Physiological responses of *Nucella lapillus* and *Mytilus galloprovincialis* to thermal stress

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Introduction

Climate change is currently one of the main concerns that threatens biodiversity, ecosystems and human life. These changes are associated with an increased rate of global temperatures, largely due to greenhouse gases produced by human activities. This warming effect will have major impacts on coastal and intertidal habitats. Intertidal communities are dynamic ecosystem dominated by ectothermic organisms, which play an important role in nutrients cycle and host some organisms of ecological and economical relevance.

Aims: To assess the physiological responses of two keystone species inhabiting the intertidal ecosystem: the predator snail *Nucella lapillus* and the mussel, *Mytilus galloprovincialis*, an ecosystem engineer, exposed to a temperature gradient.

Materials & Methods

*Nucella lapillus* & *Mytilus galloprovincialis*

240 individuals sampled from Belinho, Esposende

- Specimens were exposed to a temperature gradient ranging from 7 up to 28°C
- Physiological response, reproductive and predatory behavior measured (4 weeks)
- Survey performed every 48 - 72h
- Mussels were daily fed with a microalgae mix (*Tatraselmis* sp. and *Isochrysis* sp.)
- One ANOVA test for every parameter and Two-way ANOVA for statistical interactions observed on *N. lapillus*

Quarantine and acclimation for two days at 16°C. Applied temperature shifts of ±1°C/day

Tagged and placed in the temperature-controlled system

Results & Discussion

**Fig. 2.**

A) Mean of *N. lapillus* mortality during the experiment (n=3); B) Mean of *M. galloprovincialis* mortality during the experiment (n=3).

- Thermal tolerance limit for *N. lapillus* occurred at 28°C, producing 100% of mortality at 5th day.
- No mortality occurred between 13 and 25°C for *M. galloprovincialis*, registering 13% of mortality at 28°C.

**Fig. 3.**

A) Mean of mussels drilled by *N. lapillus* during the experiment (n=3); B) Mean egg capsules laid by *N. lapillus* during the experiment (n=3).

- *N. lapillus* displayed a predatory-behavior temperature-dependent tendency with no statistical significance (p-value=0.367).
- Predation peak observed at 19°C.
- Reproduction occurred only between 10 and 22°C.
- Maximum reproduction registered at 16°C, without statistical significance (p-value=0.285).
- Statistical interactions between Reproduction, Predation and Mortality detected only at 28°C.

Conclusions

- Both species are relatively resistant to heat stress, being *N. lapillus* more sensitive to higher temperatures.
- Mortality of *M. galloprovincialis* were higher than *N. lapillus* at lower temperatures.
- *N. lapillus* suppresses their reproductive behavior at temperatures above 22°C, and at 25°C its predation activity was reduced.

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