



Biological and trophic dynamics in the English Channel

Dynamiques biologiques et trophiques en Manche

Consequences of human disturbances on sole (*Solea solea*) population

by S. Rochette, E. Rivot, O. Le Pape, Agrocampus Ouest



Outline

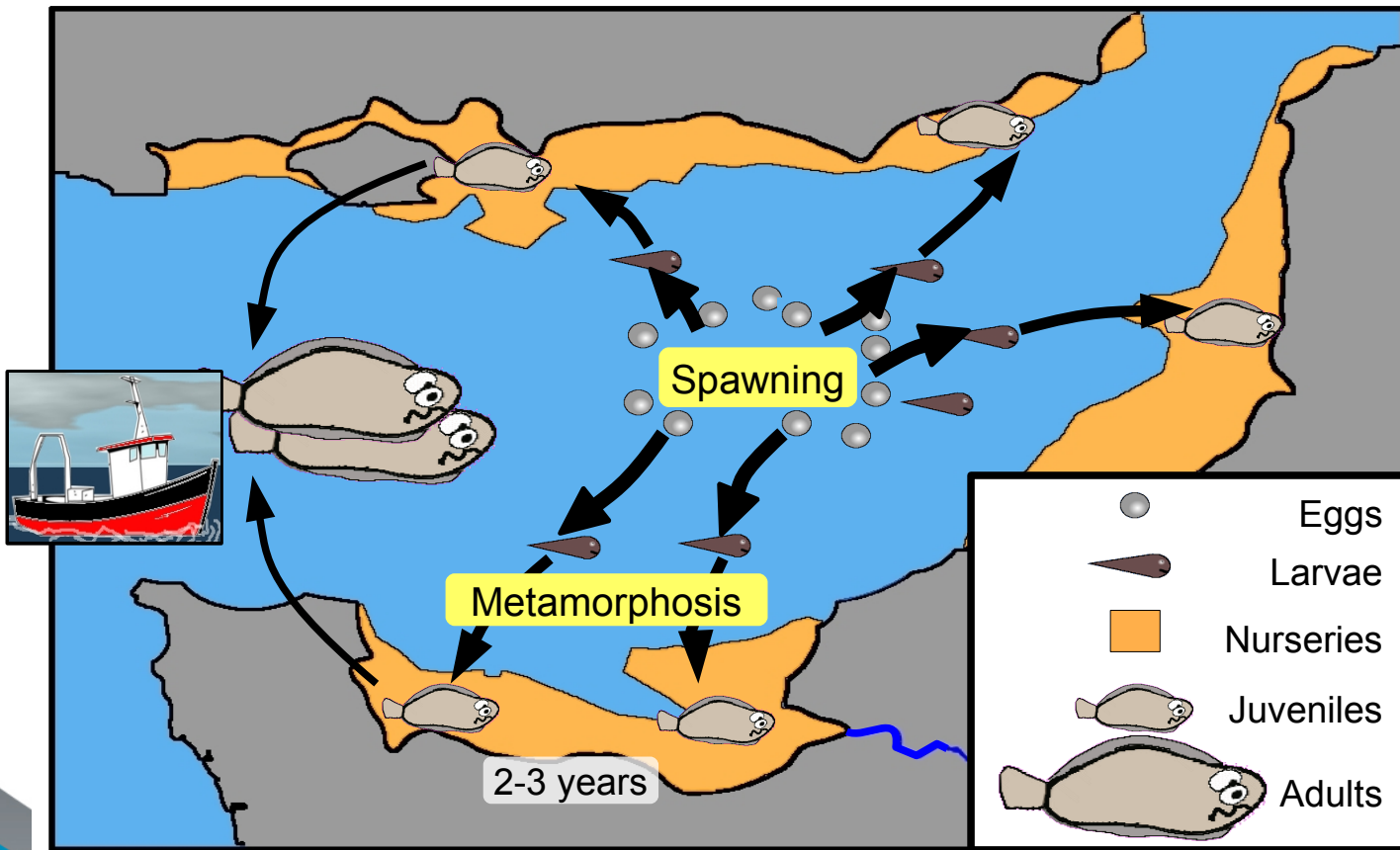
1. Introduction
2. Assessing the quality of nursery habitats
3. Quantifying larval dispersal and survival
4. Modelling an integrated life cycle



1. Introduction

Context

- The sole population life cycle in the eastern Channel



1. Introduction

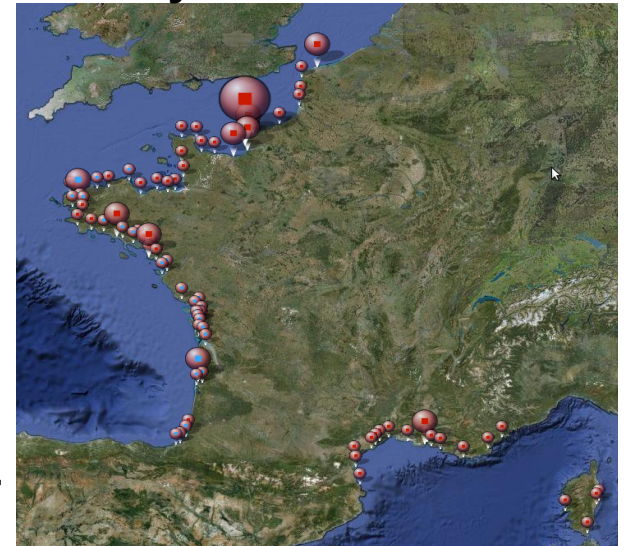
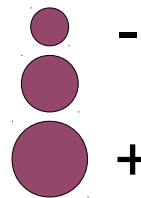
Context

- Pressures over nurseries of the eastern Channel
 - *Habitat modifications (-75% of muddy grounds)*
 - *Chemical contamination ($\times 10$)*

The Seine estuary



Polycyclic Aromatic Hydrocarbons



1. Introduction

Objectives

- How human pressures impact marine fish life cycle?
 - *Habitat degradation over nurseries*
 - *Influence of larval supply*
 - *Combination at the scale of the population*



