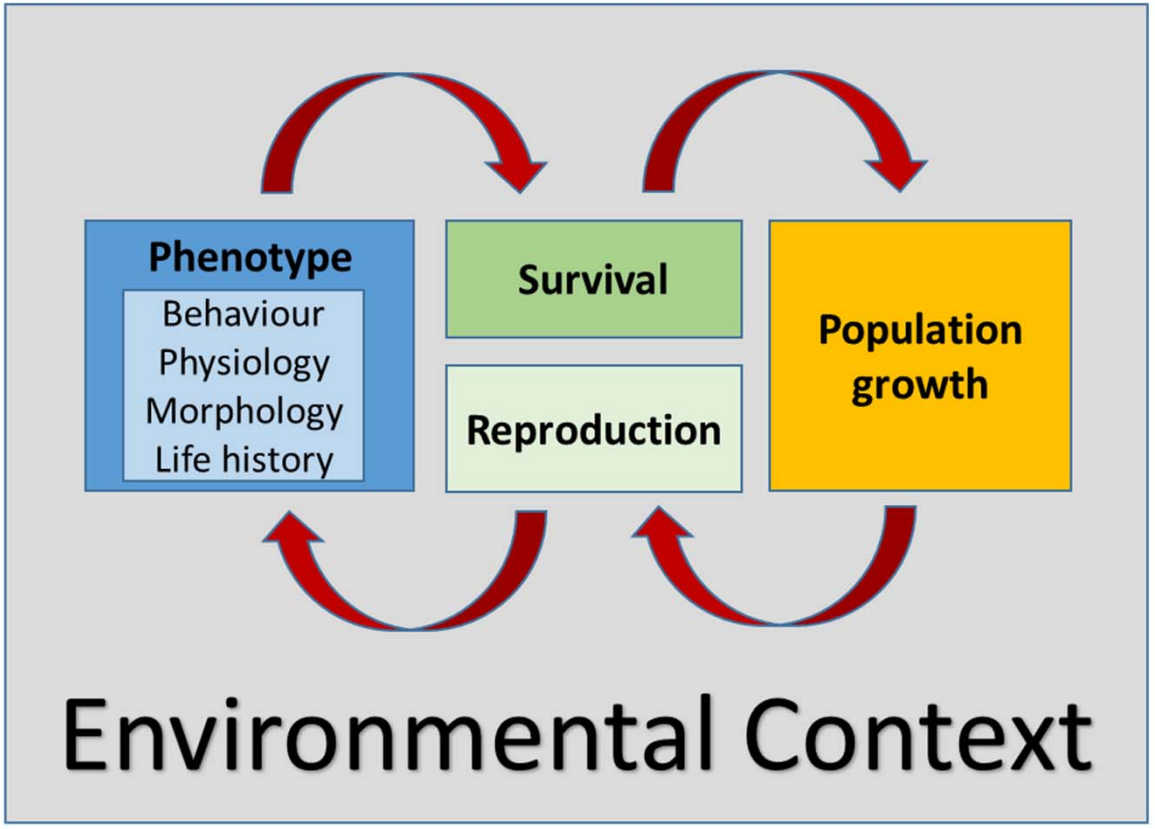
ECOLAB
Marine Animal Ecology and Coastal Ecosystems

