An overview of the energy metabolism during *Aurelia aurita*'s life cycle (from ephyra to medusa)

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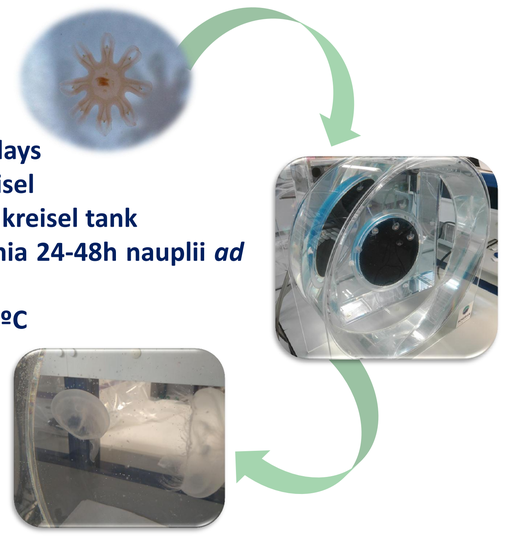
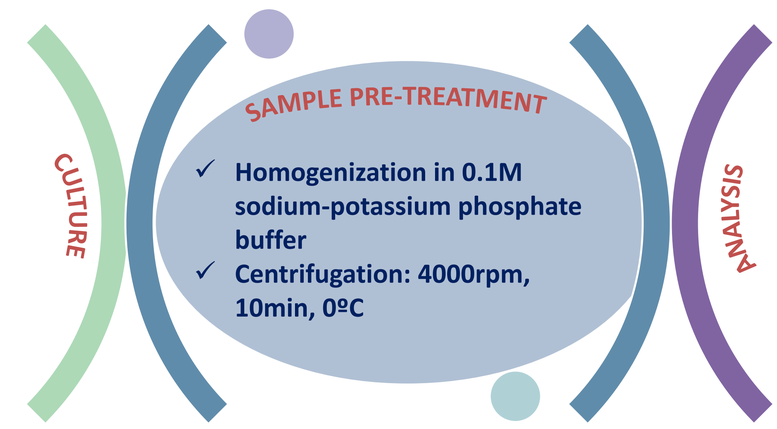
INTRODUCTION

The biochemical composition and energy metabolism of the organisms are important keys to reach a better understanding about the transfer of energy within an ecological community. In addition to that, during years gelatinous zooplankton such as jellyfish has been underestimated for the plankton community or trophic ecosystem models. In this study, we explore the energy metabolism of *Aurelia aurita* by means of cellular energy allocation approach (CEA index), the respiratory electron transport system activity (ETS), and organic analysis of lipids (LIP), carbohydrates (CARB) and proteins (PROT). We analysed these parameters during 66 days from ephyra to medusa.

METHODOLOGY



Culture period: 66 days
Rearing: 10L air kreisel
Medusa phase: 40L kreisel tank
Food regime: Artemia 24-48h nauplii *ad libitum*, once daily.
Temperature: 19-23ºC



Energy available	Energy consumption
Ea (J·mgDW^{-1}) = PROT·(E_{prot})+ LIP·(E_{lip}) + CARB(E_{carb})	Ec (J·h^{-1}·mgDW^{-1}) = ETS· E_{ETS}
→ PROT: Rutter-SDS method (Martínez et al, 2020) → LIP: Extraction (Bligh and Dyer, 1959); Charring (200ºC, 15min); Vanillin method (Barnes and Blackstock, 1973) → CARB: Dubois et al. (1956)	Kinetic assay based on Owens and King (1975) and Gómez et al. (1996)
Gnaiger (1983) – Energy equivalents E_{prot}: 24 J·mg protein^{-1} E_{lip}: 39.5 J·mg lipid^{-1} E_{carb}: 17.5 J·mg carbohydrate^{-1} E_{ETS}: 0.48 J µmolO_2^{-1}	