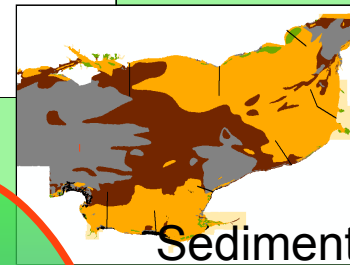
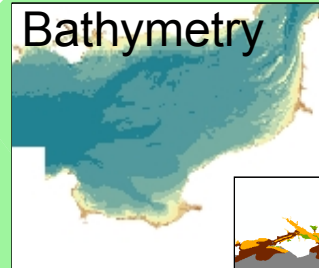
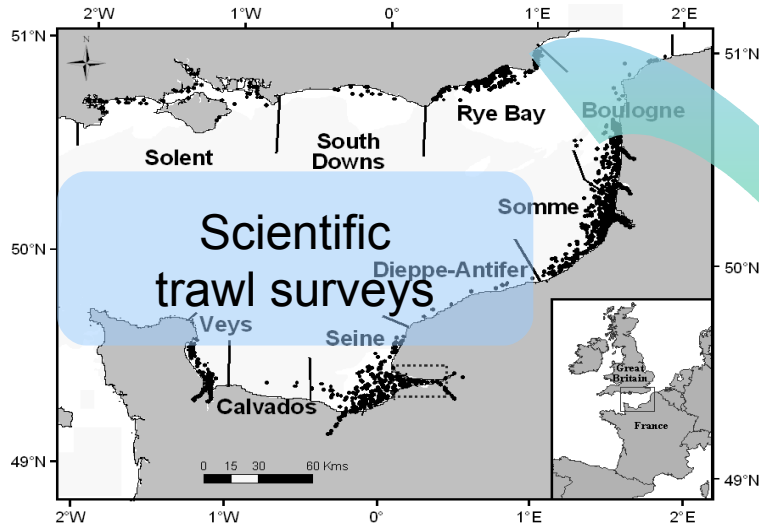
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- 2. Assessing the quality of nursery habitats**
3. Quantifying larval dispersal and survival
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2. Quality of nursery habitats

Material & Methods



Statistical model
Juveniles densities ~
Sector + Bathymetry + Sediment

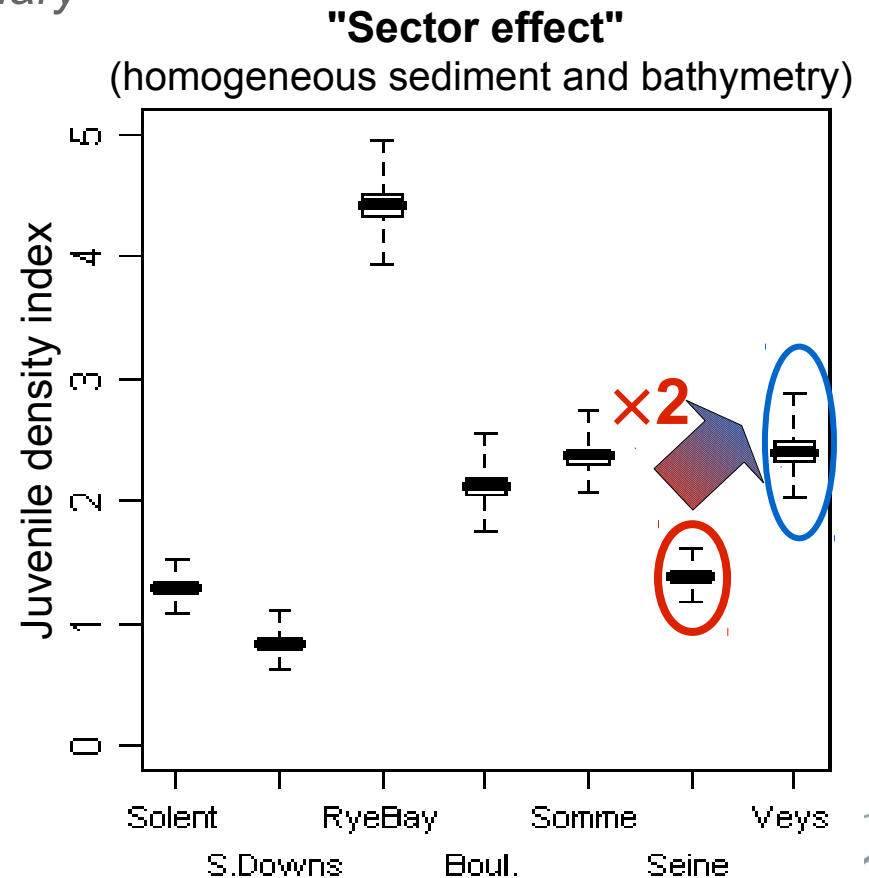
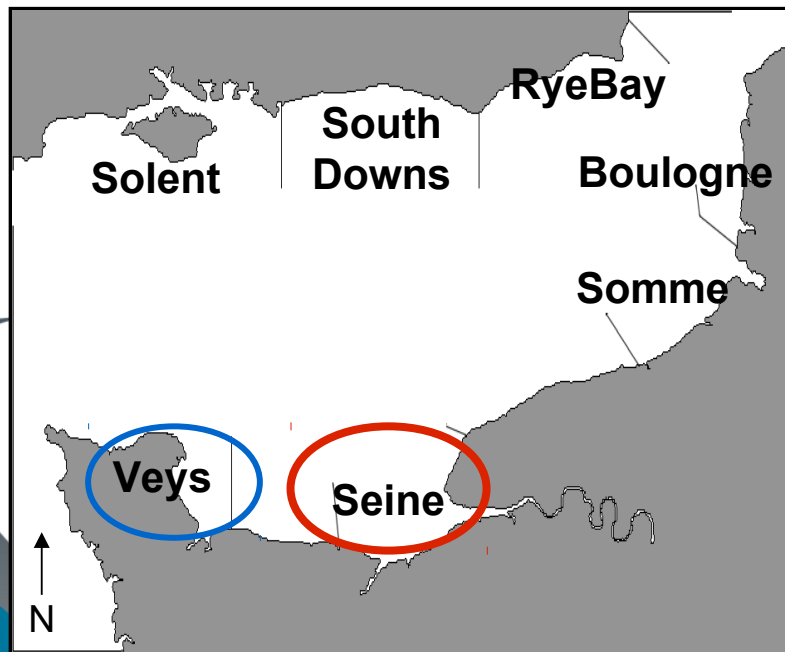
Mapping of juveniles densities
Amount of juveniles in nurseries