C A U
Christian-Albrechts-Universität zu Kiel

Picture by I. Mück

INTRODUCTION

Isabel Mück Martin Vallon

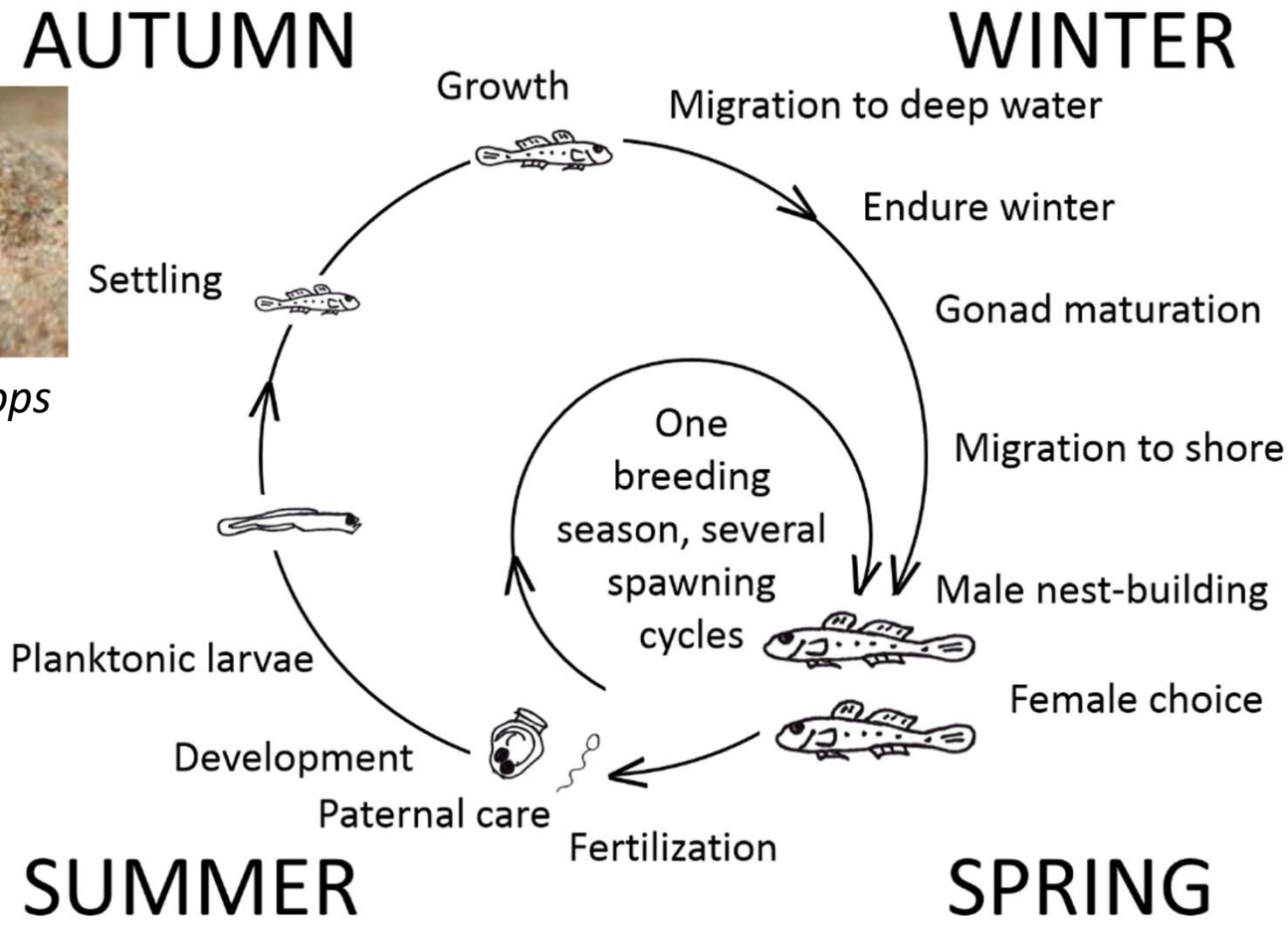


modified after Pelletier & Garant 2012

INTRODUCTION

Life-cycle of common gobies

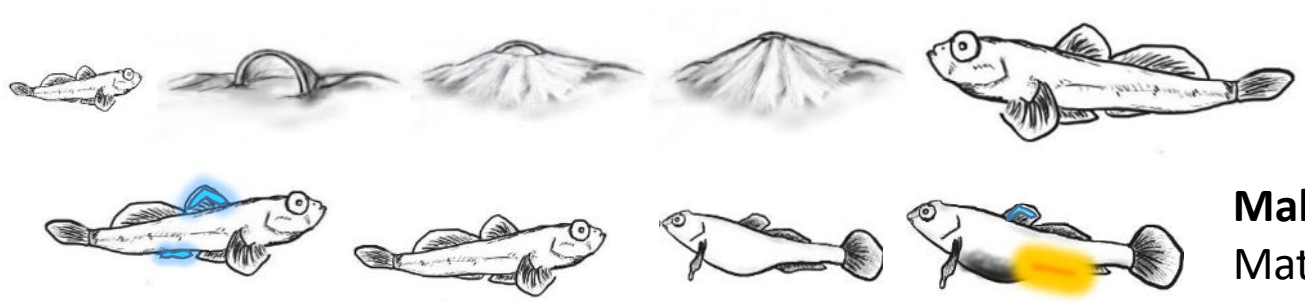
Pomatoschistus microps



Drawing courtesy of O. Svensson

INTRODUCTION

Diversity of Reproductive Decisions

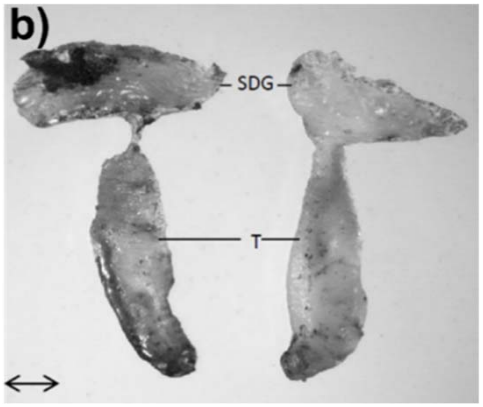


Males:
Nest building
Parental care, ART

Males & Females:
Mating behaviour
Ornaments

Males: Filial cannibalism

Females: Egg distribution



Male gonads:
Trade-off between investment in testis (**T**) and sperm duct glands (**SDG**)

Common gobies
(*Pomatoschistus microps*)

Context-dependent reproductive lifestyles?

Drawing By L. Ylitepsa

INTRODUCTION

Common goby (*Pomatoschistus microps*)

