

**Jesus, J. M., BORGES, M.-T., Calheiros, C., Castro, P.M.L., 2011. Constructed Wetlands for freshwater and saline aquaculture wastewater treatment: a microcosm experience. IV FIRMA - Fórum Ibero-Americano dos Recursos Marinhos e Aquacultura. Viana do Castelo, 27-29 Outubro.**

## **Constructed Wetlands for freshwater and saline aquaculture wastewater treatment: a microcosm experience**

Jesus<sup>1</sup> J. M., Borges<sup>2</sup> M.-T., Calheiros<sup>3</sup> C. and Castro<sup>3</sup> P.M.L.

<sup>1</sup> Master in Environmental Science and Technology, Faculty of Sciences, University of Porto, Portugal.

<sup>2</sup> CIIMAR and Department of Biology, Faculty of Sciences, University of Porto, Portugal.

<sup>3</sup> School of Biotechnology (Oporto), Portuguese Catholic University, Portugal.

E-mail: JoaoJesusCTA@hotmail.com

### **Background**

Aquaculture activity produces wastewater with increasing nutrient loadings due to new intensification practices, putting environmental pressure in the vicinity of the culture farms. This discharge contributes to the degradation of receiving waters, becoming a problem that needs to be addressed. Among the different types of intensive cultivation techniques recirculation (RAS) and shallow raceways systems (SRS), especially marine, are particularly challenging due to the higher concentrations of harmful metabolites and saltwater. However, the unique characteristics of aquaculture wastewaters make their treatment costly and energy intensive. Constructed wetlands are a possible, less expensive, underexplored treatment solution even for high salinity situations, consisting of shallow channels planted with aquatic plants, relying upon biological, physical and chemical processes to treat wastewater.

### **Objectives**

This study aims to provide insights to key question marks regarding the use of constructed wetlands to treat freshwater or saline intensive aquaculture wastewater.

### **Methods**

Lab-scale prototypes (microcosms) planted with non acclimated *Typha latifolia* were designed to simulate VSSF wetlands with HRT = 7 days using expanded clay with 8 to 12.5 mm in diameter as substrate to treat either simulated freshwater or real saline aquaculture wastewater (2.4% salinity, SRS+RAS). Plant survival, growth and nutrient removal (ammonia, nitrite, nitrate and phosphate) were assessed.

### **Results**

The microcosm wetland treatment system was able to reduce by 61%, 78% and 98% the concentrations of ammonia, nitrite and phosphate, respectively, in fresh water, and by 94%; 78%, 34% and 100% the concentrations of ammonia, nitrite, nitrate and phosphate, respectively, in salt water, enabling discharge in accordance with Portuguese law. An adaptation time of 2 weeks was needed to attain the maximum removal rate for all the nutrients tested.

### **Conclusions**

*Typha latifolia* was better adapted to freshwater conditions, although being able to withstand wastewaters with salinity up to 1.2%. Despite a complete growth inhibition after 2 weeks, the plants remained viable with no compromise in treatment efficiency observed. The results achieved, although promising, need further confirmation using longer duration experiments and higher scale systems.

### **Acknowledgments**

Commercial fish farm for providing effluents.

Câmara do Porto for providing plant specimens.

### **Keywords**

Aquaculture, Constructed wetlands, Saline wastewater.