2. Quality of nursery habitats

Results: the statistical model

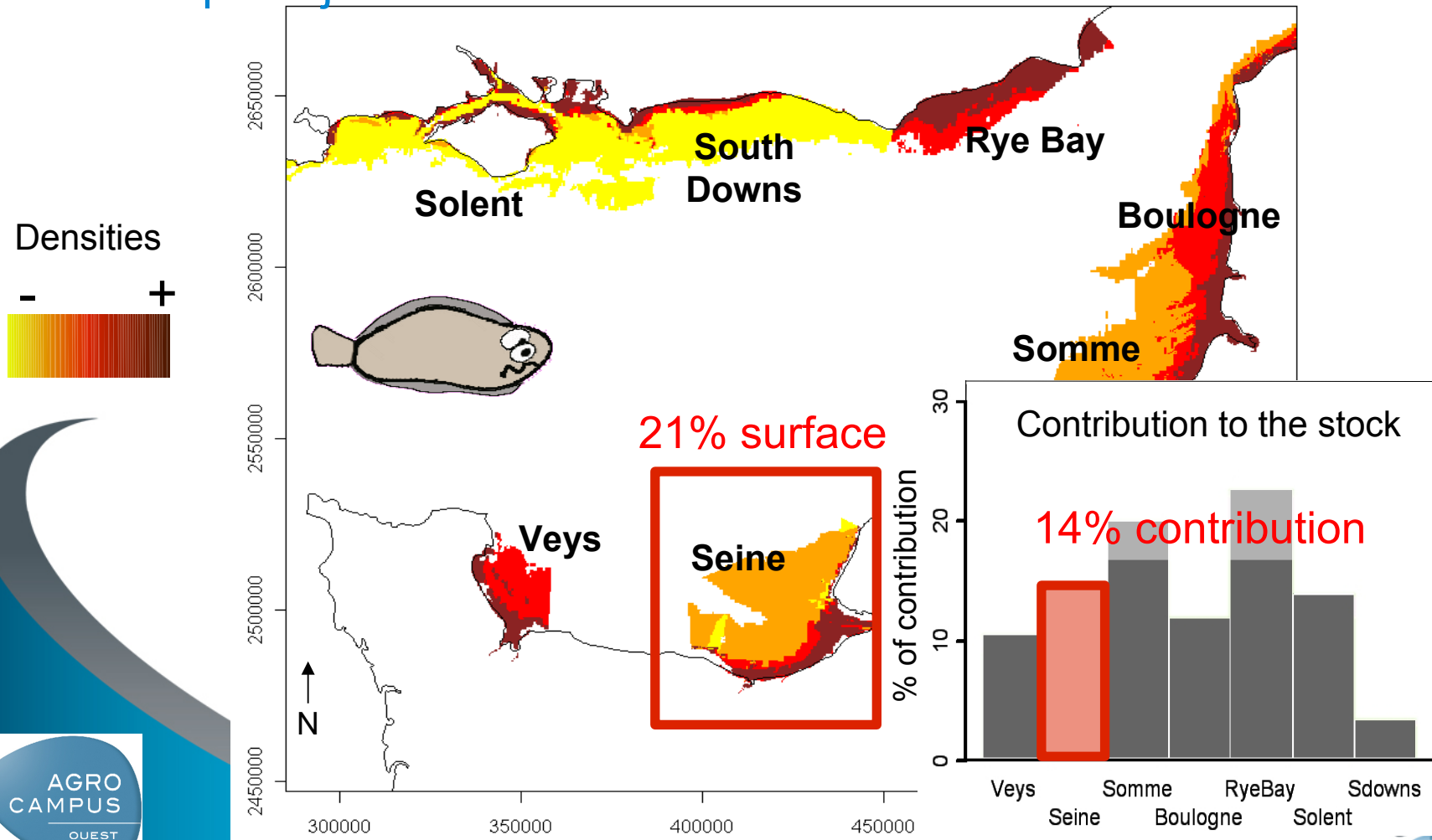
- Discrepancies between nurseries
 - Low densities in the Seine estuary*



