Can a 10-day heatwave affect the metabolism of an intertidal crustacean?

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INTRODUCTION

Coastal marine ecosystems have long been vulnerable to stress caused by nutrient-limitation, but now climate change is causing additional stress by increasing the frequency of extreme events such as marine heatwaves. Thus, understanding the impact of both climate warming and nutrient availability helps to understand their effects on the community and to develop protection strategies for the marine littoral community. In this study, we analyse the consequences of a 10 days heatwave event on both starved and well fed prawns (*Palaemon elegans*).

METHODOLOGY

Incubation temperatures
- 20ºC
- 26ºC
- 32ºC

Food-levels
- Well-fed
- Starved

Sampling
- Initial time
- 24, 48,96h
- 7 and 10 days

Analysis
- ✓ Respiration (R)
- ✓ Electron transport system (ETS)
- ✓ Cytochrome c oxidase (CCO)
- ✓ Heterotrophic energy transformation (HET)
- ✓ Proteins (PROT)
- ✓ Carbohydrates (CARB)
- ✓ Lipids (LIP)
- ✓ CEA index [ratio between the energy available (Ea = prot + carb + lip), and energy consumed (Ec = ETS in units of energy)]

RESULTS

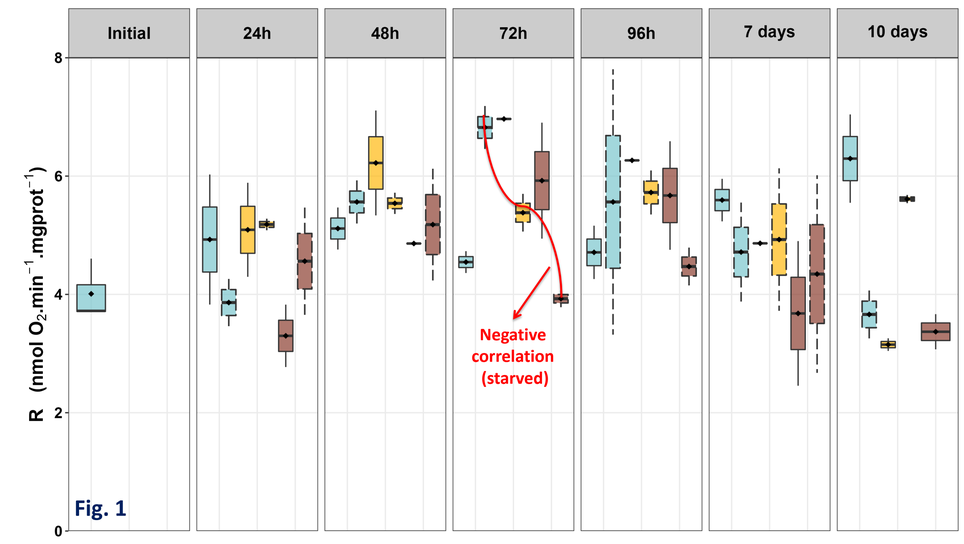

Fig. 1

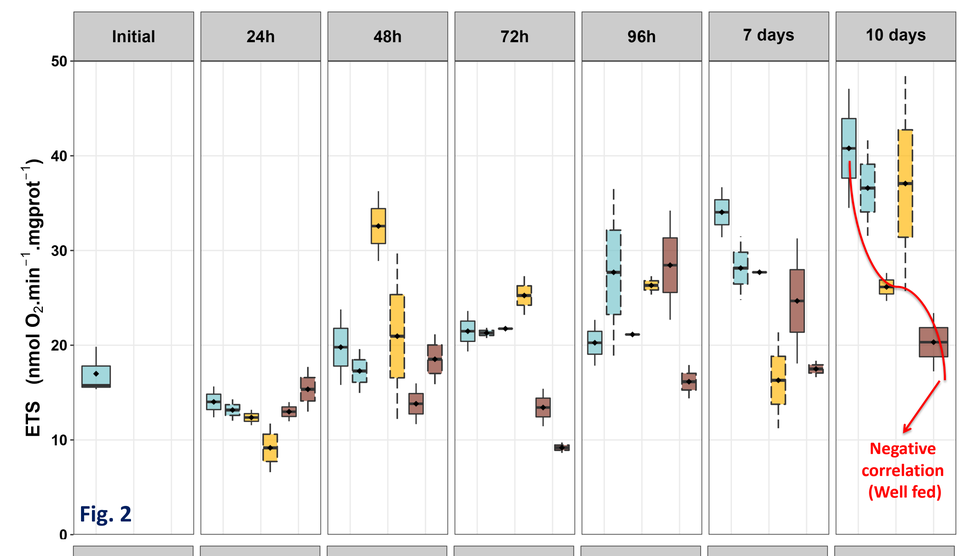

Fig. 2

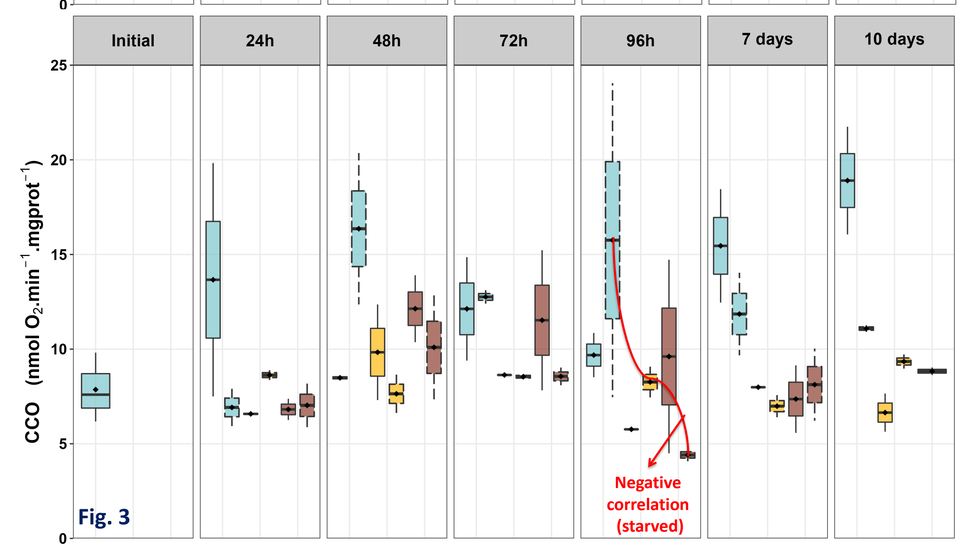

Fig. 3

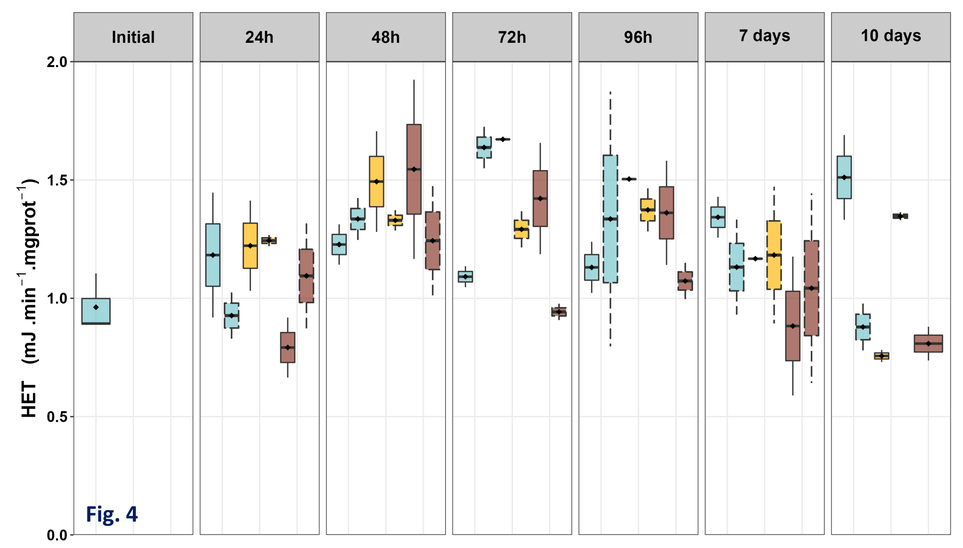

Fig. 4

- ✓ The prawns show a metabolic regulation in response to the different exposures throughout the experiment (Figs 1-8).
- ✓ AT THE END (10 days of exposure):
  - *Well-fed scenario [Food]*
    - R, ETS, CCO showed higher activities at the lowest temperature, and, as expected, HET was also higher.
    - The CEA index (Ea:Ec ratio) showed a strongly positive correlation with temperature
    - There was more PROT content at higher temperatures; CARB were lower at 32ºC; and LIP shows the same values at 20 and 26ºC.
  - *Starvation scenario [Starvation]*
    - R, ETS and CCO showed different patterns. At 26ºC, R had the highest value while in CCO was the lowest. ETS was equal at 20ºC and 26ºC.
    - Both CEA and HET were lower at 20ºC.
    - PROT and CARB values, after showing an uneven but decreasing trend over the exposure time, the values were equalised between the different temperatures, while LIP suffers an increase at 26ºC.

