



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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River Ave Basin

- * Ave rises in Serra da Cabreira (≈ 1200 m)
- * Extension of ≈ 94 km to the mouth
- * Average flow in mouth of Ave River is $40 \text{ m}^3/\text{s}$
- * River basin covers $\approx 1400 \text{ km}^2$
- * Most important tributary's: River Este and River Vizela
- * Located between Cávado River Basin and Leça River Basin



Mapa da bacia hidrográfica do rio Tâmega, apresentando a rede hidrográfica, pontos de amostragem (B1-B17, B26), estações de tratamento (L1-L7), e localidades principais (Braga, Guimarães, Vila do Conde, etc.).

* Industry of Ave valley

Ave Estuary

Integrated in:

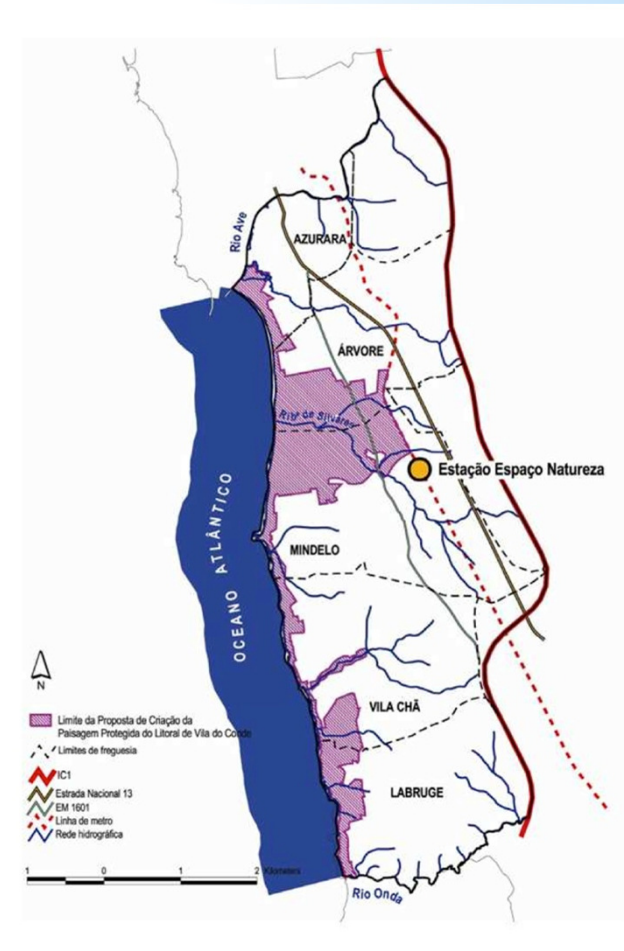
- * Paisagem Protegida Regional do Litoral de Vila do Conde (2009)

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 physico-chemical and biological conditions of river water for many years.



Ave Estuary

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.



Aims

- * 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



Methods

Fieldwork

- * 64 samples were collected
- * 7 sampling points
- * In 5 months (between 2010 and 2012)
- * Collect the superficial sediment layer using a core sampler ($\varnothing$ 84.5mm)
- * Samples fixed and stained with 4% formalin + Rose Bengal