2. Quality of nursery habitats

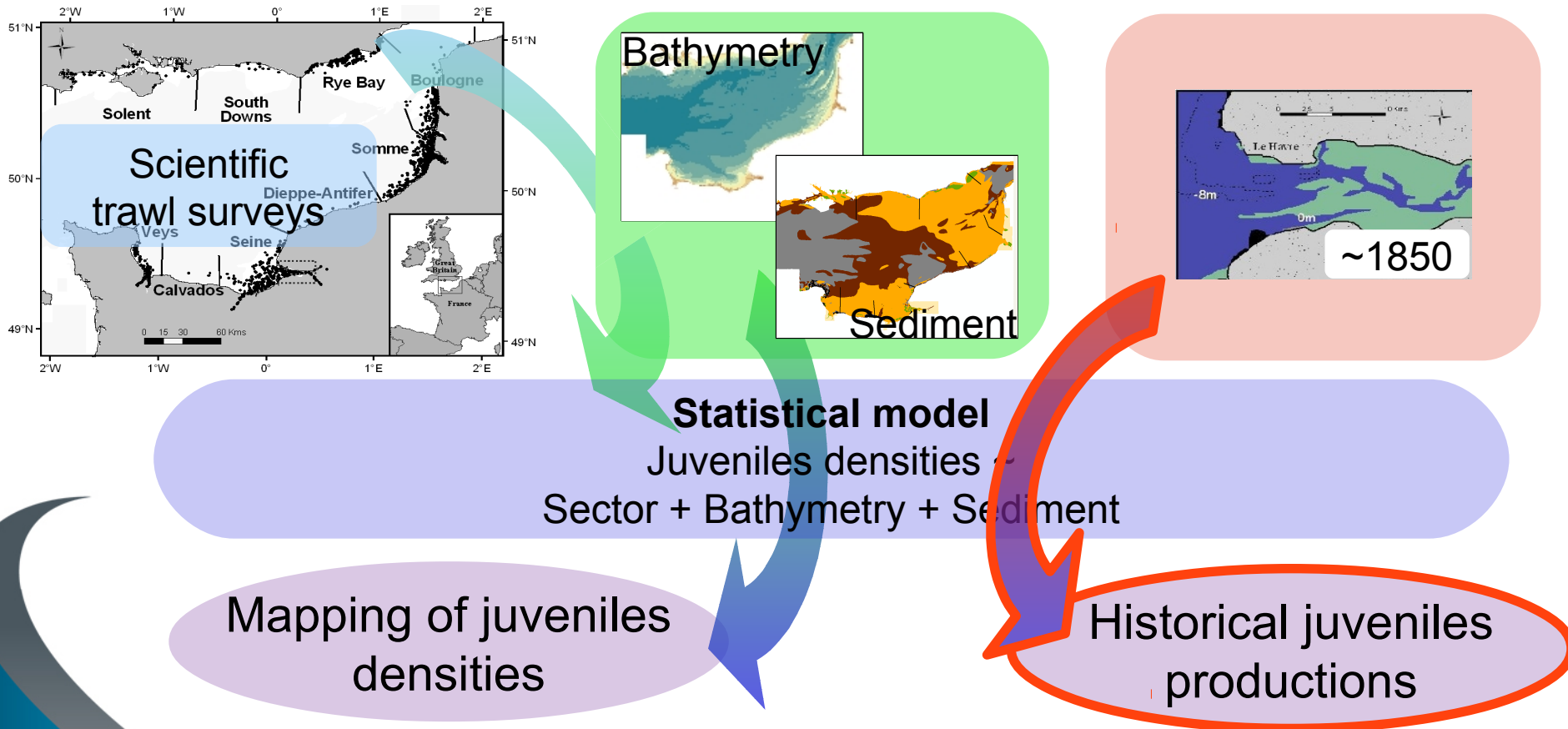
Results: juvenile production

- Maps of juvenile densities



2. Quality of nursery habitats

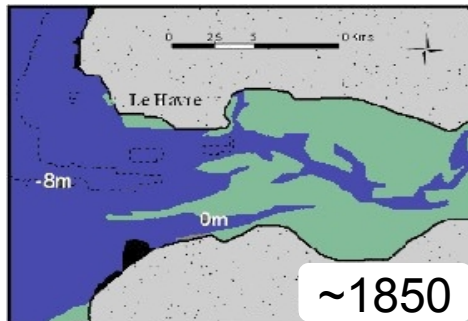
Results: habitat degradation



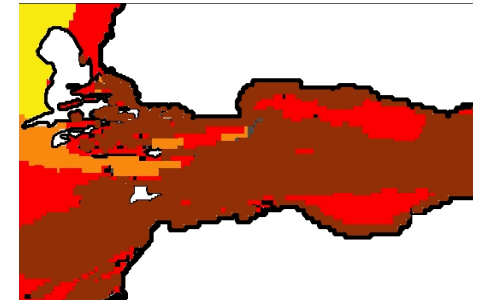
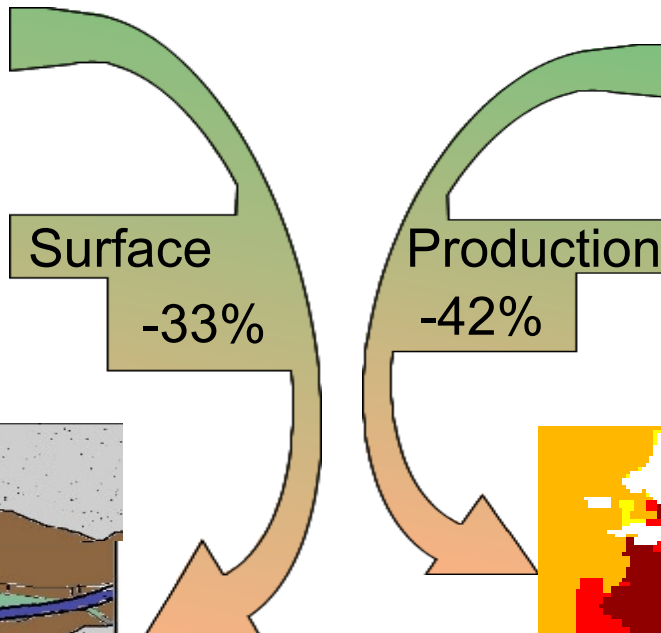
2. Quality of nursery habitats

Results: habitat degradation

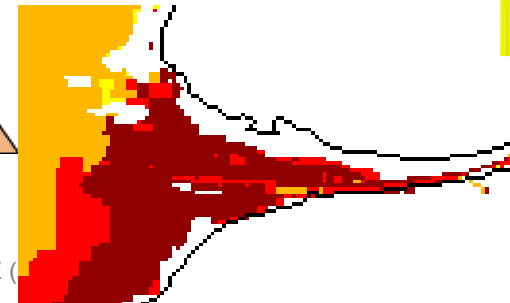
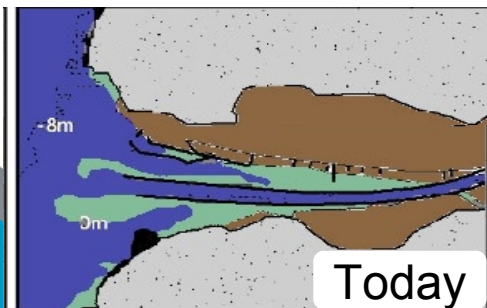
- The case of the Seine estuary
 - *Habitat destruction*