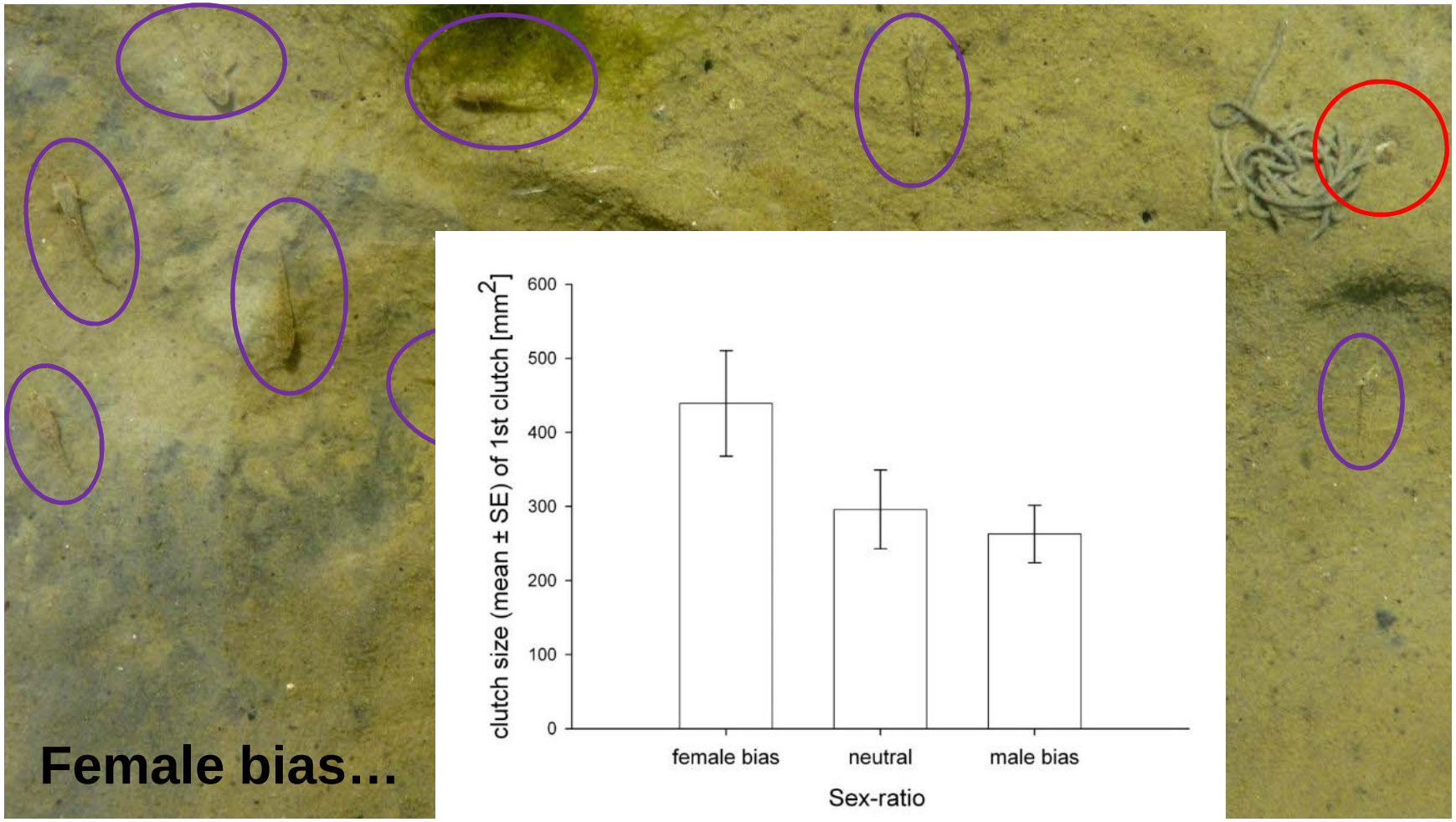
- Occur along a ecological gradient
- Single reproductive season
- Competition for clams as nest sites
- Space in nests limited
- Males and females: court & compete
- Paternal care
- Filial cannibalism
- Alternative male reproductive tactics

Nest holder of a natural nest

Clam (*Mya arenaria*)

INDIVIDUALS

Females have larger first clutches under female-bias



Female mating decisions affected by sex-ratio

(Heubel *et al.* 2008, Heubel 2018)

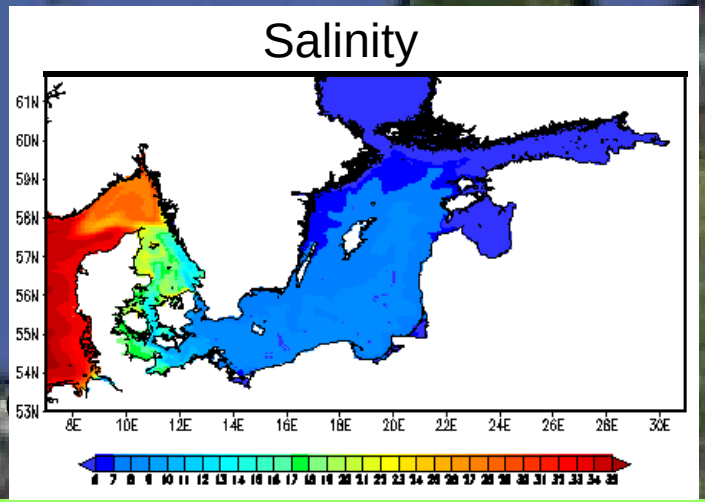
Variation along salinity gradient: Context differs with consequences for mating system

