



# Influence of temperature, irradiance and pH on the physiology of *Teleaulax amphioxeia*

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## Context:

• Global change is modifying coastal ecosystems and has an impact on human health and sustainability of sectors including aquaculture, fisheries and tourism. The ERA-Net project Co-development of Climate services for adaptation to changing Marine Ecosystems (CoCliME) aims at bringing together scientific knowledge with industrial end users and public decision makers.

The cryptophyte *Teleaulax amphioxeia* (Conrad) (Hill 1992):

- Is observed in coastal waters worldwide and forms **red tide**
- Is a organism source of plastids in the trophic chain of the mixotrophic and harmful genus *Dinophysis* (*T. amphioxeia* < *Mesodinium rubrum* < *Dinophysis*)
- Its chloroplasts have an importance for *M. rubrum* (and thus *Dinophysis*) photosynthesis and bloom dynamics

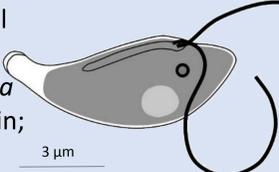
## Objective:

Determine the effect of **temperature (T)**, **irradiance (I)** and **pH** and their potential interactions on **growth rate**, **Fv/Fm**, **Chl a** and **Chl c** content of *T. amphioxeia*

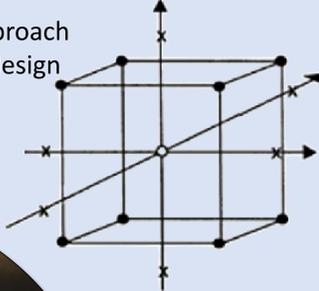
- Improve knowledge on the **bottom** of the **food chain** of several **toxic *Dinophysis*** species
- Optimizing the **culture conditions** of *Dinophysis*

## Materials and methods:

• Monoclonal culture of *T. amphioxeia* (Huelva, Spain; AND-A0710)



• Factorial design approach - central composite design (2<sup>3\*</sup>) - TIP device