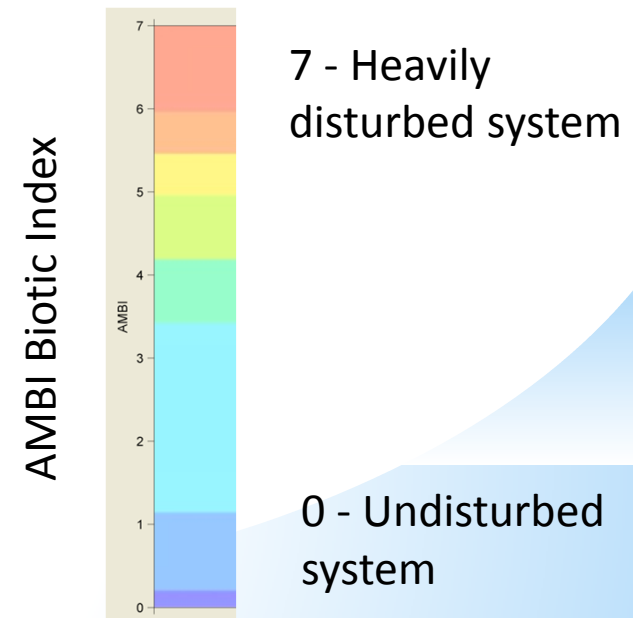
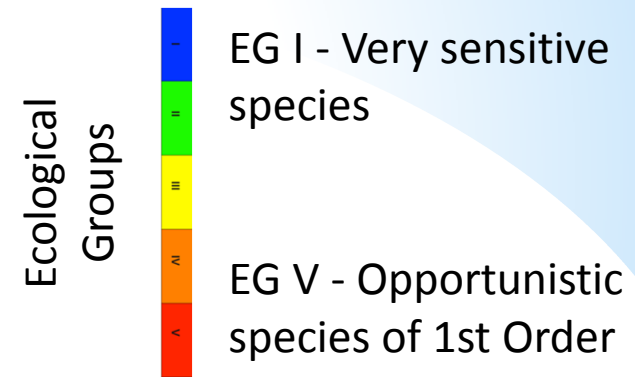
Methods

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)

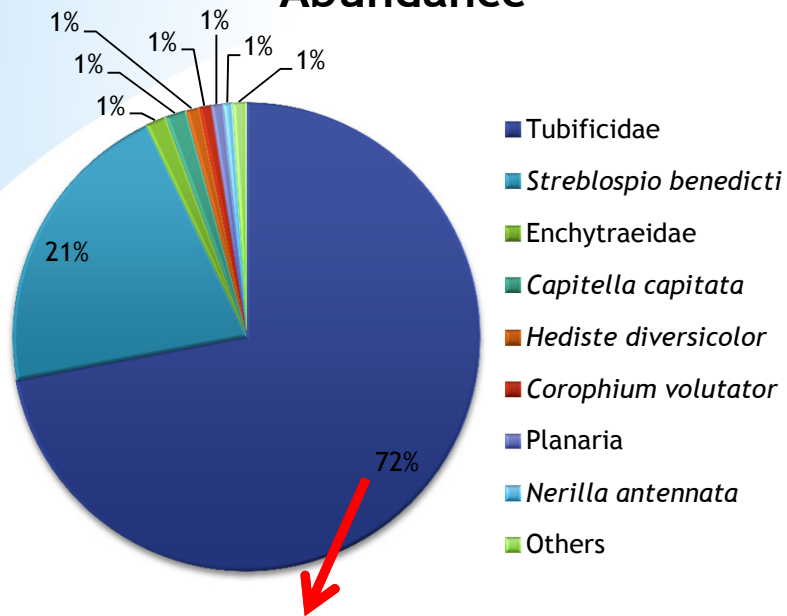
- Designed for the study of benthic macroinvertebrate communities, assessing the ecological quality in coastal environments;
- Software that includes more than 6500 *taxa* (last updated May 2012);
- Assign to each species a particular Ecological Group (EG) according to a gradient of sensitivity to disturbances;
- 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;