CONCLUSION

***Palaemon elegans* showed an adaptive and regulating capacity for survival under stressful conditions.**

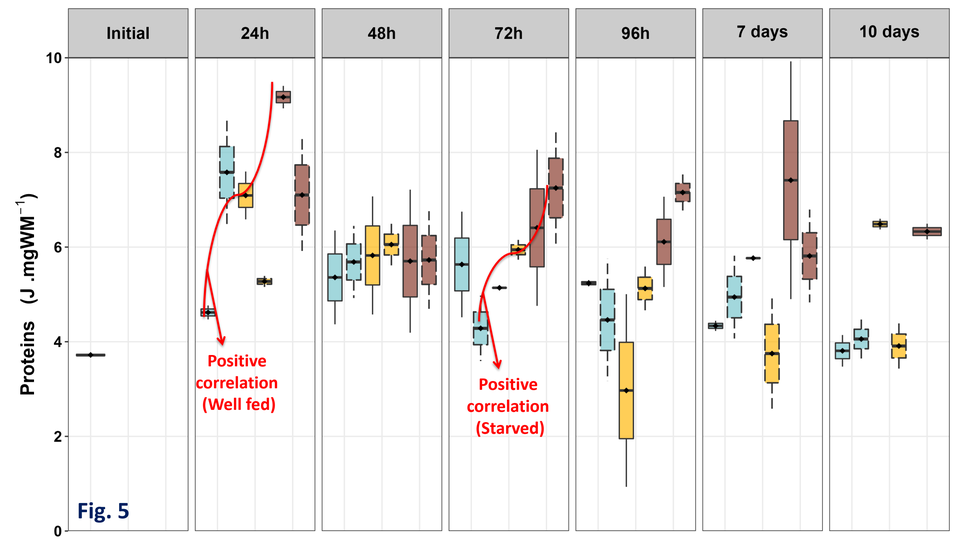

Fig. 5