Continental
Intertidal
Subtidal



Densities
- +



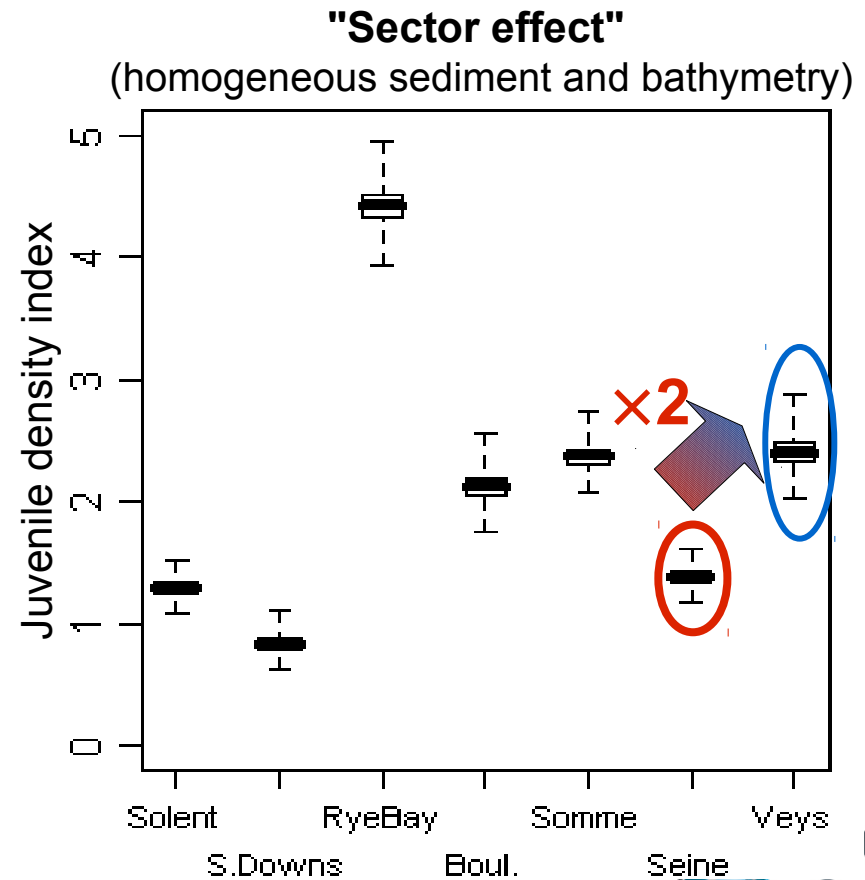
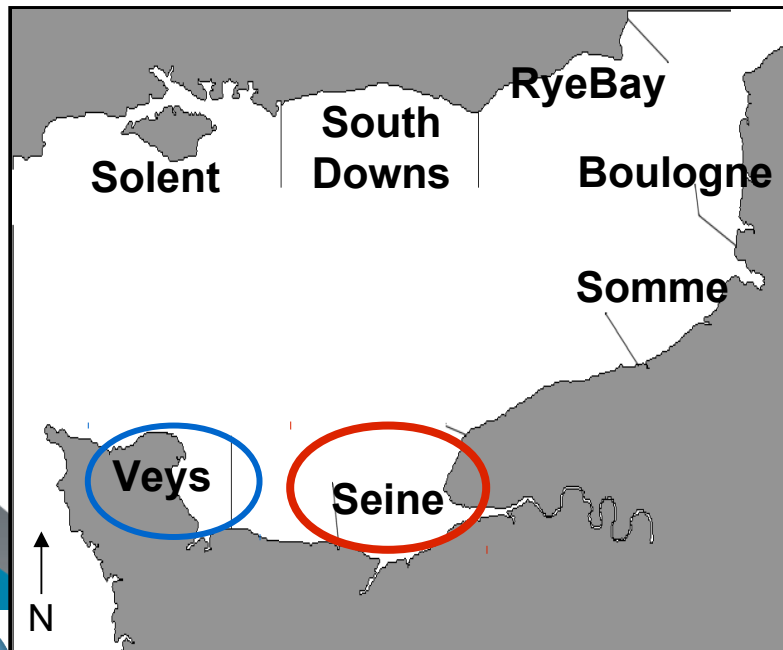
HUMAN DISTURBANCES ON SOLE (



2. Quality of nursery habitats

Results: habitat degradation

- The case of the Seine estuary
 - *Habitat destruction*
 - *Chemical contamination?*
 - Reference "Bay of Veys" in 1850

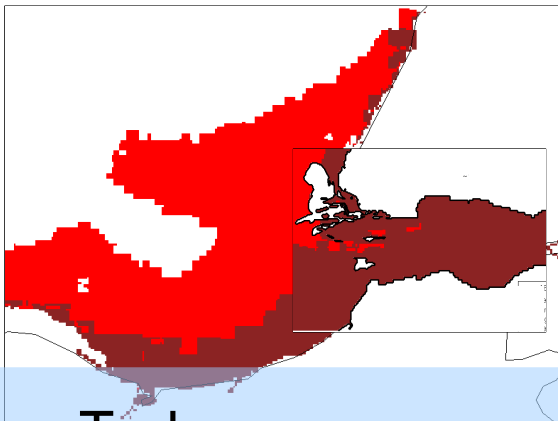


2. Quality of nursery habitats

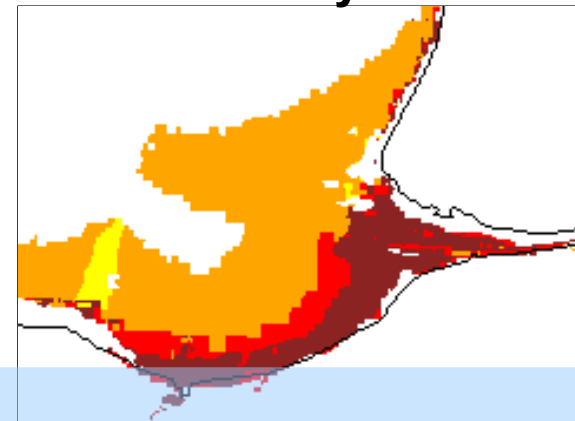
Results: habitat degradation

- The case of the Seine estuary
 - *Habitat destruction*
 - *Chemical contamination?*
 - Reference "Bay of Veys" in 1850

1850



Today



1850 → Today

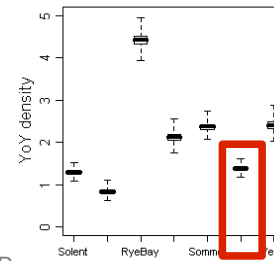
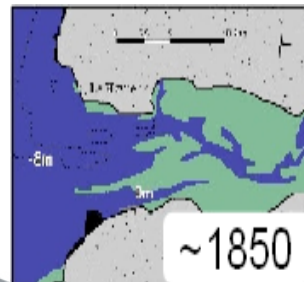
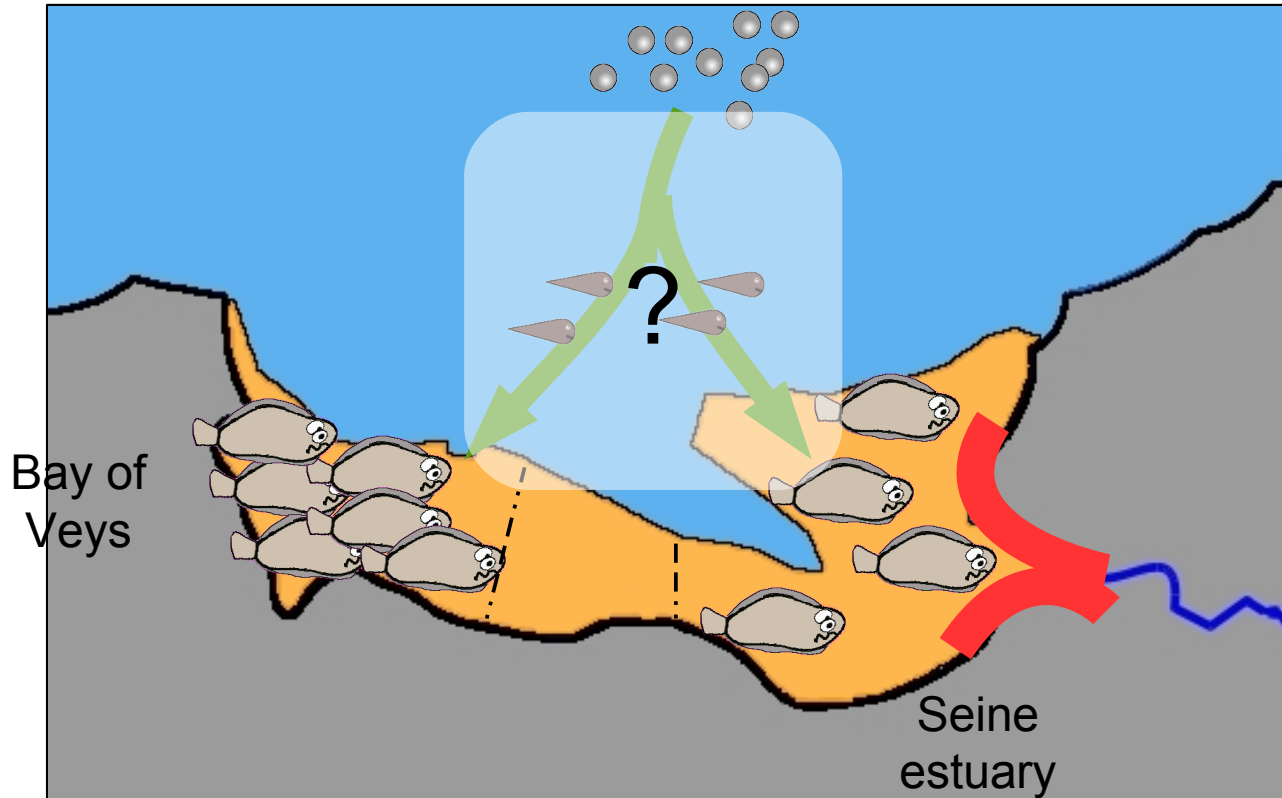
⇒ Habitat destruction + contamination