POPULATIONS

HIGH

INTER-MEDIATE

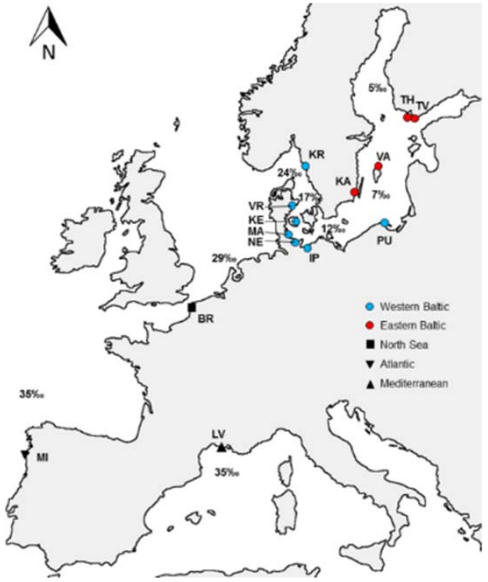
LOW

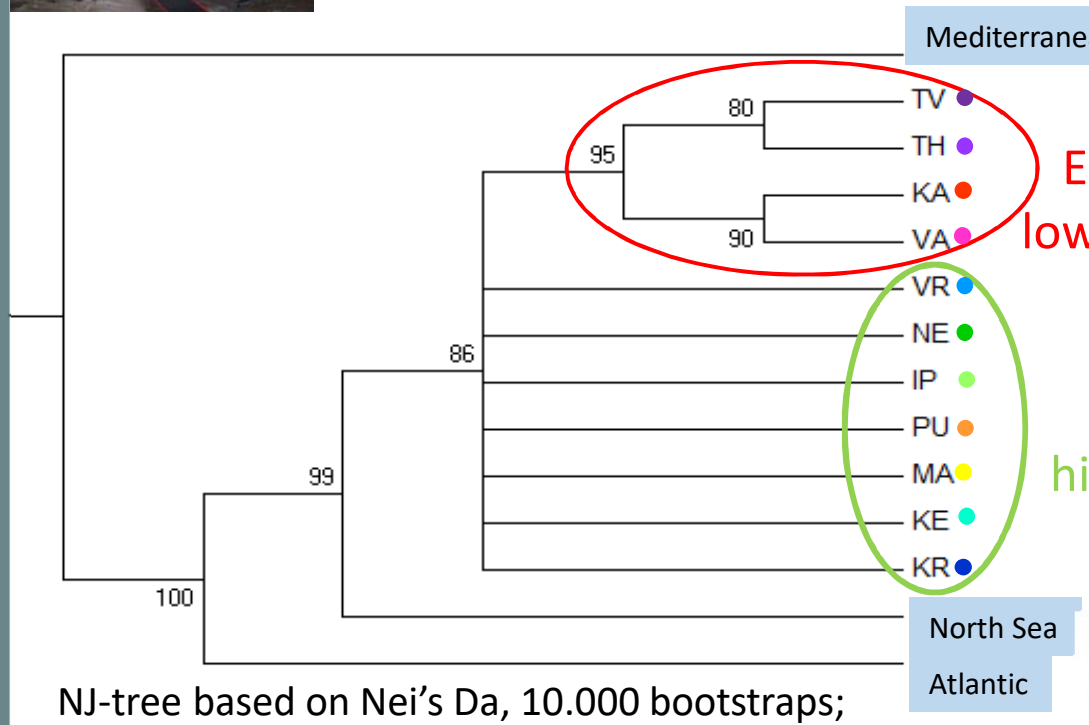


Context-dependent reproductive lifestyles?

POPULATIONS

Genetic Structure



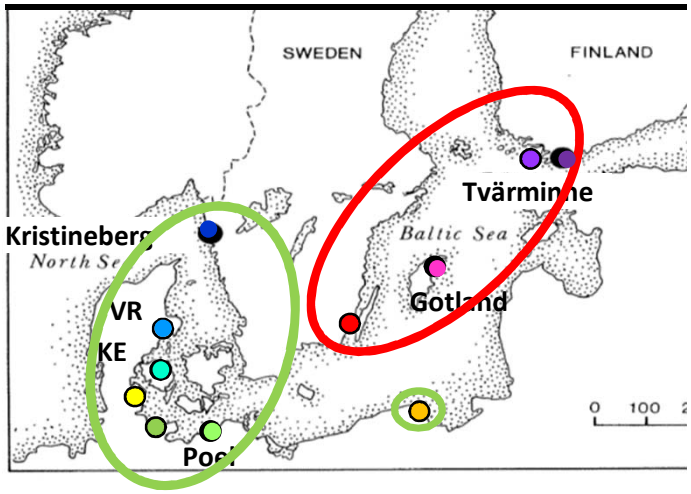


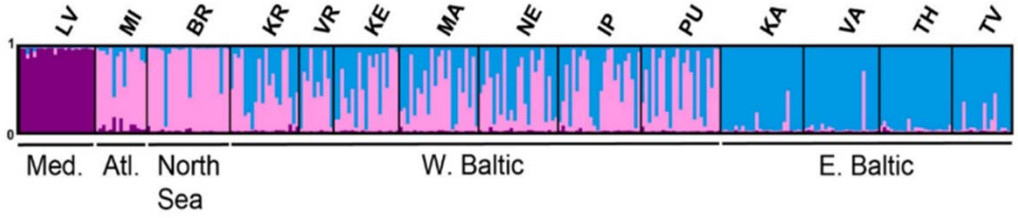
E-Baltic
low salinity

W-Baltic
high salinity

NJ-tree based on Nei's Da, 10.000 bootstraps;

Baltic Sea:



