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**THE INFLUENCE OF ENVIRONMENTAL FACTORS ON  
THE ECO-PHYSIOLOGICAL CONDITION OF  
*Mytilus galloprovincialis*  
FROM THE ROMANIAN BLACK SEA COAST**

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## AIMS AND BACKGROUND

- The mussel *Mytilus galloprovincialis* is a widespread commercially valuable species of the Black Sea with a very good capacity of adaptation and resistance to large fluctuations in environmental factors, especially salinity.
- Field observations during the past 5 years indicated that mussel populations at the Romanian Black Sea coast have declined due to the anthropogenic impact and extreme natural phenomena (e.g. high temperatures during the summer and freezing temperatures during the winter).



*Mytilus galloprovincialis*



## AIMS AND BACKGROUND

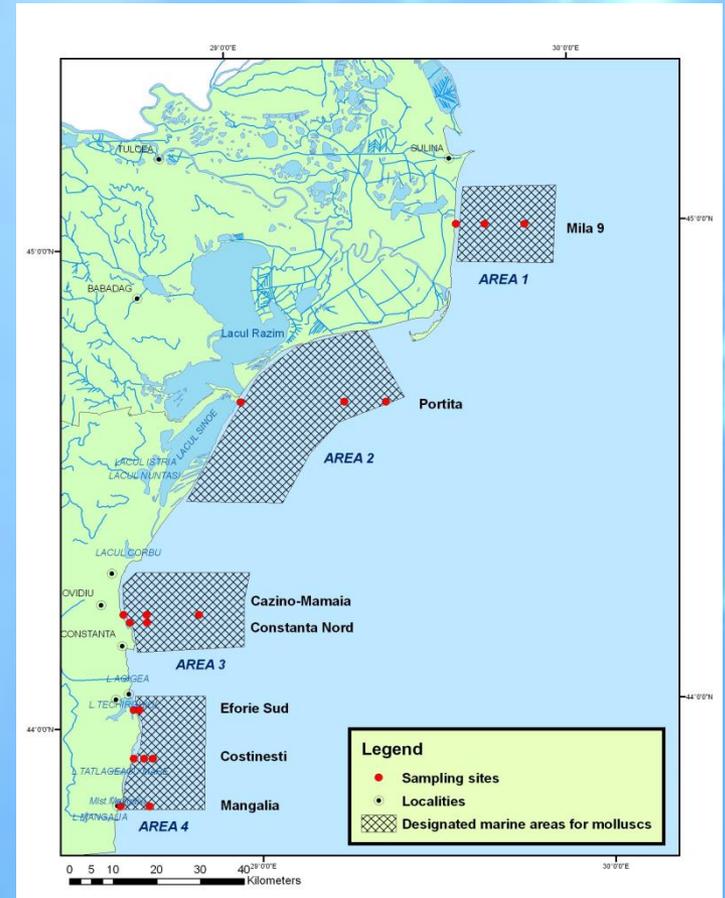
Within the requirements of implementing in Romania EU legislation is the EU “Shellfish Waters” Directive No. 2006/113/EC.

For the implementation of the EU Directives the following steps were accomplished by NIMRD:

(i) the delimitation of four favorable areas for the development and exploitation of molluscs in the Romanian coastal area (Order No. 1950/2007);

(ii) developing a monitoring system of the marine environment in the designated areas;

(iii) establish the maximal allowed limits of organohalogenated substances and heavy metals in water, sediments and marine molluscs (Order No. 1888/2007).



Map with sampling sites from designated marine areas for growth and economic exploitation of molluscs.

## AIMS AND BACKGROUND

The level of compliance for quality parameters of shellfish water with the objectives set by Directive 79/923 and HG 201/2002 and Directive 2006/113/EC with its amendments

AREA1		
YEAR	<u>SALINITY</u> % LEVEL OF COMPLIANCE	Level of compliance set - % No samples with values below the maximum allowable (MA) and / or recommended (MR)
2006	66.6	(MA and MR) -95
2007	50	
2008	0	
2009	0	
2011	50	Salinity 12-38‰ Directive No. 2006/113/EC
2012	60	

## **AIMS AND BACKGROUND**

I investigated the response of young and adult mussels under laboratory conditions to changes in salinity and temperature.

Mussels collected from shallow waters of the Romanian Black Sea coast, which are less affected by anthropogenic impact, were used in the experiments.

