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Advanced monitoring of South Portugal water bodies towards WFD.

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ABSTRACT

The challenge on implementation of the EU Water Framework Directive (WFD) fosters the development of new monitoring methods and approaches. It is now commonly accepted that the use of classical monitoring campaigns in discrete point is not sufficient to fully assess and describe a water body. Due to this the WFD promote the use of modelling techniques in surface waters to assist all phases of the process, from characterisation and establishment of reference conditions to identification of pressures and assessment of impact. The work presented in this communication is based on these principles. A classical monitoring of the water status of the main transitional water bodies of Algarve (south of Portugal) is combined with advanced in situ water profiling and hydrodynamic, water quality and ecological modelling of the systems to build a complete description of its state. This approach extends spatially and temporally the resolution of the classical point sampling. The methodology was applied during a 12 month program in Ria Formosa coastal lagoon, the Guadiana estuary and the Arade estuary. The synoptic profiling uses an YSI 6600 EDS multi-parameter system attached to a boat and a GPS receiver to produce monthly synoptic maps of the systems. This data extends the discrete point sampling with laboratory analysis performed monthly in several points of each water body. The point sampling is used to calibrate the profiling system and to include variables, such as nutrients, not measured by the sensors. A total of 1427 samplings were performed for physical and chemical parameters, chlorophyll and microbiologic contamination in the water column. This data is used to drive the hydrodynamic, transport and ecological modules of the MOHID water modelling system (www.mohid.com), enabling an integrate description of the water column.
The system assessment was completed by analysis in the benthonic compartment. Sediment sampling using 25 cm X 4 cm PVC corers was performed in 24 stations during winter and summer. The samples were analysed for physical and geochemical properties. The state of macro invertebrate and marine grass communities was also assessed. This part of the study was confined to selected regions of the three water bodies to evaluate the impact of waste water discharges in the systems. The macro invertebrate community was analysed for taxonomic composition, relative abundance, specific and taxonomic diversity, biomass, RNA/DNA index and nematode/copepod ratio. The marine grass *Zostera noltii* and the tidal flat species *Spartina maritima* e *Sarcocornia perennis* were also analysed in selected regions close to WWTPs. Leave length, Epigeal and hypogeal biomass was determined to characterize the communities. The reproductive effort was evaluated by the ratio between reproductive flowering and total flowering (reproductive + vegetative).
The results show that globally the three water bodies have a good trophic status. Eutrophication symptoms are not generalised. Due to physical transport and dispersion, nutrient enrichment is not the only factor limiting growth. This means that only some confined regions of the system can be endangered by point and diffuse sources of pollution. The spots receiving WWTP discharges were analysed with mode detail. The results show that the microbiologic impact of these discharges in Ria Formosa and Guadiana Estuary are confined to a region between 500 m and 1 Km along the main channels close to the discharge points. In the Arade estuary the system is microbiologically impacted in a more uniform way. Results show evidences that the pollution sources are not confined to WWTP discharges in Arade estuary. The benthonic studies corroborate these findings.