

## E. Flemish-Dutch collaboration

1. Interview with Prof. Dr. C. Heip
2. Carbon and nitrogen cycling in the Scheldt estuary: the major players, long term changes and an integrated view
3. N and Si cycling in freshwater tidal marshes
4. Diversity-productivity relationships in estuarine microphytobenthos
5. The structure and functional roles of tidal flat meiobenthos

### 1. Interview with Prof Dr. C. Heip



## **International collaboration**

**Carlo Heip, initiator and coordinator of the VLANEZO programme that merged with LOICZ in 2002. He describes the origins of the LOICZ-VLANEZO programme.**

Heip: Vlanezo arose from the bordering countries' policy of the European Union. The then Dutch Education minister, Jo Ritzen, initiated and funded two collaborative ventures for sea research. One was NEBROC (Netherlands Bremen Cooperation), and the other was VLANEZO (Flemish-Dutch Cooperation in Coastal Research). The research was managed by NWO (Netherlands Organisation for Scientific Research). VLANEZO focussed on the estuary that the Netherlands and Belgium share, the 160 kilometre-long estuary of the Schelde. The research covered the unique tidal area from Vlissingen to Ghent with tidal differences of up to seven metres at Antwerp and still two metres at the freshwater head of the estuary in Ghent. We wanted to understand the ecology of the estuary and especially to understand the ecological effects of the intertidal flats and the salt marshes.

*In the 1990s the Schelde was regularly in the news and not just because of the silting problem and the accessibility of Antwerp ...*

There were various problems such as chemical and organic pollution: the untreated wastewater from Brussels was then being discharged into the Schelde via the Zenne tributary. And on top of that there was the dossier about the deepening of the Westerschelde. We examined this from a biomorphological viewpoint, in other words: how do the various aspects affect each other? How do the habitats develop? How does the nitrogen-carbon cycle affect the system? At the start of the twenty-first century, the Schelde was a very damaged ecosystem. The freshwater part up until the border was a stinking anoxic water mass due to the organic pollution. In the saltwater part from the border onwards, the system was less damaged because the anoxic water was diluted with salty seawater. Since the construction of two water treatment plants in Brussels the situation in the Schelde has improved considerably.

*What exactly could be investigated in a river that was so strongly polluted?*

In the period that the river was anoxic, its ecology was dominated by nitrification, a process due to bacteria that use ammonium instead of the sun as an energy source. These bacteria oxidised ammonium into nitrite and nitrate using considerable quantities of oxygen in the process. We made an extensive study of that chemosynthesis process. The results revealed one advantage of that polluted situation: easily biodegradable organic material and carbon dioxide were removed from the system in a natural process. Now that the anoxic conditions scarcely apply, this no longer occurs.

*And which research focussed on the Westerschelde?*

A lot was already known about the macrofauna in that area. However, a gap in our knowledge were the microscopic organisms such as nematodes and diatoms. Diatoms, in particular, have a far from easy existence in the Schelde because the river is so turbid. At low tide, they

photosynthesis as can be seen from the brown colour of the mudflats. These two studies have led to an enormous increase in our knowledge about organisms in the mudflats. They were found to be a large source of organic material. Birds can benefit from that at low tide and crabs and fish at high tide. They are, in effect, small factories of organic material.

*In recent years (during the last Balkenende Cabinet) the Flemish-Dutch conflict about the deepening of the Westerschelde frequently made the news. Emotions often ran high.*

Yes, there are proponents and opponents, but what are the facts? We barely know what the effects of deepening the Schelde are. Sediment transport is very difficult to understand and to model. The distance between Vlissingen and Antwerp is about 100 kilometres and some 10 million cubic metres of sediment is being dredged each year. If the process cannot be managed then the Schelde will silt up and Antwerp will lose its harbour function. One thing is certain: deepening the Schelde has created an imbalanced ecosystem. The Schelde is basically too deep for its width. We must examine the consequences of the third deepening of the Schelde, that is just finished now (2011) and where the geomorphological equilibrium point lies. One prediction is that the estuary may change from a multi channel system to a single channel system and that the morphology will be completely transformed. A Schelde without salt marshes and mudflats is beneficial for shipping but not for fish and for wildlife. That would mean that the objectives of Natura 2000 would not be achieved. Wrong decisions will have major economic and ecological consequences.

*And then of course there is the coastal defence, the number one priority of water policy.*

We have discovered that the plants, and in some cases the animals, are capable of stabilising sediments so that erosion is counteracted. A lot of research has been done on the formation of new salt marshes. A dike is strengthened if it has a salt marsh in front of it and that costs nothing. Islands of *Spartina* are the first stage of salt marsh formation. Over a period of several decades these islands develop into a new salt marsh that comes to lie in front of the old salt marsh. We have discovered that *Spartina* cannot grow at location with lugworms as these worms eat all the seeds. The *Spartina* capture sediments enabling the salt marshes to grow. You get a coastal defence free of charge and without any effort.

*Via VLANEZO and LOICZ a lot of research has been done on the Schelde river as an estuary. That can contribute to a responsible policy for Flanders and the Netherlands.*

VLANEZO is first and foremost a fundamental research programme to gather knowledge about processes. It is unclear what that knowledge contributes to societal processes because policy makers often have little understanding of ecology and it does not impact their decisions very much. On the other hand, the political process to prepare for the third deepening of the Schelde is an example of how it can be done. Here there was a good relationship between the scientists and the policy makers. From a strategic viewpoint, the research has also had a positive effect because both the Netherlands and Flanders successfully managed to collaborate in the work. We will experience far more of this worldwide as many problems are transnational and that is certainly the case with water. We must learn to work from such a transnational perspective as that is what Europe is about.