Prior to the experiments, the mussels were acclimated for one week in natural seawater from Black Sea, at a salinity of 15.1-16.4‰.



### **DURING THE EXPERIMENTS:**

- **The mussels were transferred in 45 liters containers with seawater (salinity 10‰, 8‰, 6‰).**
- **In each variant of salinity, I used 30 young individuals (20-40 mm) and 30 adult individuals (45-75 mm).**
- **The Control was a variant with normal seawater in Romanian Black Sea at 16.4‰ salinity and environment temperature conditions.**
- **Permanent aeration was provided.**
- **The seawater was not changed and mussels were not fed.**

## EXPERIMENTAL

**EXPERIMENT I** consisted in maintaining the young and adult mussels placed in containers filled with seawater during 15 days at lower salinities of 10‰ (Variant 1), 8‰ (Variant 2), and 6‰ (Variant 3), at constant temperature of environment conditions of spring.



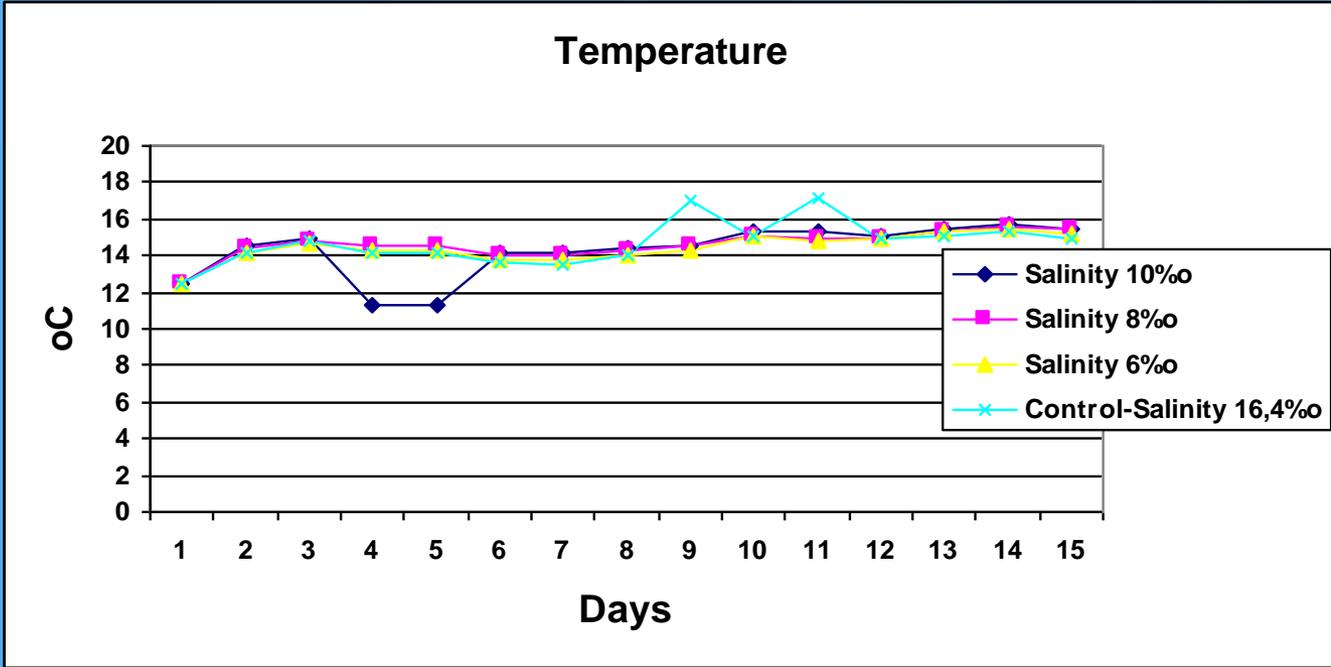
## EXPERIMENTAL

**EXPERIMENT II:** I increased progressively the temperature up to 30°C for 9 days, maintaining the young and adult mussels placed in containers filled with seawater at salinities of 10‰ (Variant 1), 8‰ (Variant 2), and 6‰ (Variant 3)



