A DEB model to predict accumulation and detoxification of paralytic shellfish toxins by the Japanese Oyster (*Crassostrea gigas)*

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Introduction

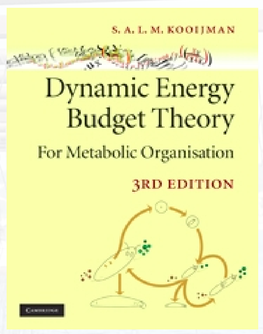
Facilities for shellfish exploitations in the Cancale bay

Crassostrea gigas **is the world most important marine culture species with a global production of about 4 millions tonnes in 2010. (FAO)**

Production depends on numerous environmental conditions that affect recruitment, survival and growth. As filter-feeders, these bivalves are particularly sensitive to algal toxins that they accumulate. Indeed, the net augmentation of the frequency of harmful algal bloom regularly forces health authorities to pronounce closures of commercial and recreational shellfish harvesting.

Red tide in Elorn Bay in Brittany (France, 2004).

A model based on Dynamic Energy Budget (DEB) theory (Kooijman, 2010)[1] was developed to predict growth and reproduction of *Crassostrea gigas.*



This type of model has already allow to describe kinetics of accumulation and detoxication of xenobiotics such as PCB in the hake (Bodiguel *et al.*, 2009)[2] or in the sole (Eichinger *et al.,* 2010)[3].

- The objective of this project is to couple this model with a paralytic shellfish toxin (PST) module that will describe kinetics of accumulation and detoxification of these toxins in the oyster body.

ACCUTOX Project

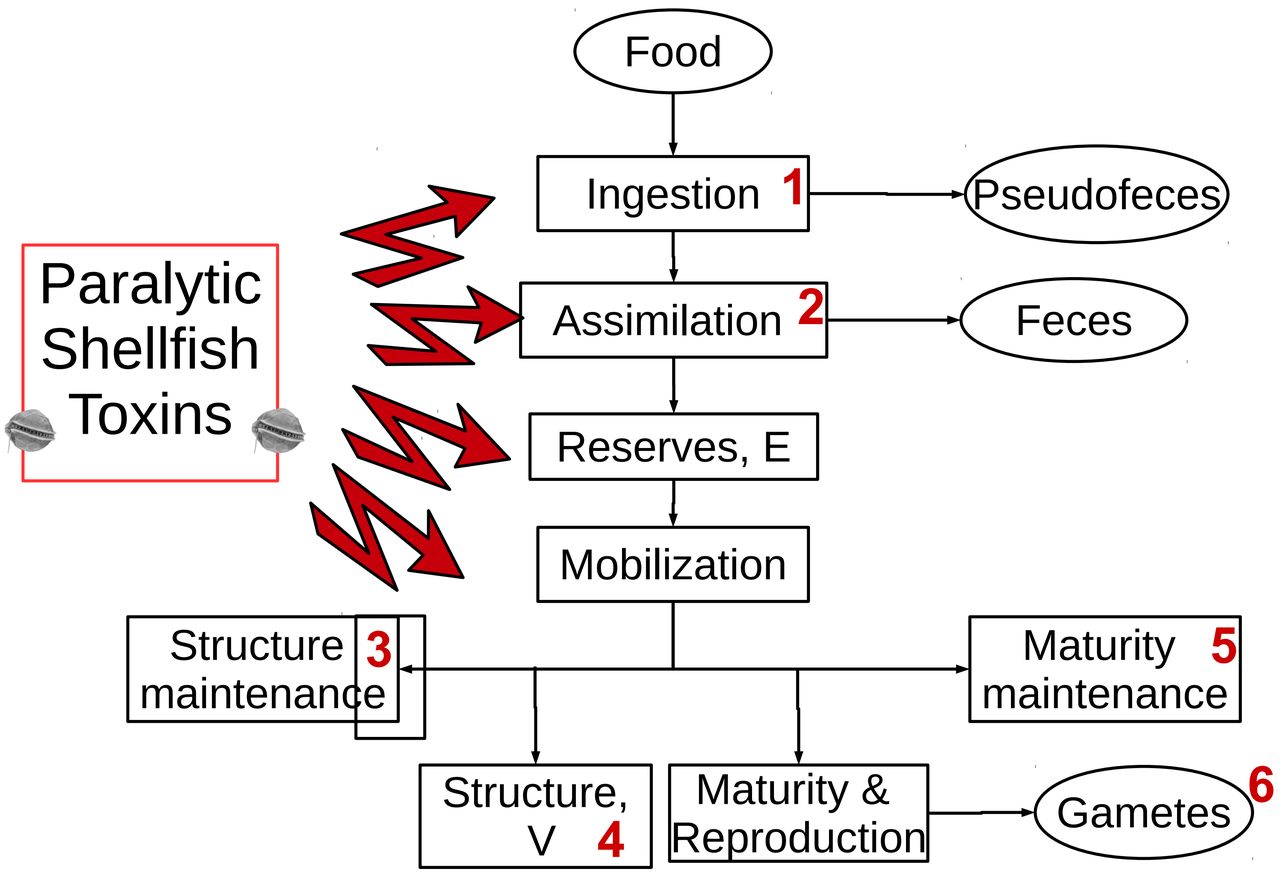
→ This thesis is integrated in the project ACCUTOX which aims to characterize factors determining paralytic toxin accumulation by the oyster. With a collaborating work, the program will be able to deal with this issue in his overall, from genomics to physiology through social incidence studies. The present project, dedicated to the modeling of toxification/detoxification kinetics constitutes a task of the ACCUTOX project

Objectives

→ Understand and describe physiological impacts induced by paralytic shellfish poisoning synthesized by micro-algae (e.g. *Alexandrium minutum*) on *Crassostrea gigas*

→ Develop a DEB based model that will describe precisely the accumulation and detoxification process of paralytic shellfish toxins.

Impacts of PST on DEB variables



1 ***e.g.*** **Modification of feeding behaviour (filtration rate and valve activity[4]) and subsequently on food intake rate**

2 **Planned experiment to test the impact of toxicity on assimilation**

3 ***e.g.*** **Overproduction of mucus [5] and modification of the ventilation periods**

4 **Reduced growth in *Ruditapes philippinarum* in Li *et al.,* 2002 [6]. Planned experiment to test this hypothesis in *C. gigas***

5 ***e.g.*** **Inflammatory reaction, increase in the number and activity of hemocytes [5]**

6 ***e.g.*** **Decreased mobility and ATP content of gametes [5]**

References

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[4] Tran D., Haberkorn H., Soudant P., Ciret P., Massabuau J.C., Behavioral responses of Crassostrea gigas exposed to the harmful algae *Alexandrium minutum* Aquaculture 298 (2010) 338–345

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