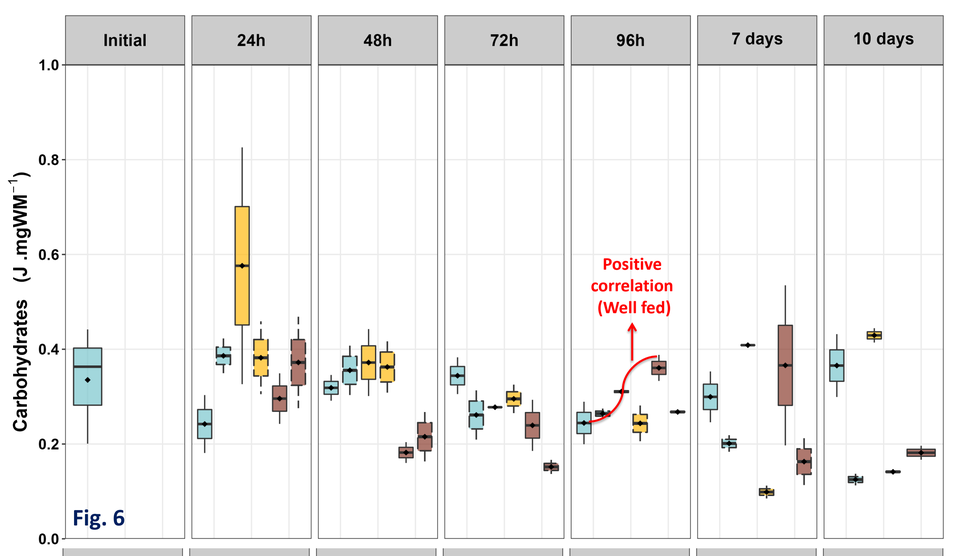

Fig. 6

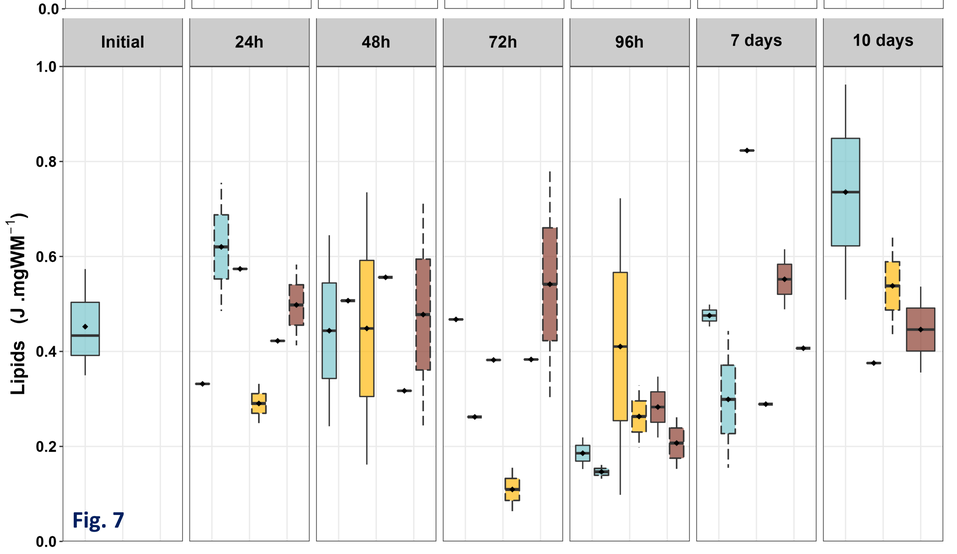

Fig. 7

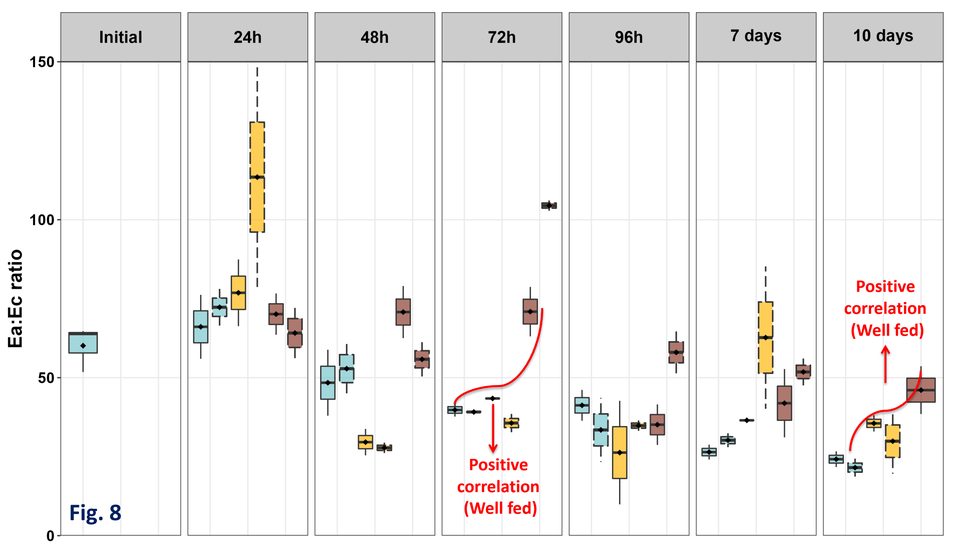

Fig. 8

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