# RESULTS AND DISCUSSION

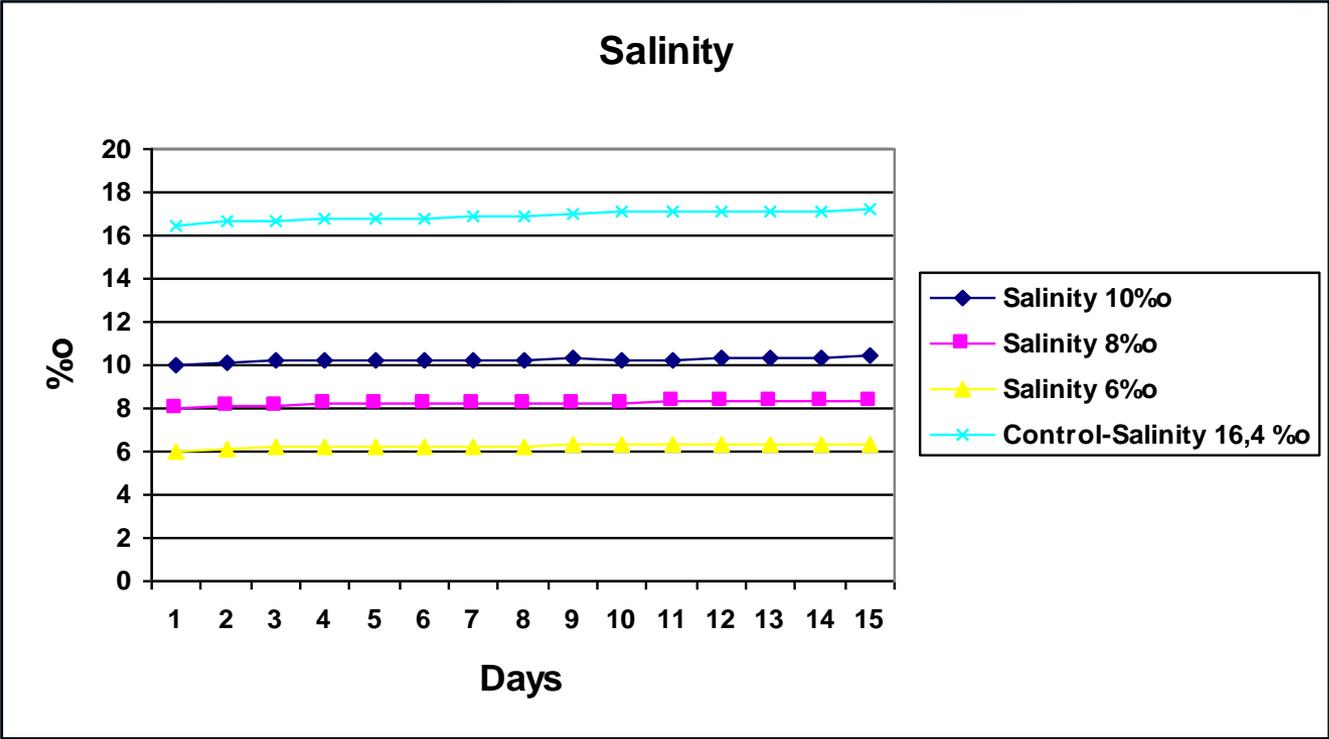
## EXPERIMENT I



During the experiment, the seawater temperature from containers had small fluctuations and it was due to the normal environmental conditions corresponding to spring, average 11.30-17.10°C.

# RESULTS AND DISCUSSION

## EXPERIMENT I



The salinity was constant in all variants during 15 days.