Factorial design in the TIP device



13 to 25

6.5 to 8.6

pH



40 to 800

Growth

Fv/Fm



Chl a & Chl c



## Ongoing:

Optimal Fv/Fm, Chl a and Chl c content

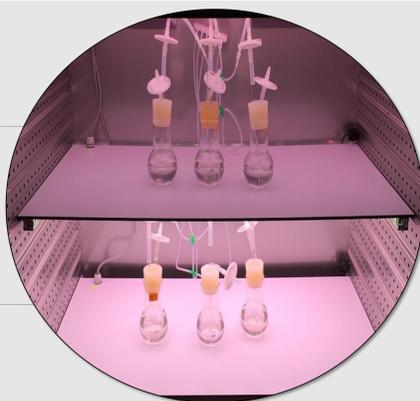


T 17.6 °C  
I 100

Optimal growth rate



T 17.6 °C  
I 400

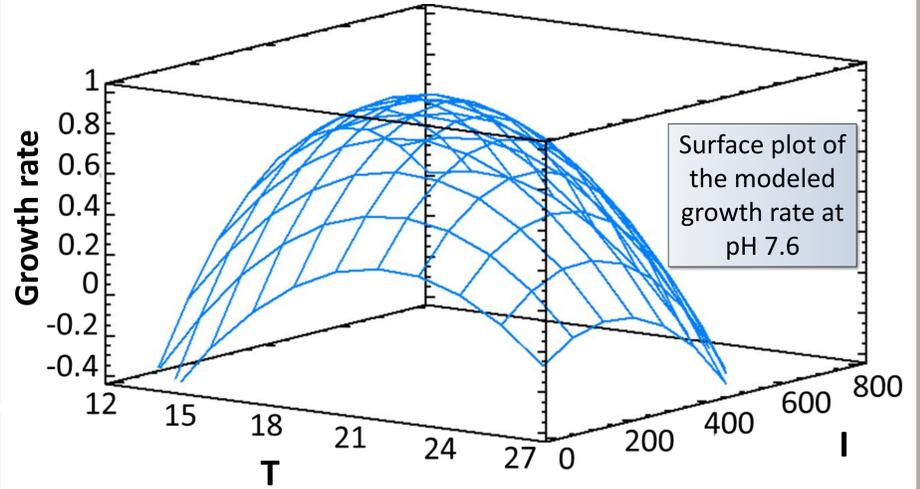


Semi continuous culture in batch

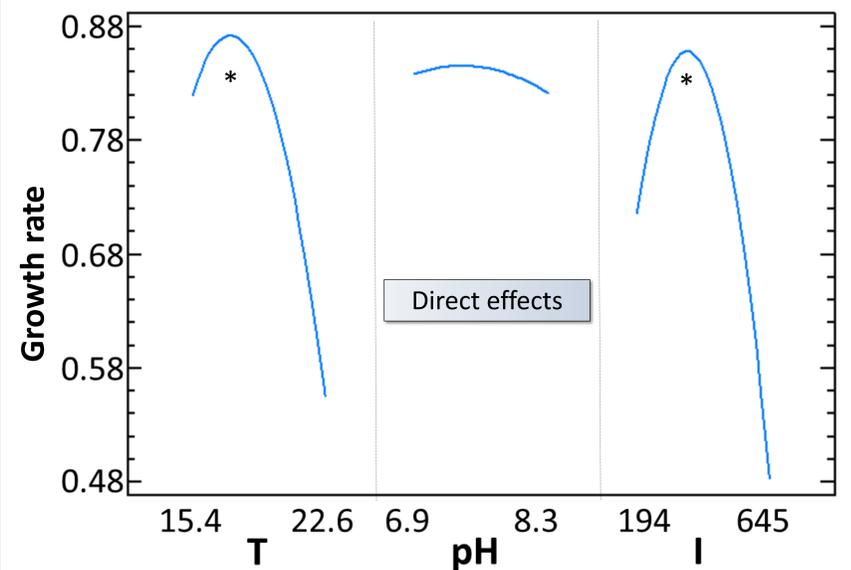
Nutrition of *M. rubrum*



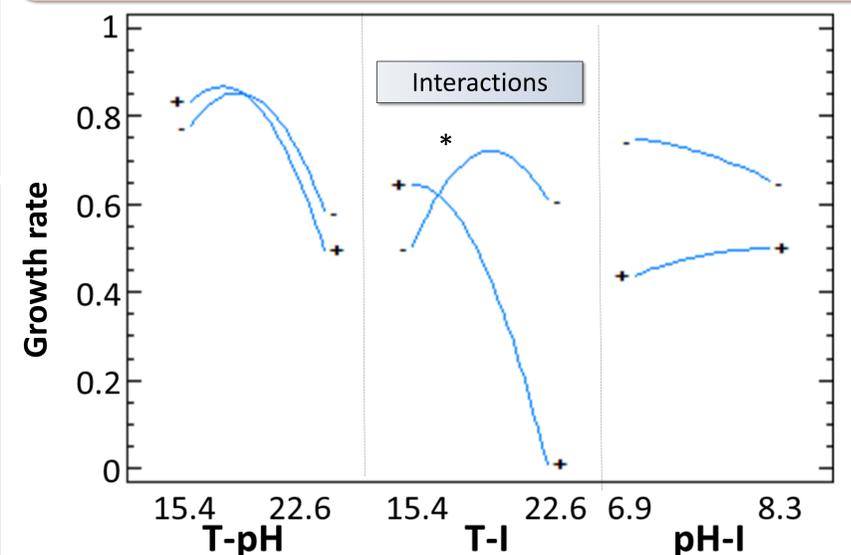
Growth rate determination



Optimal growth rate of *T. amphioxeia* of **0.88 d<sup>-1</sup>** at T 17.6 °C; pH 7.6; I 400 µmol photons m<sup>-2</sup> s<sup>-1</sup>



**Tolerance** of *T. amphioxeia* over the **whole pH range** tested (6.9 to 8.3) but no growth was observed below 6.5 and above 9. **Optimum pH is lower** than the **current pH** of French coastal waters.  
**Negative impact** of **high T** or **I** on growth rate. P<0.05



**Significant interaction** between T and I on growth rate. P<0.05  
**High I** coupled with **high T** have a **negative** impact on growth rate.  
**Medium I** coupled with **medium T** have a **positive** effect on growth rate.

## Conclusion:

This work improves knowledge on the culture of the trophic chain of *Dinophysis* sp. by optimizing the physiological state of *T. amphioxeia* (optimal growth conditions and optimal pigment quantity/quality conditions). Ocean acidification will unlikely have an impact on *T. amphioxeia*. The increase of water temperature will likely have a positive effect on growth up to 17.6 °C (warmer than current temperature of French coastal waters).

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