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# **Importance of grey mullets on coastal food webs in a context of omega-3 deficiency: from sub-individual level to trophic dynamics**

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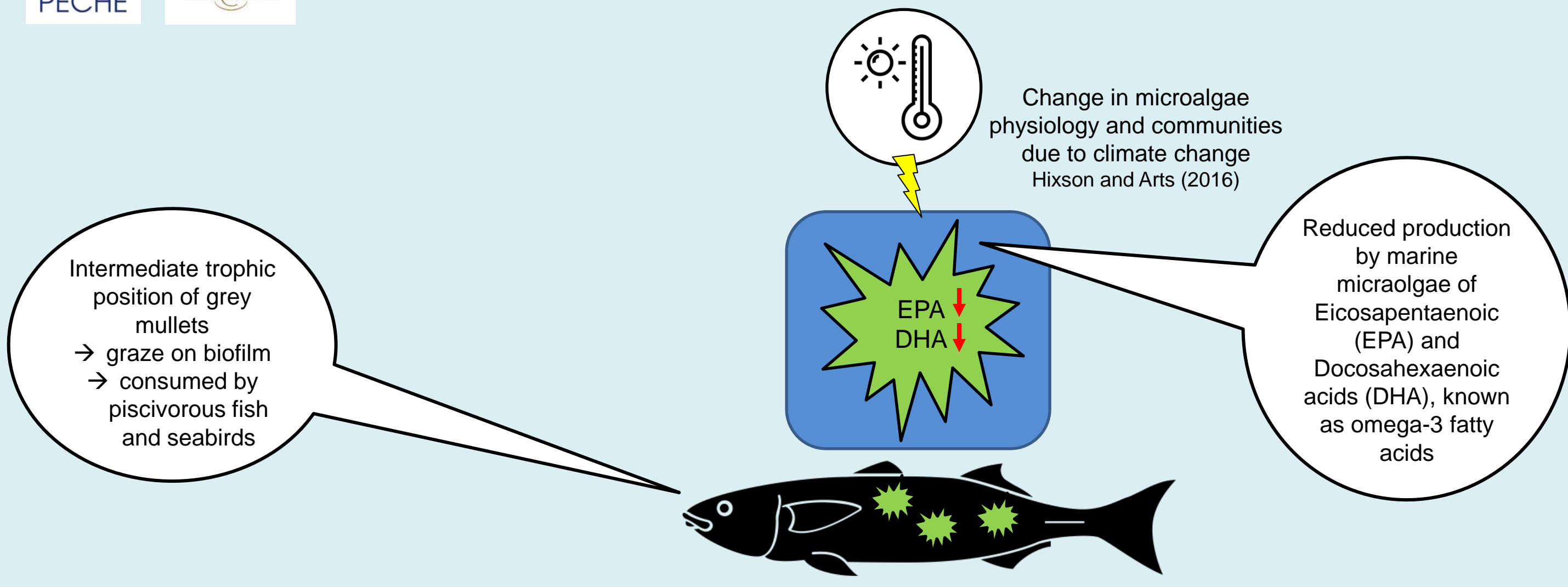


HAL Authorization

# Importance of grey mullets on coastal food webs in a context of omega-3 deficiency: from sub-individual level to trophic dynamics



