Environmental Quality of Cávado Estuary (NW PORTUGAL)

Application of AMBI Biotic Index

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INTRODUCTION

Estuaries play a crucial role in local economy. At a global scale, estuaries are coastal ecosystems which are known to suffer high anthropogenic pressures and impacts(1).

Benthic macroinvertebrate communities have some characteristics that make them excellent bioindicators of ecosystem health: they are abundant in estuaries; they have a low rate of dispersion and a relatively long life cycle; the different *taxa* develop different responses or sensitivities to environmental changes; they are involved in remineralisation of organic sediments and are an important link to higher trophic levels(2).

Cávado estuary is included in a coastal protected area, the PNLN - Parque Natural do Litoral Norte (North Littoral Natural Park). It is used by local fisherman and also by sport fisherman and other aquatic leisure activities. It is the end of Cávado river basin and by that it is influenced by some industrial plants, extensive agriculture, cattle farms, urban effluents and sewage treatment plants. All human activities have influenced the environmental quality of this small estuary along the years. Evaluating and monitoring the Cávado macrobenthic community is essential for the proper management of the biological resources and the estuarine habitat.

AIMS

- Assess the environmental quality of Cávado estuary;
- Assess the status of the disturbance of the ecosystem by applying AZTI Marine Biotic Index - AMBI;
- Evaluate the ecological quality parameters of Water Framework Directive (WFD) by calculating the M-AMBI index.

METHODS

Macrobenthos were collected with a 40 cm wide dredge at five sampling stations (E1, E2 and E3 located in the margin of muddy banks and E1a and E3a in the middle of the estuary channel) (Figure 1). Sampling took place over two years between February 2009 and September 2010.

Figure 1 – Sampling stations at Cávado estuary.

Samples were screened and benthic organisms sorted, counted and identified to the lowest possible *taxa*. Using the software AMBI(2), we calculated the AMBI - AZTI Marine Biotic Index which assigns a classification of system disturbance based on the sensitivity of sampled *taxa*. Also the M-AMBI index was calculated, which classifies the status of the ecological system in accordance to the guidelines established by the WFD.

RESULTS AND DISCUSSION

During the sampling period 11434 macroinvertebrates were collected belonging to 37 *taxa*. Species influencing the index were, *Corophium multisetosum* (Figure 2), *Leptocheirus pilosus*, *Carcinus maenas*, *Echinogammarus marinus* (Figure 3), *Sphaeroma serratum* (Figure 4), *Neomysis integer* and *Echinogammarus stoerensis*.

Figure 2 – *Corophium multisetosum*

Figure 3 – *Echinogammarus marinus*

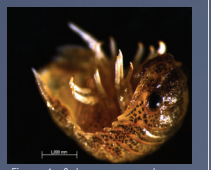

Figure 4 – *Sphaeroma serratum*

Group III (species tolerant to an excess of organic matter) was the dominant Ecological Group (EG) at all sampling stations (>64%). Group I (species very sensitive to environmental disturbance) was higher at E1 (25%). There were no *taxa* assigned to the EG IV. March 2009 recorded the higher percentage of the EG V (opportunistic species) (28%) and April 2010 the higher percentage of the EG I (56%). Along the estuary channel, AMBI biotic index was 2 at all stations E1, E1a, E2, E3 and E3a indicating "slightly disturbed" communities (Figure 5). In station E3 the proportion of not assigned *taxa* was higher than 20%, so the results of the analysis should be evaluated with care(3). Over the study period there were no relevant variations of AMBI values. In February and March 2009 the proportion of not assigned *taxa* was higher than 20%, so the results of the analysis should be evaluated with care(3).

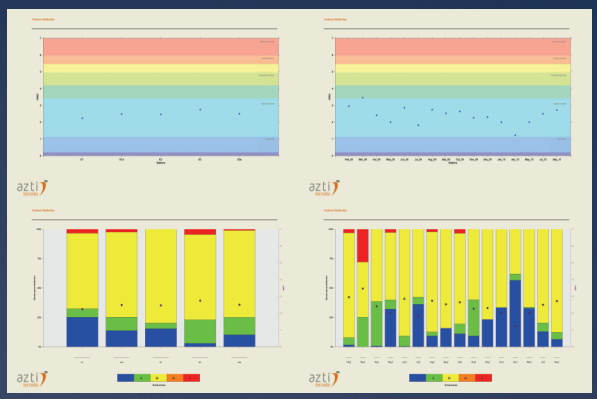

Figure 5 - Distribution of ecological groups and values of AMBI biotic index by sampling station and sampling month at Cávado estuary.

The values of M-AMBI index, which follows the criteria of the WFD, show a variation between "moderate" and "high" ecological quality of this estuary, over the period and space studied (Figure 6). These values are higher than those recorded in the estuaries of Lima(4) and Douro(5), two estuaries too much anthropomorphized and disturbed.

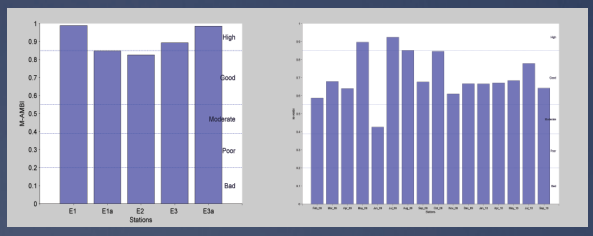

Figure 6 - Distribution of M-AMBI index and the respective ecological status of Cávado estuary.

If we do not exclude from the analysis Crangonidae and Palaemonidae families(3), the stations E3 and E3a modifies the value of AMBI from 2 to 1, keeping unchanged the remaining values. Also the sampling method, not very efficient for annelids, could produce higher values for the AMBI index, witch means higher perturbations level.

CONCLUSION

During the studied period, the AMBI biotic index obtained for Cávado estuary was 2 corresponding to "slightly disturbed" communities.

According to the criteria of the WFD this estuary shows a status that ranged from "high" to "moderate" ecological quality.

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