Assessing bivalve's distribution as a response to phytoplankton/inorganic suspended particles ratio in the Belgian Coastal zone: a trait based model.

MARTINI E[1], DESMIT X[1], LACROIX G[1], KERCKHOF F[1], DEGRAER S[1],

[1]*MUMM, Royal Belgian Institute of Natural Sciences Belgium*

Phytoplankton is generally assumed as the most important source of organic matter for bivalves in many estuaries and coastal zones. In particular, filter feeding bivalves pump seawater through their gills to retain suspended particulate matter (SPM), including inorganic particles. Since phytoplankton has a high energetic value, the higher its fraction in SPM, the higher the quality of the filtered material. In the Belgian coastal zone (BCZ) SPM concentration features a gradient from East to West due to a high turbidity area in front of the port of Zeebrugge. It has been observed that when SPM concentration increases, its organic fraction (phytoplankton plus detritus) decreases [*Fettweis et al*., 2008] as it becomes more and more diluted in the inorganic material: this implies a decrease in food quality for filter feeders.

In this study we show the development of a trait based model (TBM), which main goal is to find a mechanistic explanation to the bivalve's distribution in BCZ.

To capture enough food, the bivalves must filter high amount of SPM without clogging. Gills and palps are the organs responsible for two different food harvesting functions: particles filtration and particles selection respectively. Several studies have demonstrated that these two functions are related to the sizes of the organs [*Milke and Ward*, 2003]. A trade-off between the two functions is introduced, assuming that a fixed fraction of energy is invested in the food harvesting apparatus (gills plus palps), but that each species allocate it differently between the organs. Therefore the two biological functions for food harvesting can be reduced to one trait: the gills/paps mass ratio. The following hypothesis is formulated: bivalve communities in the BCZ are firstly structured by food availability and quality, i.e. SPM concentration and organic fraction of SPM, and the trait determining the fittest species is the gills-to-palps mass ratio.

This concept was designed into equations describing bivalve's growth, and then translated into a simple box model simulating the BCZ biogeochemical conditions. The gills-to-palps ratio allowing the fittest species to grow under varying conditions are compared with in situ measurements of gills-to-palps ratios in the BCZ. To our knowledge this is the first TBM for organisms other than primary producers

REFERENCES

Fettweis M., Van den Eynde D., Maggi F., 2008. Monitoring en Modellering van het cohesieve sedimenttransport en evaluatie van de effecten op het mariene ecosystem ten gevolge van bagger en stortoperatie (MOMO). Activitei rapport 1. Behersenheid van het Mathematisch Model van de Noordzee (BMM).

Milke LM., Ward E.J., 2003. Influence of diet on pre-ingestive particle processing in bivalves: II. Residence time in the pallial cavity and handling time on the labial palps. *J. Exp. Mar. Biol. Ecol.*, 293(2), 151-172.