First evaluation of the ecological quality of the Ave estuary based on the analysis of macrobenthic community through the AMBI index

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* Ave rises in Serra da Cabreira (≈1200 m)

* Extension of ≈94 km to the mouth

* Average flow in mouth of Ave River is 40 m³/s

* River basin covers ≈1400 km²

* Most important tributary’s: River Este and River Vizela

* Located between Cávado River Basin and Leça River Basin
* Urban development of Ave valley

* Industry of Ave valley
Ave Estuary

Integrated in:

* Paisagem Protegida Regional do Litoral de Vila do Conde (2009)

Management plans:

* Plano Director Municipal de Vila do Conde (1995)
* Plano de Ordenamento da Orla Costeira de Caminha-Espinho (1999)

Macrobenthic fauna:

* There are no published data
* Biological richness very low, result of poor phisico-quimical and biological conditions of river water for many years.
Ave river estuary (north of Portugal) is heavily modified with concrete banks, a shipyard, a fishing harbor and a leisure harbor. Several industries are located in the middle and lower parts of its river basin, which together with domestic effluents and agriculture/livestock leachates are responsible for poor water quality.
* Make the first approach to the study of the macrobenthic community of Ave estuary to evaluate the ecological quality of this system, with the application of the AMBI index

* Establish a baseline for future monitoring programs in the Ave estuary

* Create scientific knowledge to support conservation and management of estuary
Fieldwork

* 64 samples were collected

* 7 sampling points

* In 5 months (between 2010 and 2012)

* Collect the superficial sediment layer using a core sampler (Ø 84.5mm)

* Samples fixed and stained with 4% formalin + Rose Bengal
Methods

Laboratory

* Identification and counting of invertebrates

* Biodiversity indexes calculation

* MultiDimensional Scaling analysis - MDS

* Analysis of similarity – ANOSIM

* Correlation matrix between biological parameters and sediment size fractions
AZTI Marine Biotic Index (AMBI)

- Designed for the study of benthic macroinvertebrate communities, assessing the ecological quality in coastal environments;
- Software that includes more than 6500 taxa (last updated May 2012);
- Assign to each species a particular Ecological Group (EG) according to a gradient of sensitivity to disturbances;
- Calculates the biotic index and graphically represents all data;
- Proposes a classification of level of disturbance of a coastal ecosystem by the representation of health of benthic macroinvertebrate community;

**Ecological Groups**

- EG I - Very sensitive species
- EG V - Opportunistic species of 1st Order

**AMBI Biotic Index**

- 0 - Undisturbed system
- 7 - Heavily disturbed system
**Results**

15 taxa
12243 ind.
64 samples

**Abundance**

- Tubificidae 165715,3 ind./m²
- Hediste diversicolor 316,337 g/m²

**Biomass**

<table>
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<th>Index</th>
<th>Sampling Points</th>
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<tr>
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<td>Shannon-Wiener Diversity</td>
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<td>Eequitability of Pielou</td>
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Results

<table>
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<th>Groups</th>
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<th>Mean density ind./m²</th>
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<td>C</td>
<td>2; 7</td>
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MDS analysis
Similarity between density data of sampling points

ANOSIM (R = 0.98 p = 0.01)

Correlation between density and silt (0.050 – 0.100mm)

(R = 0.80 N=7 p < 0.05)
Results

Assignment of ecological groups

- Ecological group V (opportunistic species and less sensitive to disturbances) was the most abundant in all sampling sites (>67.7%)

- Due to high percentage of TUBIFICIDAE

- *Taxa “not assigned”* (<10.5%) lower than (20%) recommended by Borja et al. (2004)
Results

AMBI Biotic Index

Sampling stations

- AMBI index range between 5 - 6
- Due to high percentage of *taxa* of Ecological Group V
- AMBI index Indicates a “Heavily disturbed” system
Conclusions

* AMBI index classified the Ave Estuary as “Heavily disturbed”

* The value of Shannon diversity index (0.757) is approximated to the value recorded in Douro estuary (0.734) (Mucha et al. 2004)

* We established a baseline for future studies and monitoring programs in Ave Estuary and for the evaluation of its management and conservation
Thanks for Your Attention