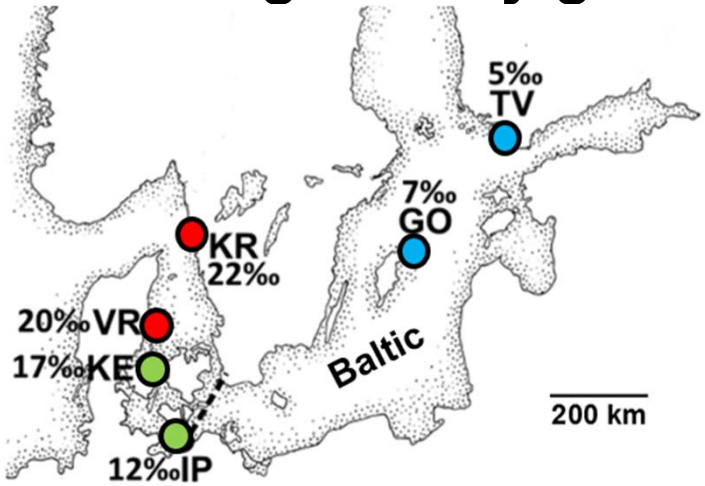


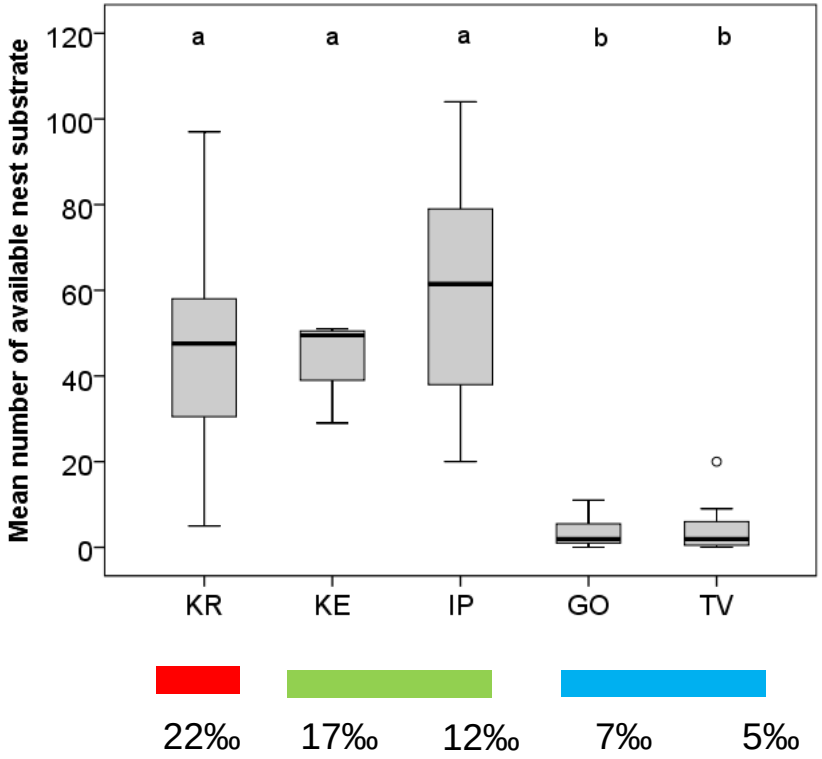
K =14, Burnin Period: 200.000, MCMC Repetitions 500.000, 10 iterations;

Mück 2016

ENVIRONMENT

Variation along salinity gradient





Clam *Mya arenaria*

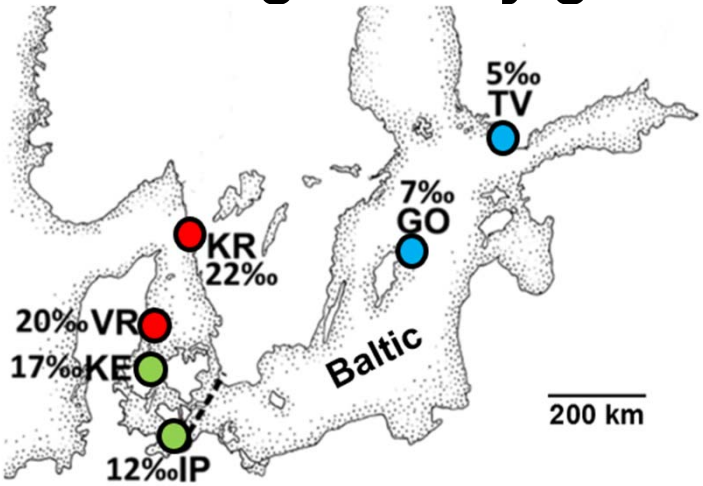
Low salinity:
nest and sperm competition expected