Results

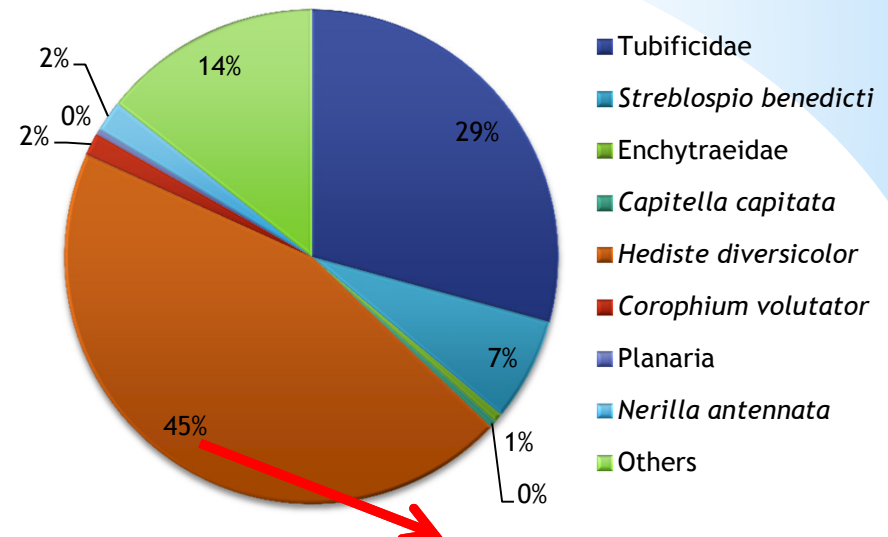
15 taxa
12243 ind.
64 samples

Abundance



Tubificidae 165715,3 ind./m²

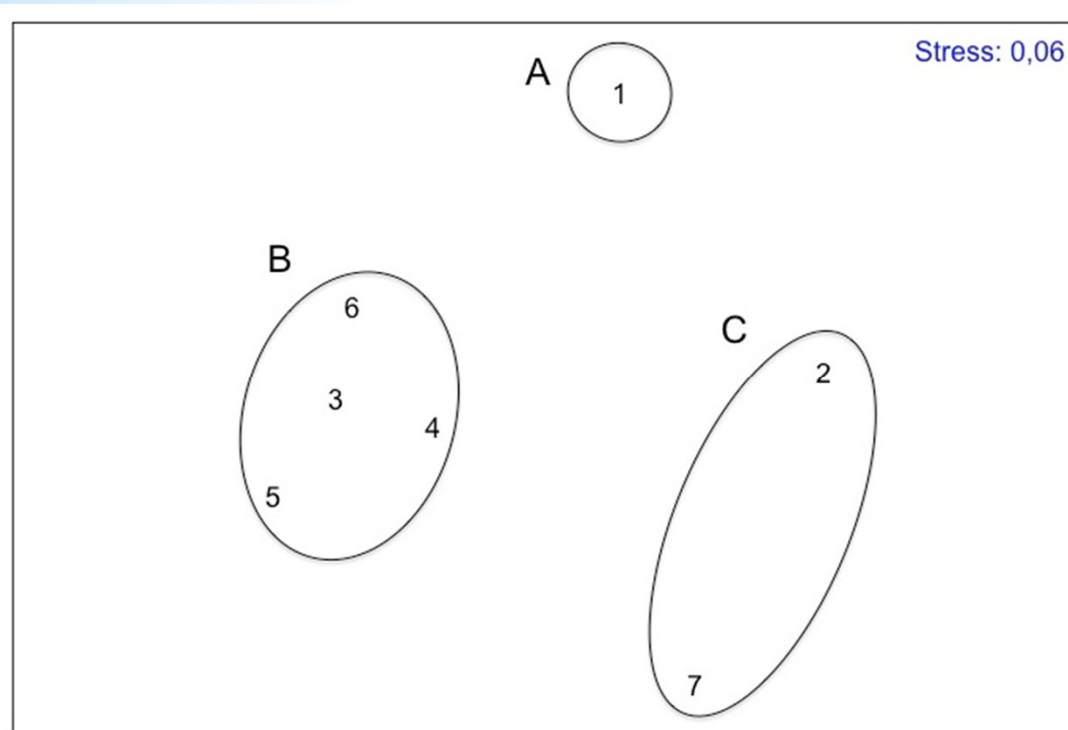
Biomass



Hediste diversicolor 316,337 g/m²

Index	Sampling Points						
	1	2	3	4	5	6	7
Shannon-Wiener Diversity	0.874	0.346	0.696	0.614	0.748	0.970	1.050
Eequitability of Pielou	0.420	0.193	0.389	0.316	0.360	0.422	0.456

Results



MDS analysis
Similarity between density
data of sampling points

ANOSIM ($R = 0.98$ $p = 0.01$)