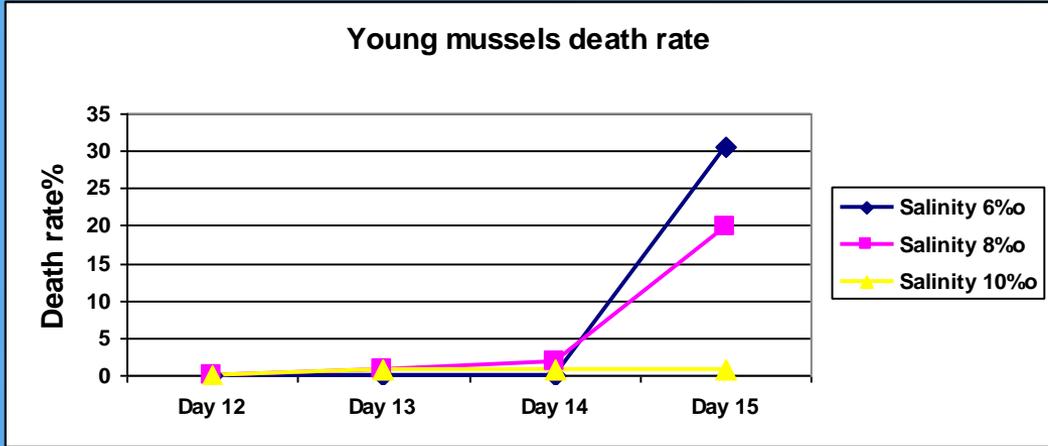
## **RESULTS AND DISCUSSION**

### **EXPERIMENT I**

- In the second day of the experiment, the ability of mussels to attach by the byssus to the substrate was:
  - 100% in variants with 10‰ salinity for young mussels and adults,
  - 10-15% for young mussels and 0% for adults in variants with 8‰ salinity,
  - 0% in variants with 6‰ salinity for young mussels and adults,
- In variants with 6‰ salinity, the shell valves were partially open, as a response to stress conditions.

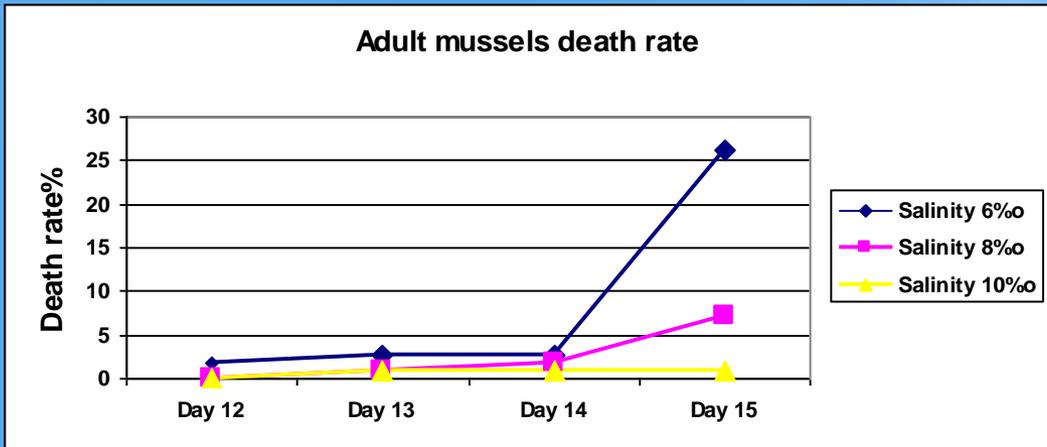
# RESULTS AND DISCUSSION

## EXPERIMENT I



The highest rate of mortality for young mussels was 30% at 6‰ salinity.

The lowest rate of mortality was 0.9% at 10‰ salinity.