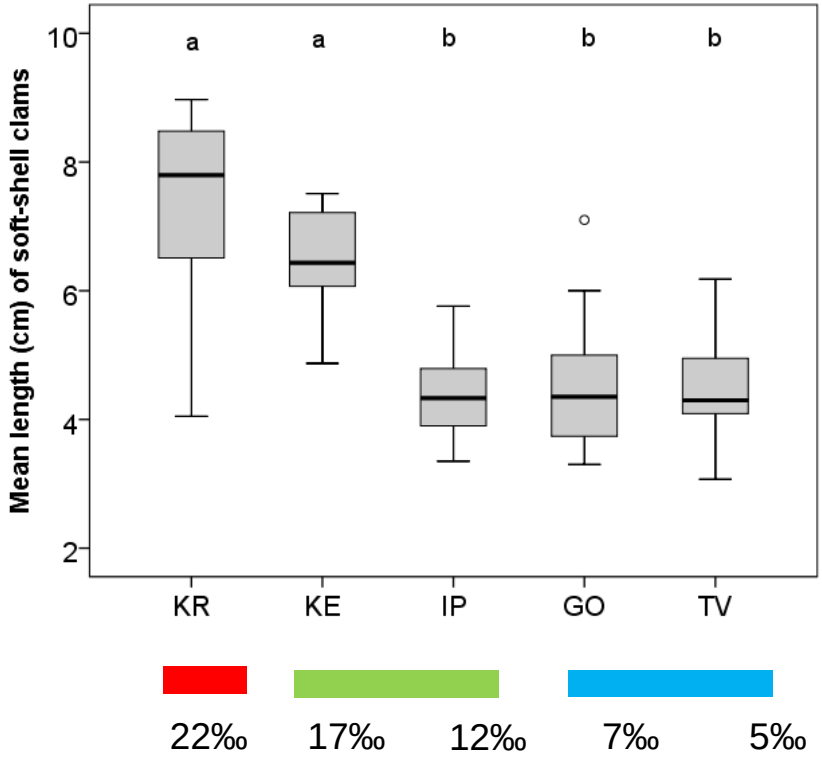
Standardised 20 m transects

Mück & Heubel 2018

ENVIRONMENT

Variation along salinity gradient





Clam *Mya arenaria*

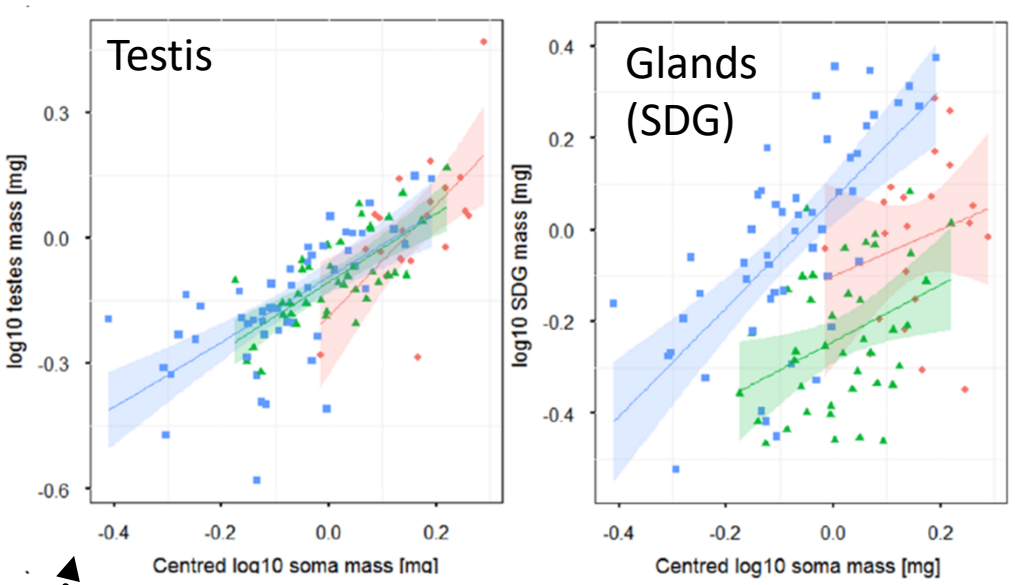
Low salinity:
nest and sperm competition expected

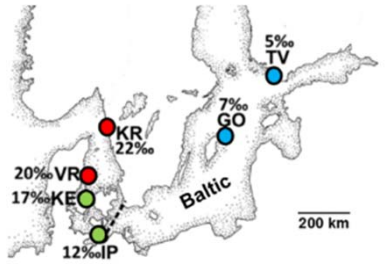
Standardised 20 m transects

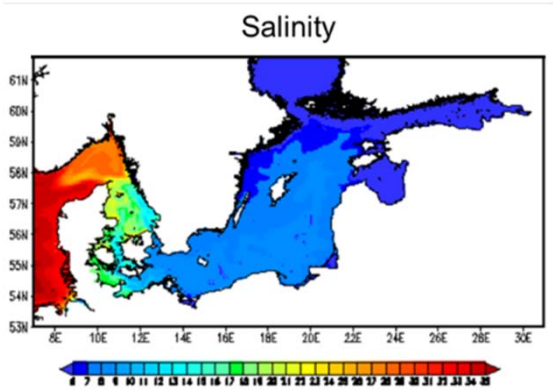
Mück & Heubel 2018

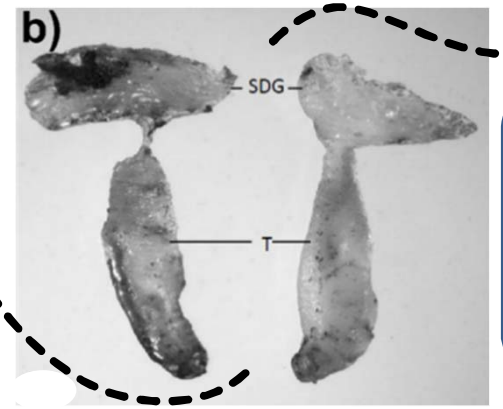
ENVIRONMENT

Male gonadal investment trade-off









Low salinity:

- No difference in testis mass
- ↑ **higher SDG** investment (mucus production)