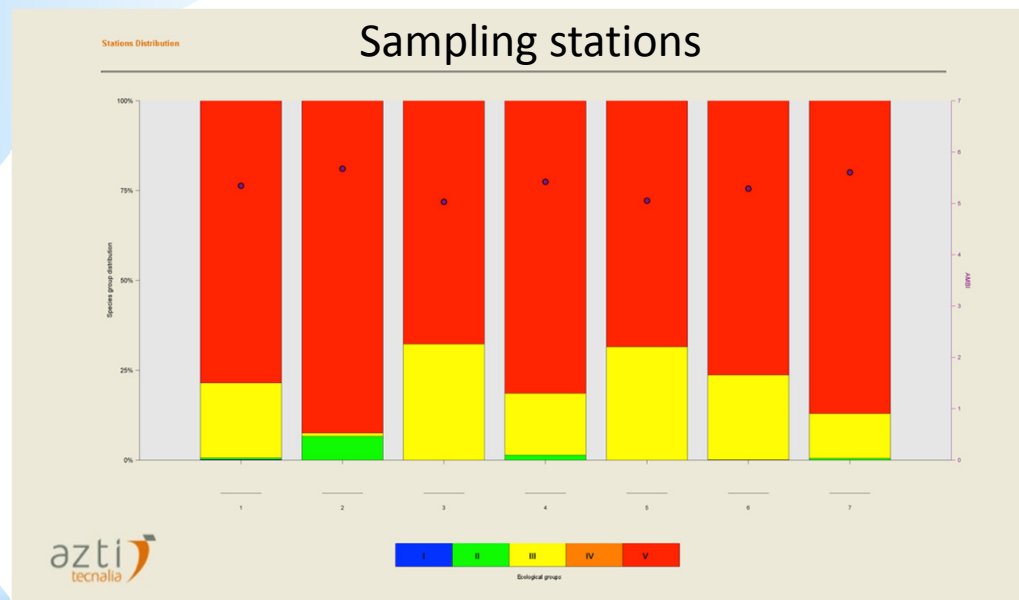
Correlation between density
and silt (0.050 – 0.100mm)

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

Groups	Sampling Points	Mean density ind./m ²
A	1	13826.7
B	3; 4; 5; 6	32541.8 – 63513.6
C	2; 7	19143.3 – 19402.0

Results

Assignment of ecological groups



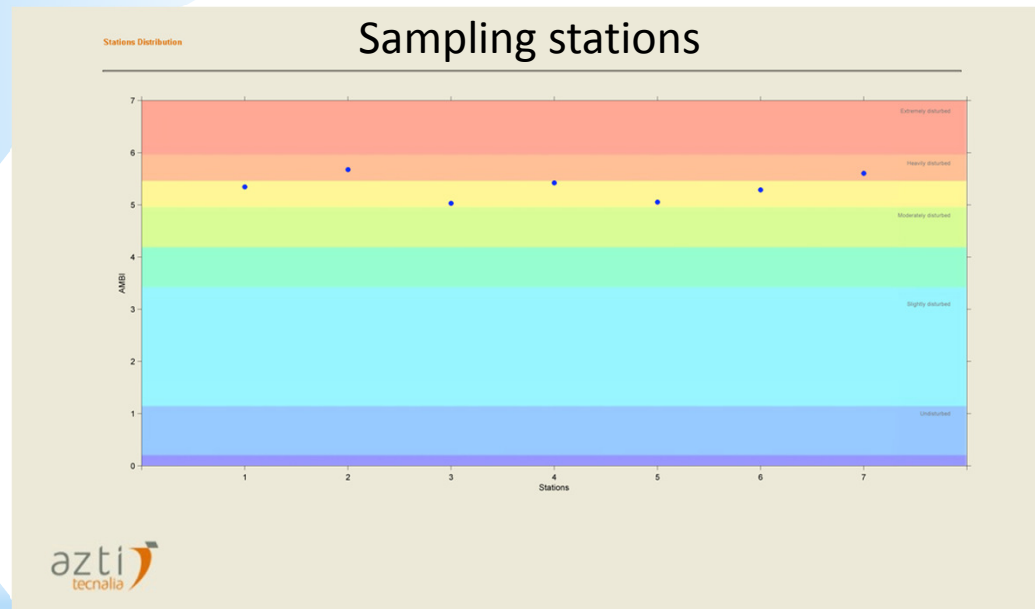
- Ecological group V (opportunistic species and less sensitive to disturbances) was the most abundant in all sampling sites (>67.7%)

- Due to high percentage of TUBIFICIDAE

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

Results

AMBI Biotic Index



- 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