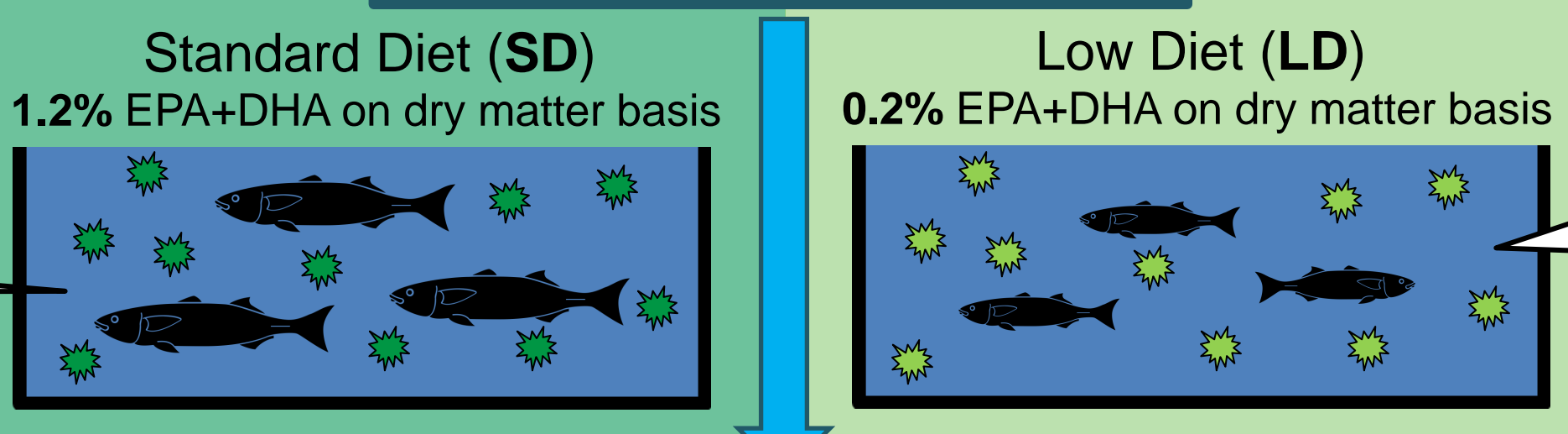
Pierre Bourdaud, Géraldine Lassalle, Nathalie Niquil, Marie Vagner



What effects on the individual fish physiology?  
What consequences on the food web functioning?

