Effect of sediment quality on prawn physiology : Total ammonia effect

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Introduction

Effect of sediment quality on prawn production has been demonstrated (Delgado *and al.*, 2003).

Relations between prawn physiology and sediment characteristics are poorly documented.

The aim of this work was to study the effect of rearing pond sediment on prawn physiology and particularly in which way soil quality can induce a stress in prawns at different molt stages.

Figure 1: Aerial view of the farm

Materials and methods

Eight stations were chosen in a pond after 3 month of rearing (Fig 2 and Tab 1). Each station was sampled for analysis of soils and water.

Potential redox, pH *in situ*, water content and organic matter of the sediment were measured. Ammonia and nitrite concentrations were measured in pore water after centrifugation (2000 g during 20 min.).

pH, temperature, oxygen, chlorophyll-*a* and turbidity were measured for water.

45 prawns (24 g) / station were distributed in 3 cages (50 x 100 x 15 cm) for 48 h. Hemolymph samples were collected for C (intermolt), D1(early premolt) and D2 (late premolt) molt stages. Magnesium (Mg), glucose concentrations and osmoregulatory capacity (O.C.) were measured as indicators of stress (Boglio, 1995 ; Hall and VanHam, 1998 ; Lignot *at al.*, 2000 ; Justou and Mugnier, 2002).

Tab 1: Caracteristics of each station

Station	Characteristics	
1	Prawns live in the pond	
2	Prawns in cage on sediment	
3		
4		
5		
6		
7	Prawns in cage without sediment (Control)	

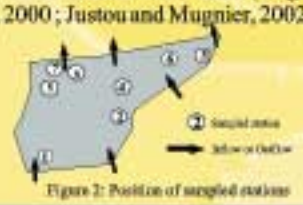
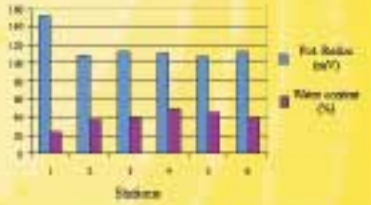


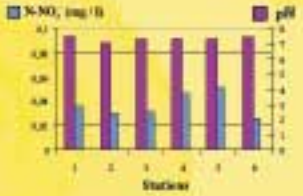
Figure 2: Position of sampled stations

Soils characteristics

Redox was similar for all stations (between 100 mV and 150 mV)

Water content : Station 1 had the lowest concentration (23 %) and station 4 presented the highest one (48 %).

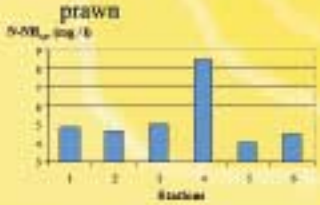




pH was similar for all stations (7.4) and its value is within a physiological range for prawn

$N\text{-}NO_2^-$: Concentrations were between 0.03 and 0.05 mg / l, below the toxic limit for prawn

$N\text{-}NH_{3,4+}$: Station 4 showed a higher level of total ammonia compared to the other stations (4.5 versus 8.5 mg / l).



Water characteristics

There was no difference between stations in term of water quality.

Prawn physiological characteristics

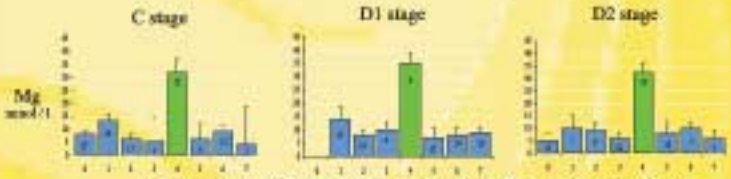


Figure 3 : Plasmatic levels of magnesium for each station in relation with molt stage. Colors shows the significant difference (number of prawns sampled are shown into bars)

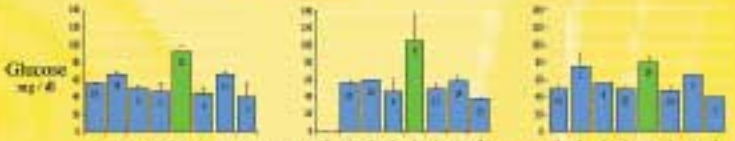


Figure 4 : Plasmatic levels of glucose for each station in relation with molt stage. Colors shows the significant difference (number of prawns sampled are shown into bars)

Figure 5 : Prawns osmotic pressure for each station in relation with molt stage. Colors shows the significant difference (number of prawns sampled are shown into bars)

An increase of magnesium and glucose levels and a decrease of O.C. indicate a stress of prawns (Boglio, 1995 ; Hall and VanHam, 1998 ; Lignot *et al.*, 2000 ; Justou and Mugnier, 2003). The stress was not molt stage dependant as all stages studied were affected.

Synthesis

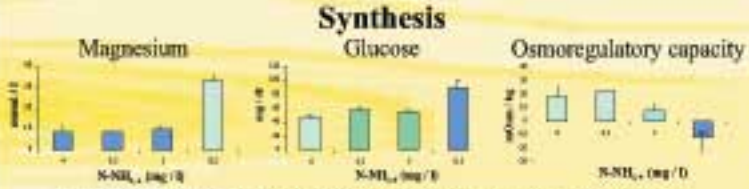


Figure 6: Variation of plasmatic Mg, glucose levels and O.C. in prawns in relation with ammonia concentration in sediment (all stages pooled) (colors shows the significant difference)

Conclusions

We observed an effect of sediment quality on prawn physiology.

This effect seems to be due to a higher level of ammonia in pore water. Justou and Mugnier (2002) have shown a stress effect in prawn (*Litopenaeus stylirostris*) when ammonia concentration in water was increased.

References

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