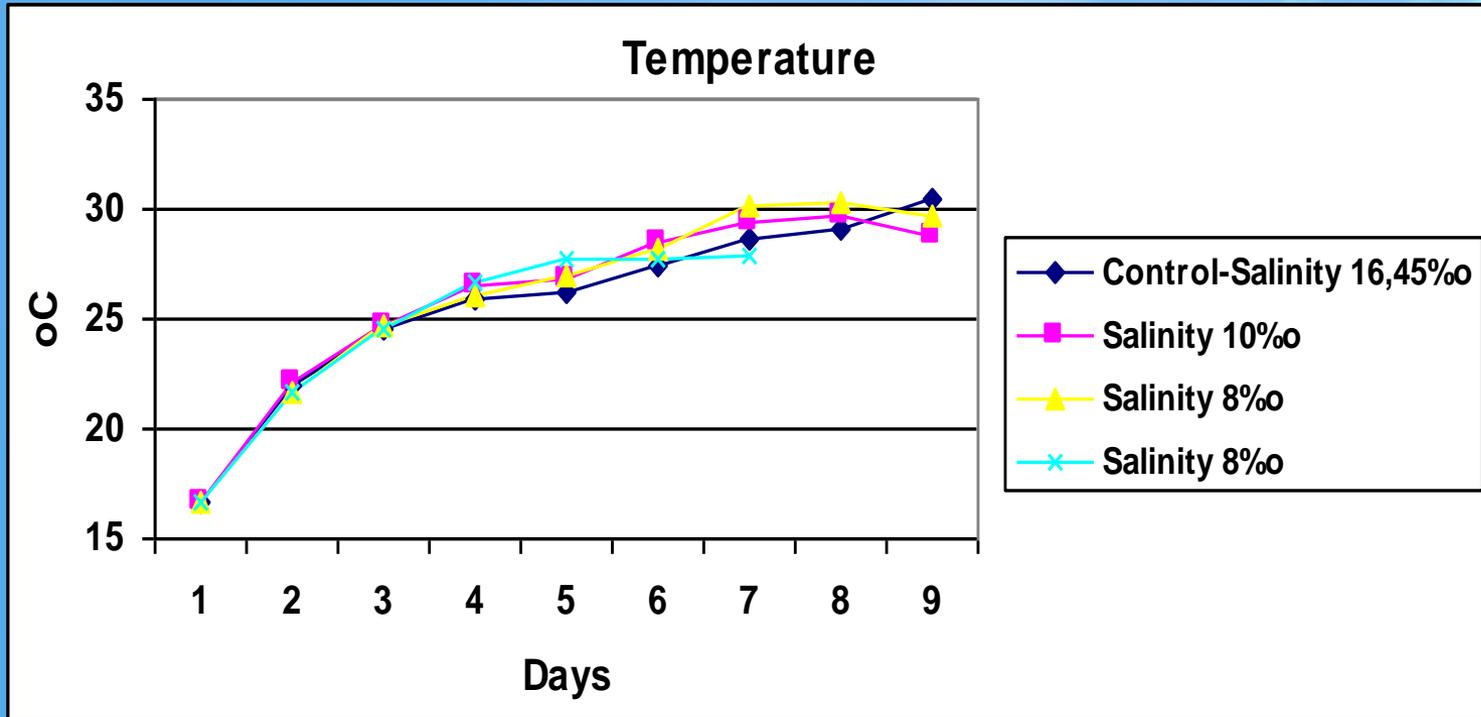


The highest rate of mortality for adult mussels was 26.1% at 6‰ salinity.

The lowest rate of mortality was 0.9% at 10‰ salinity.