⇒ 17 % loss at the scale of the eastern Channel population



2. Quality of nursery habitats

Discussion: the case of the Seine estuary



MAN DISTURB, ... S.Down ... Boul ... Seine ... SOLEA) POPULATION – 6th April



Outline

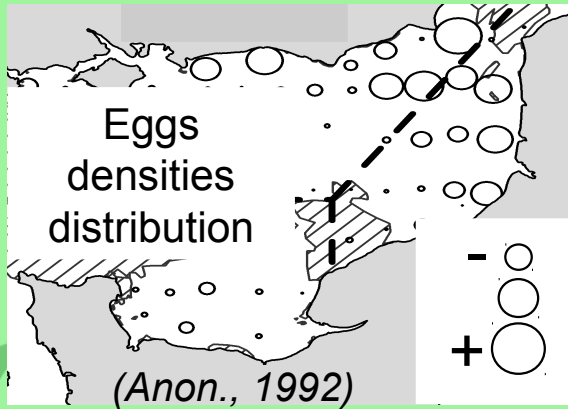
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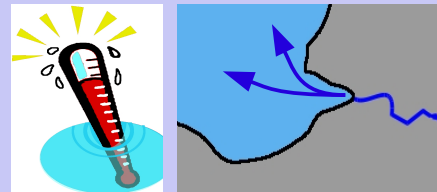
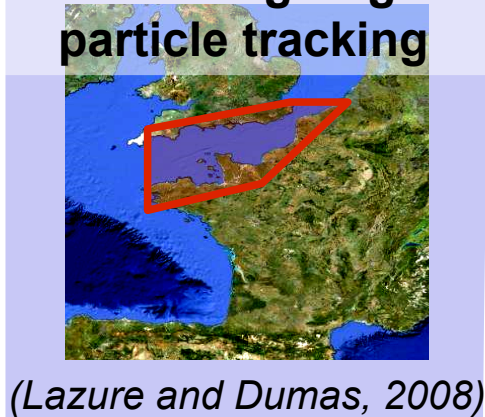
3. Larval dispersal and survival