## Experiments

### Individual & sub-individual



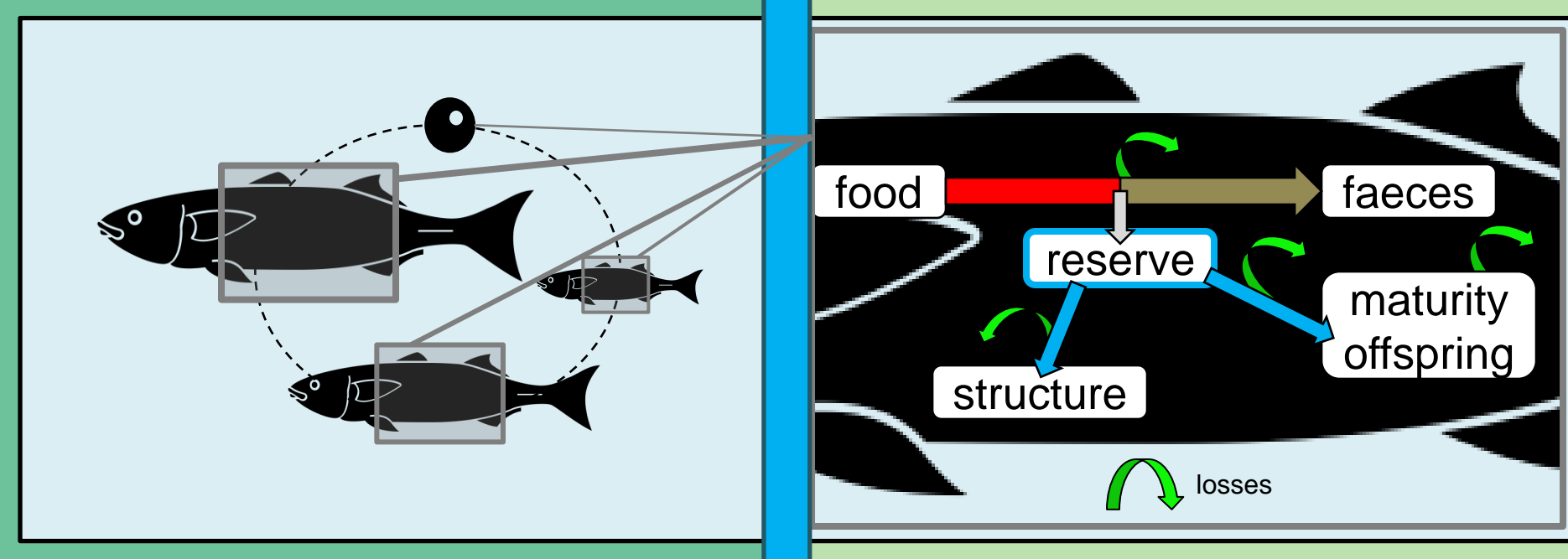
6 months at 20°C

→ Reduced growth  
→ Similar weight / length ratio  
→ More efficient use of energy for activities  
Vagner *et al.* (2014)

## DEB modeling

### Individual

Full life cycle and internal energy flows



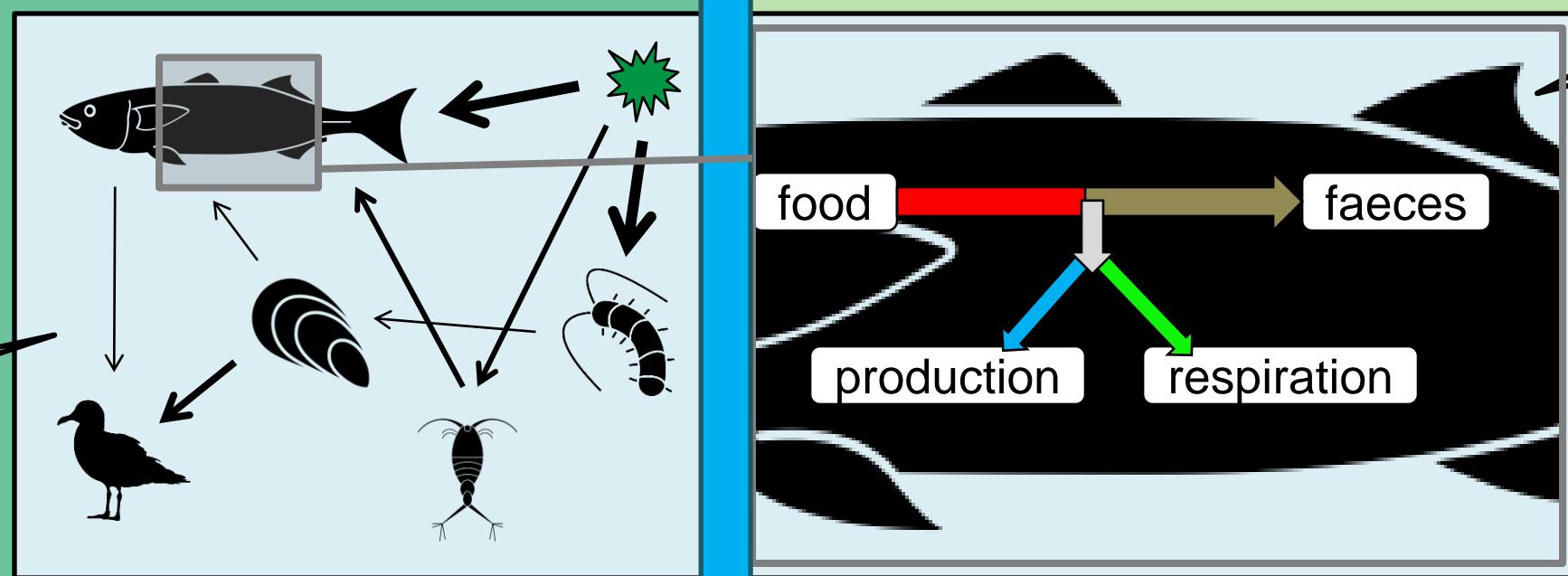
Development of Dynamic Energy Budget (DEB; Kooijman, 2010) for the two species present in the area of interest, the Marennes-Oléron bay mudflat (MO; France):  
*Chelon auratus* *Chelon ramada*

Reduction of metabolism and growth by modification of:  
→ volume-specific somatic maintenance (-25%)  
→ energy conductance (-24%); altering the mobilization of energy from the reserves in the organism