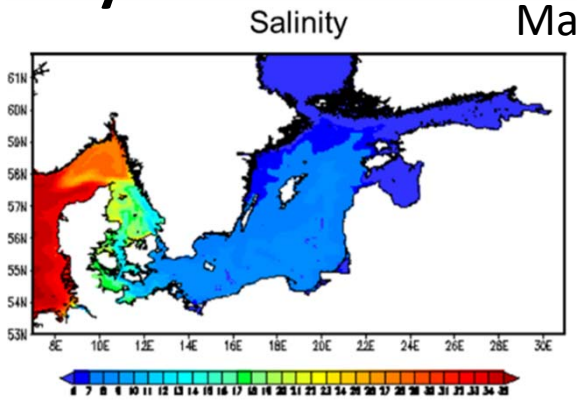
Mück 2016

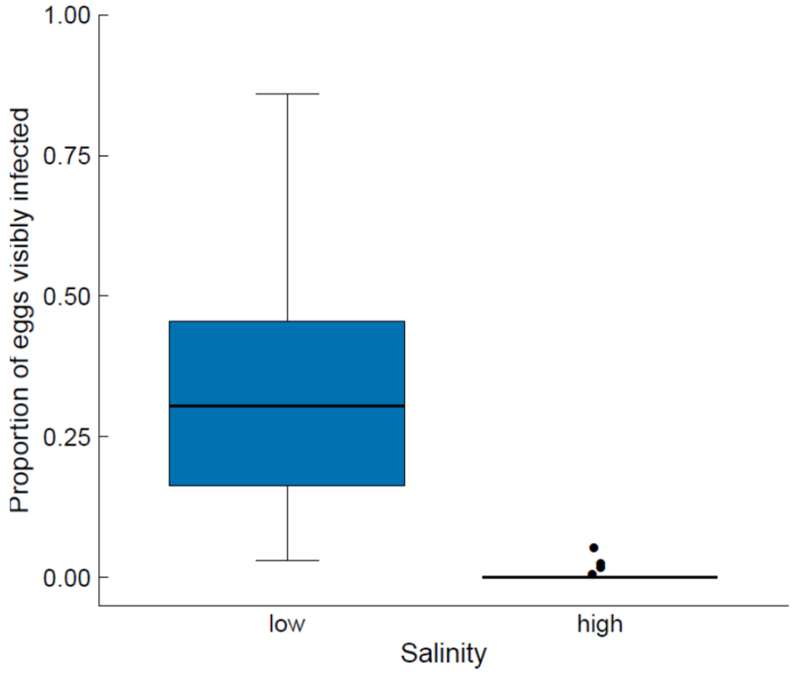
INDIVIDUALS

Salinity– do males adjust care?