Material & Methods

Spawning conditions



Ocean circulation model & lagrangian particle tracking



Realistic estimation of larval supply

1991-2004

Ifremer

Mars3D

AGRO CAMPUS
Eggs

Larval stages

Metamorphosis

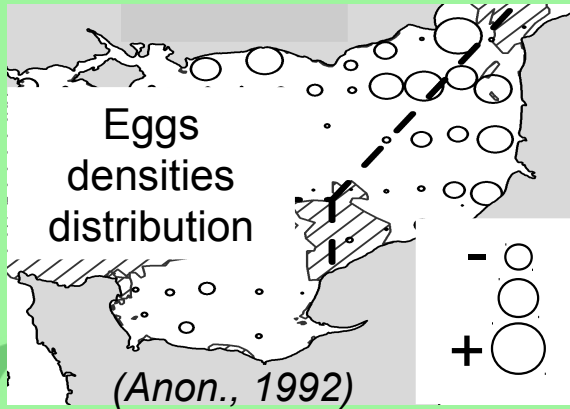
Nurseries

CONSEQUENCES OF HUMAN DISTURBANCES ON SOLE (SOLEA SOLA) REPRODUCTION - 6 April 2012

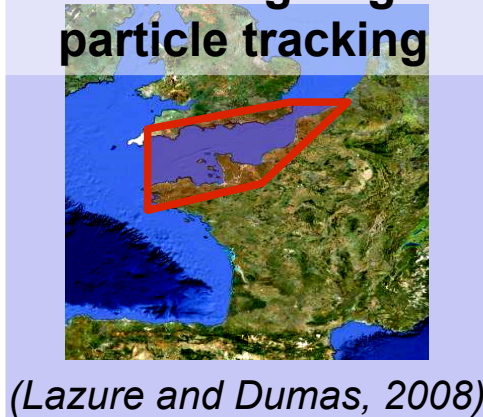
3. Larval dispersal and survival

Results: larval – juveniles comparison

Spawning conditions



Ocean circulation model & lagrangian particle tracking



Realistic estimation of larval supply

1991-2004

Juveniles densities from trawl surveys

Nurseries

Eggs

Larval stages

Metamorphosis

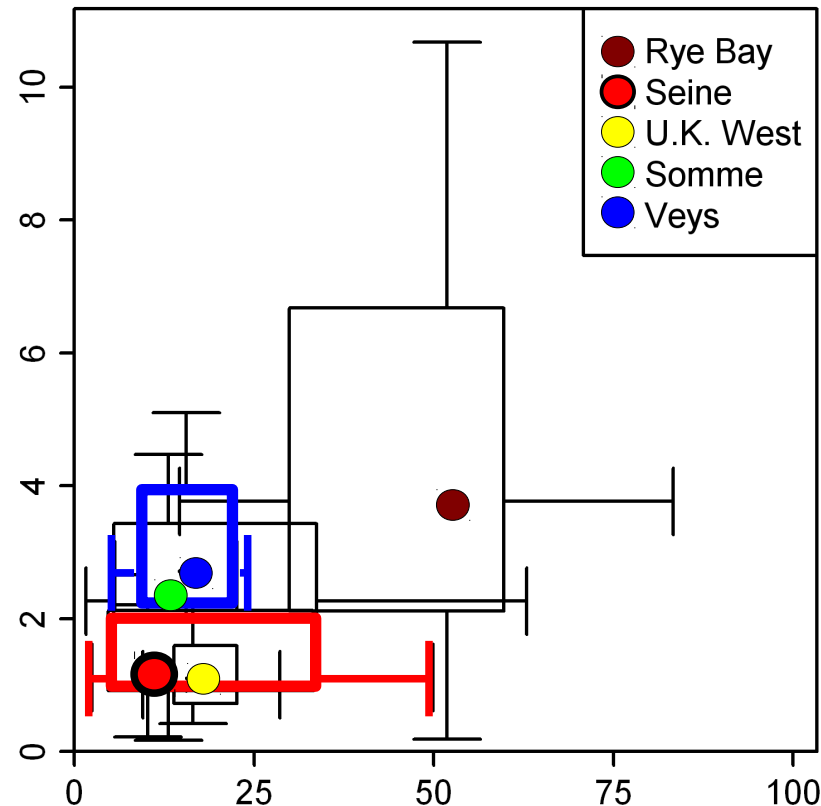
Juveniles

3. Larval dispersal and survival

Results: larval – juveniles comparison

- Same range of larval supply between nurseries
- Slightly lower amount of larvae in the Seine estuary