# RESULTS AND DISCUSSION

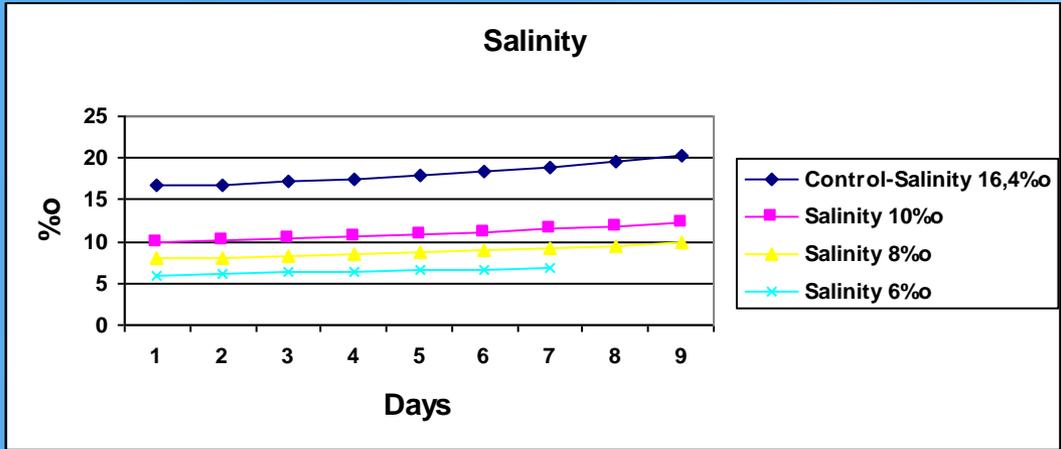
## EXPERIMENT II



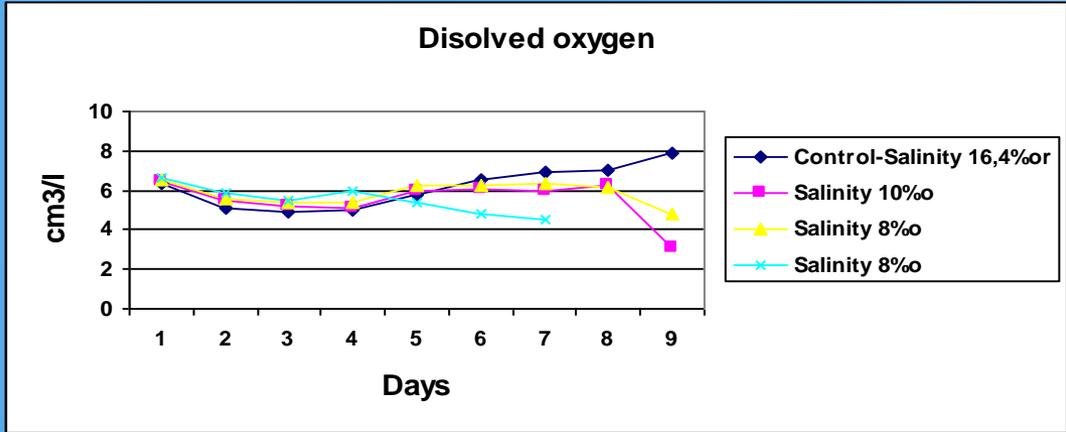
The temperature was increased progressively starting with 16.6°C up to 30°C.

# RESULTS AND DISCUSSION

## EXPERIMENT II



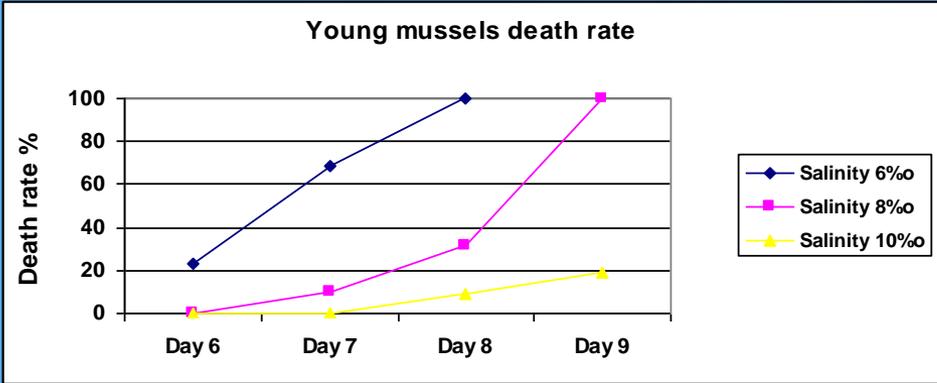
The salinity increased by 3% at the end of the experiment, due to vaporization during heating.



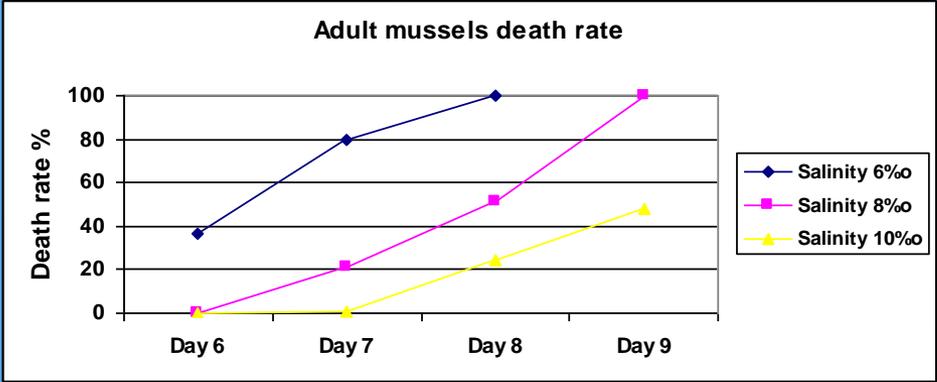
The dissolved oxygen decreased, except for Control.

# RESULTS AND DISCUSSION

## EXPERIMENT II



The salinity of 8‰ and 6‰ associated with high seawater temperature regime up to 30°C induced a 100% mortality in young and adult mussels.



Control mussels did not register mortalities at temperature over 30°C

## **CONCLUSIONS**

- **At salinities below 8‰, the mussels stop filtration of water and tightly close their shell valves.**
- **The ability to attach by byssus to substrate decreases drastically in relation to decreasing salinity and is lost at 6‰ salinity.**
- **The mortality is higher in young (30.6%) than in adults (26.1%) at 6‰ salinity and constant temperature (laboratory conditions).**
- **The 8‰ and 6‰ salinities associated with high seawater temperature regime up to 30°C induced a 100% mortality in young and adult mussels.**

**Salinity and temperature influence directly and in different ways the physiology and behavior of young and adult mussels.**



# Questions?