Martin Vallon

Higher egg infection risk at low salinity





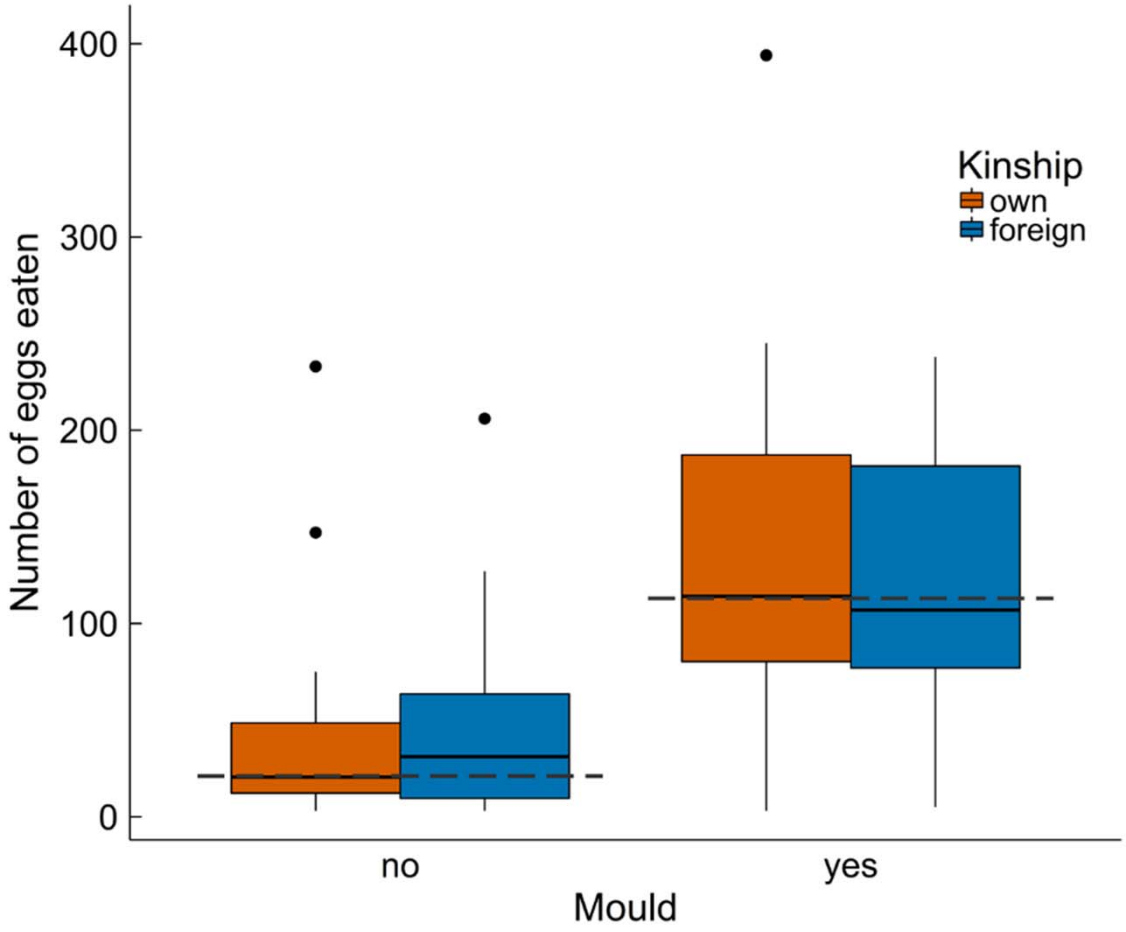
Saprolegnia - water mould

High SDG investment at low salinity:
Mucus production to prevent infection?

Vallon, Anthes & Heubel 2016, Vallon & Heubel 2016, Vallon & Heubel 2017

INDIVIDUALS

Males cannibalise infected eggs…



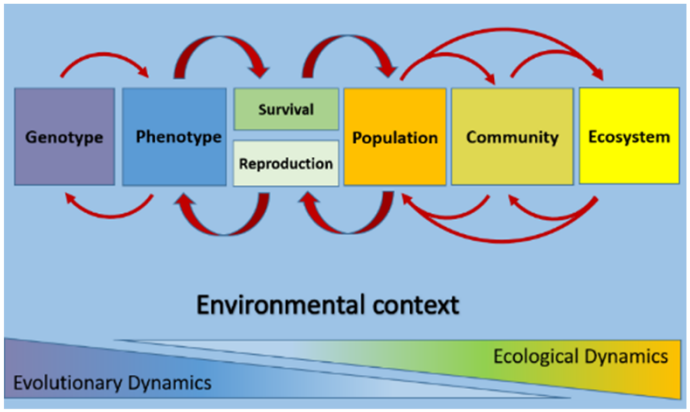
…but don't care about kinship

Linear mixed model: infection $F_{1,35}$ = 56.94***
kinship n.s., infection*kinship n.s.

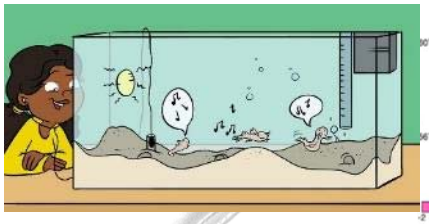
Vallon, Anthes & Heubel 2016

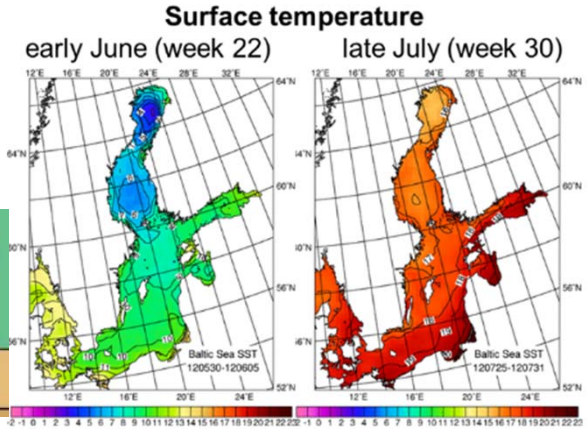
CONCLUSION & OUTLOOK

Context-dependent reproductive decisions



Acoustic communication and anthropogenic noise



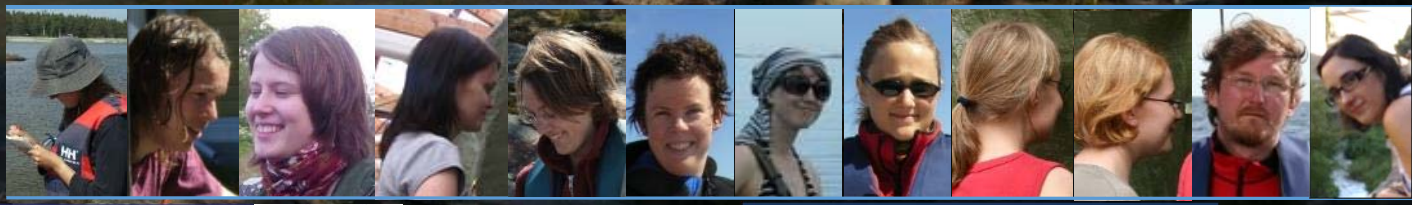


Coastal ecosystems & Habitats

- Ecological gradients
- Environmental variability
- Anthropogenic impacts
- Trophic interactions
- Life-history adaptations

- Reproductive decisions affected by **environmental context**
- **Nesting resources** limited by salinity
- Mating affected by **temperature, season, and social context**
- **Males** sensitive to **temperature** and **reproductive value**
- **Females** sensitive to female **competition**
- Selective **filial cannibalism** as a male reproductive strategy
- Low salinity populations have different **gonadal investment**
- **Sex ratio** affects clutch size, rate, success, mate choice
- **Baltic Sea**: distinct genetic clade in East Baltic (low salinity)

Tvärminne Zoological Station, Marine Biological Research Centre Kerteminde, Sven Lovén Centre for Marine Infrastructure Kristineberg, Ar Research Station Gotland, U Tübingen, Ecological Research Station Rees, U Cologne.



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