Juveniles density
from trawl
surveys



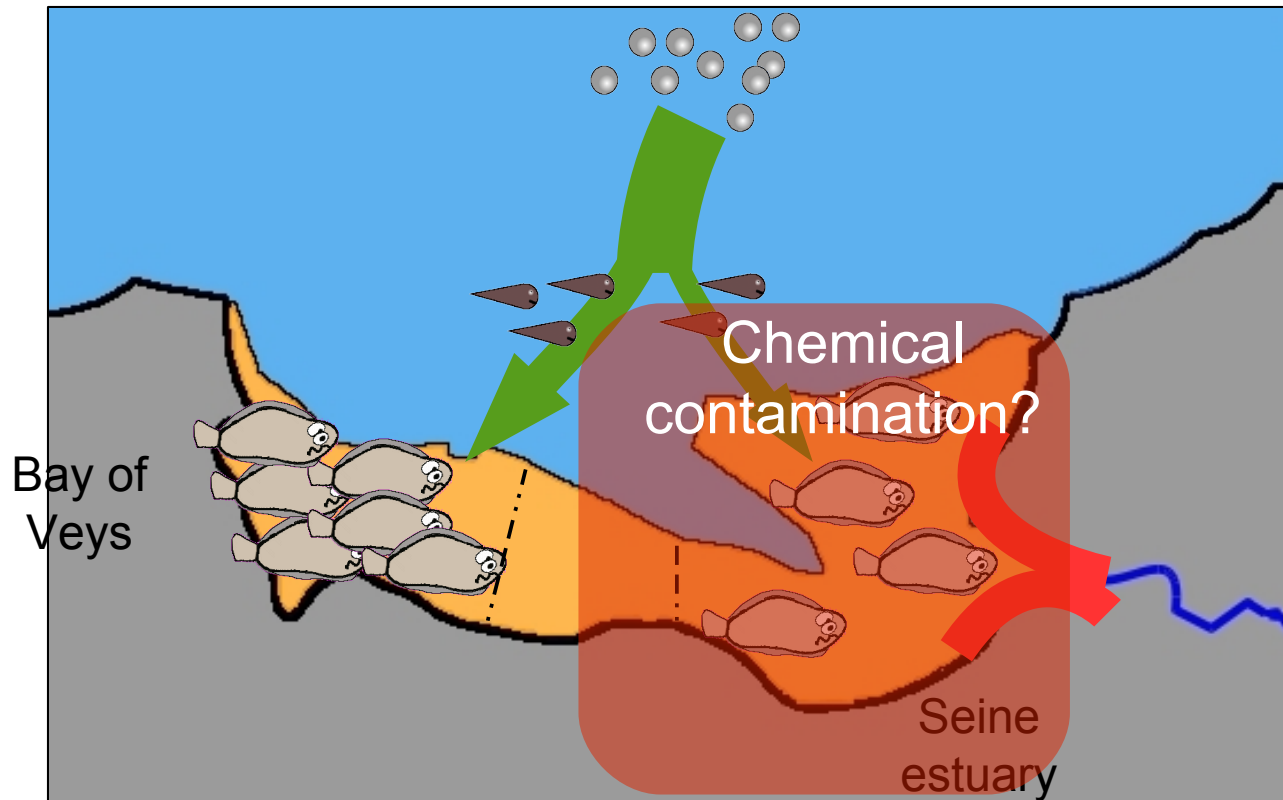
Larval density from
larval supply model

LEA SOLEA) POPULATION – 6th April



3. Larval dispersal and survival

Results: the case of the Seine estuary



Outline

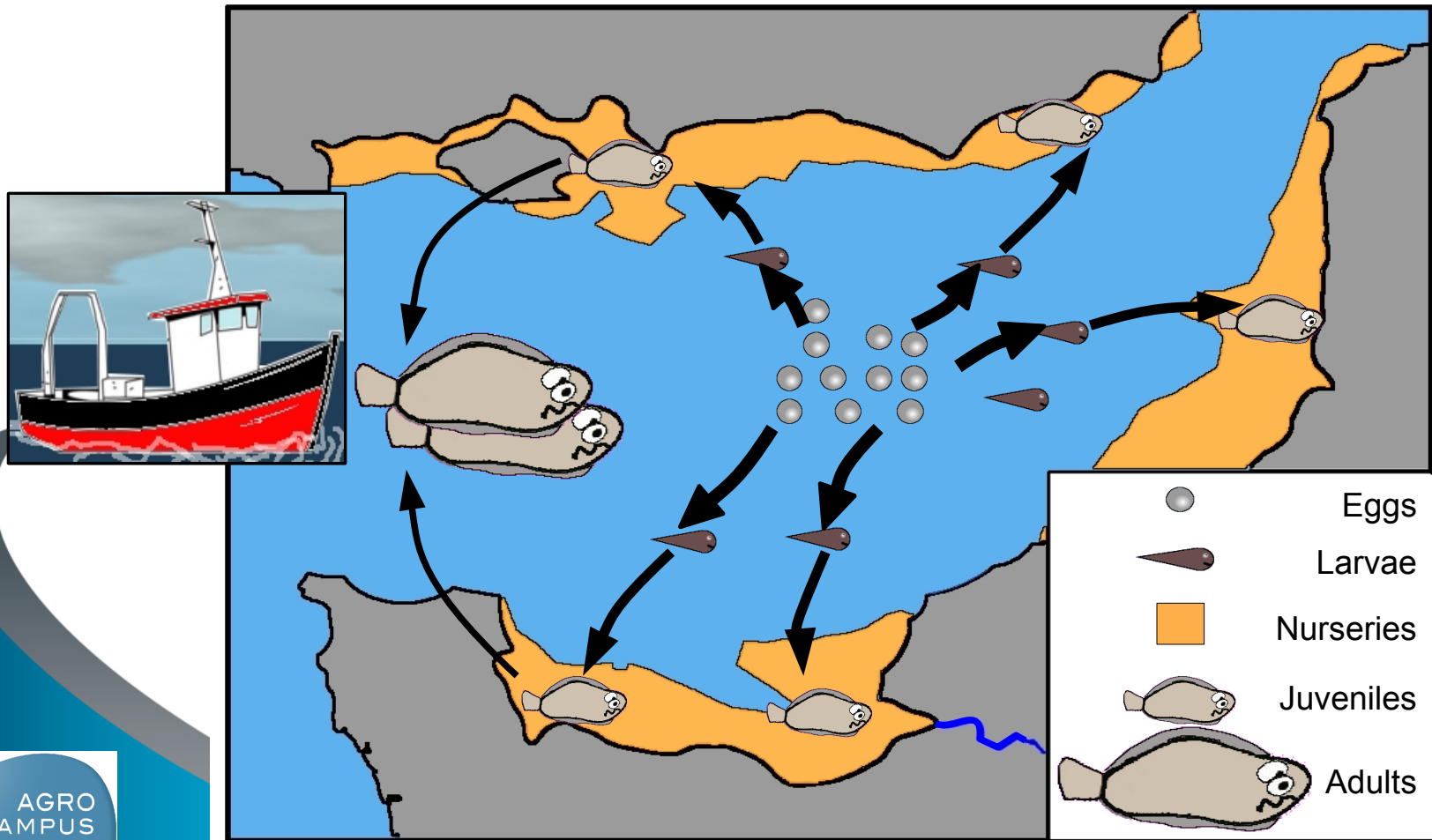
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4. The integrated life cycle

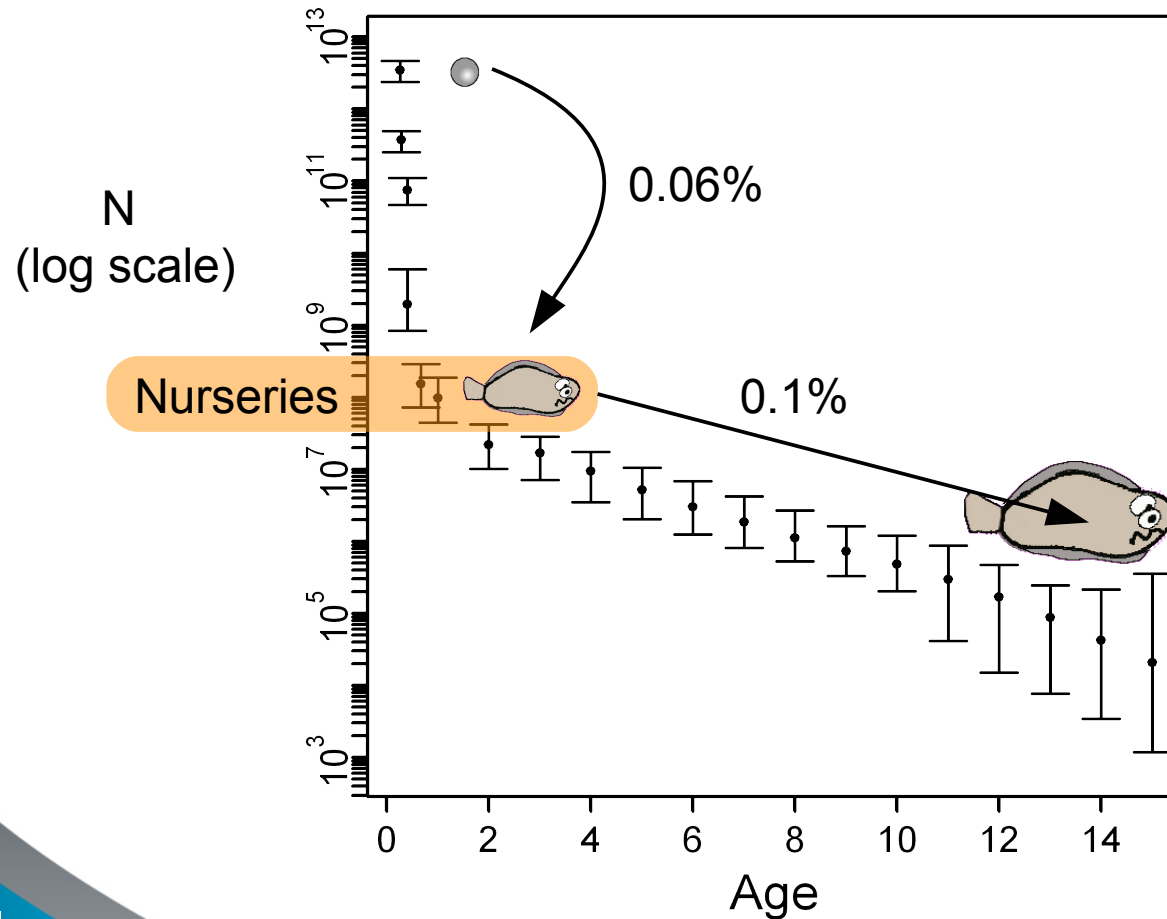
Objectives

- Embedding life cycle model within a statistical approach



4. The integrated life cycle

Importance of first life stages



4. The integrated life cycle

Perspectives

- The life cycle modelling framework offers interesting simulation perspectives
 - *Past scenarios*
 - Impact of fishing vs habitat degradation
 - *Future scenarios*
 - Stock assessment with reliable recruitment estimation
 - Effect of management scenarios (spatially-structured)





Thank you for your attention