## LIM modeling

### Trophic Network

Static mass-balanced trophic flows with uncertainty



Update of a previous Linear Inverse Model (LIM; van Oevelen *et al.*, 2010) of MO (van der Heijden *et al.*, 2020) from DEB and literature

Definition of flows similar in all LIM trophic groups

19 trophic groups

LIM outputs used on initial inputs of biomasses, trophic links, satiation, inertia, losses other than predation and detritus consumption

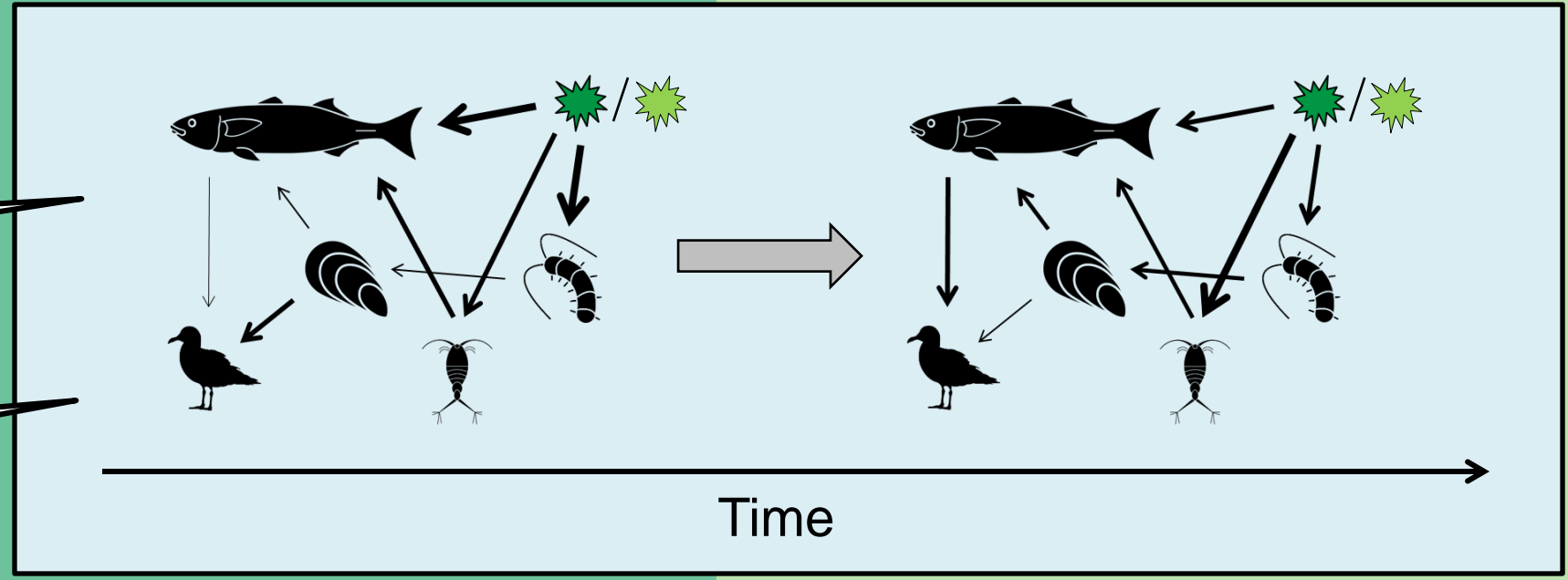
LIM constraints on defined from DEB to simulate the current MO ecosystem state with Standard Diet

No LIM simulation of the ecosystem state with LD because it would consider the different biomasses as static

## CaN modeling

### Dynamic Trophic Network

Dynamic trophic flows with uncertainty



Development of a Chance and Necessity model (CaN; Planque and Moullon, 2019) of MO from LIM outputs

DEB outputs used on CaN constraints:  
→ Consumption: -14%  
→ Production / Consumption: +6%  
→ Respiration: -21%

Flows definition similar to LIM

11 trophic groups

Comparisons of biomasses, exports of Carbon and Ecological Network Analysis

Work in progress...