Energy budget

CEA index (h) = Ea / Ec

RESULTS

Fig. 1

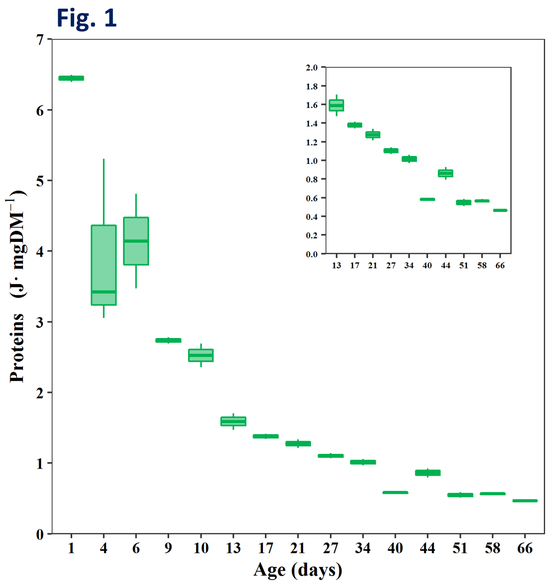


Fig. 2

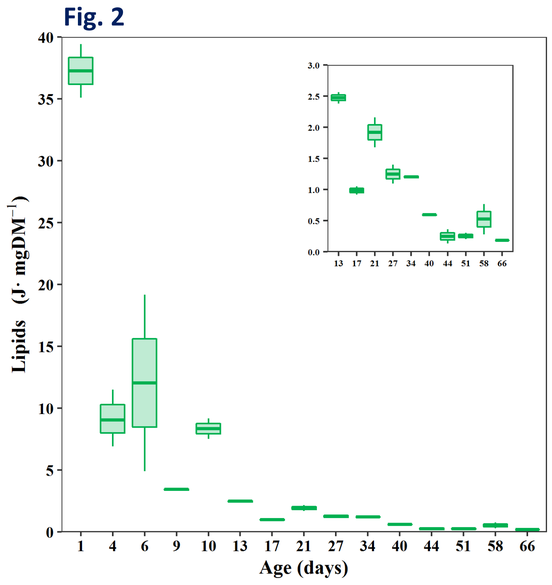
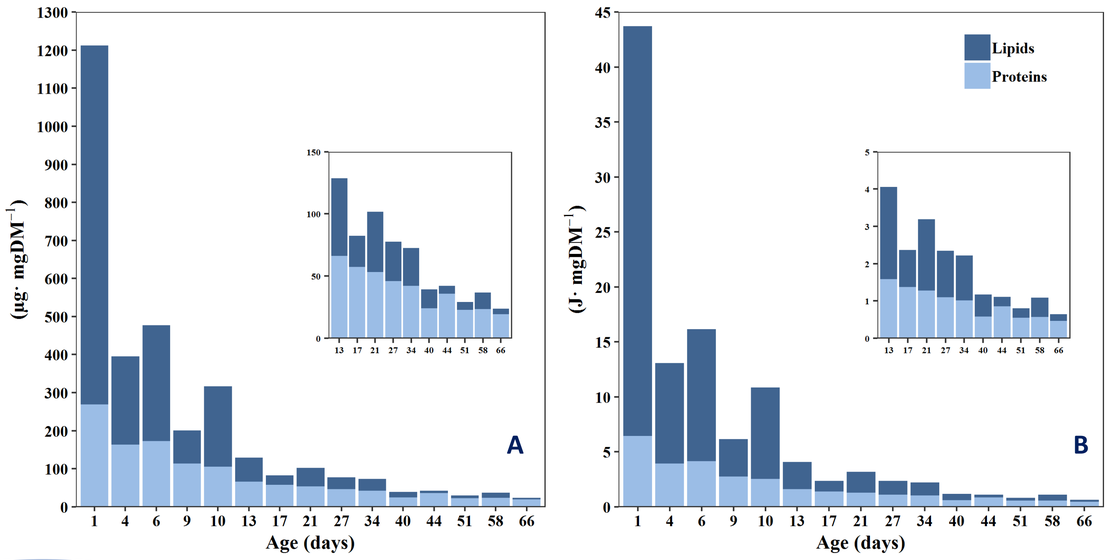


Fig. 3



CARB content was non-detected in most of the samples (below limit of detection) so the energy available (Ea, Fig. 4) was determined from LIP and PROT content

PROT (Fig.1) and LIP (Fig. 2) energy content show a decreasing tendency with age, and about 40 days of culture, all parameters seem to be stabilizing

At day 13 the main organic component changes from LIP to PROT (Fig. 3A), coinciding with the start of the process of transformation from ephyra to medusa, maybe due to the need for buoyancy, as the ephyra are less efficient swimmer than medusa.
This exchange among LIP and PROT as main energy fraction occurred at day 44 (Fig. 3B). Between days 13 and 40, medusa seems to maintain lipids as main energy source, due to their high energy content against proteins

As expected, Ea decrease also in time (Fig. 4), as well as Ec (Fig. 5). In addition, the CEA index (the Ea:Ec ratio; Fig. 6), was significantly higher during the first 10 days of culture, and also seems to stabilize from day 40 indicating a regulation of their energy metabolism

Fig. 4

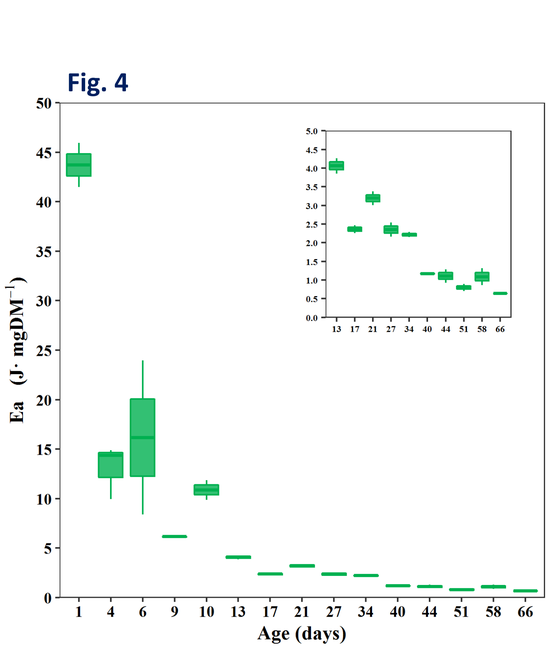


Fig. 5

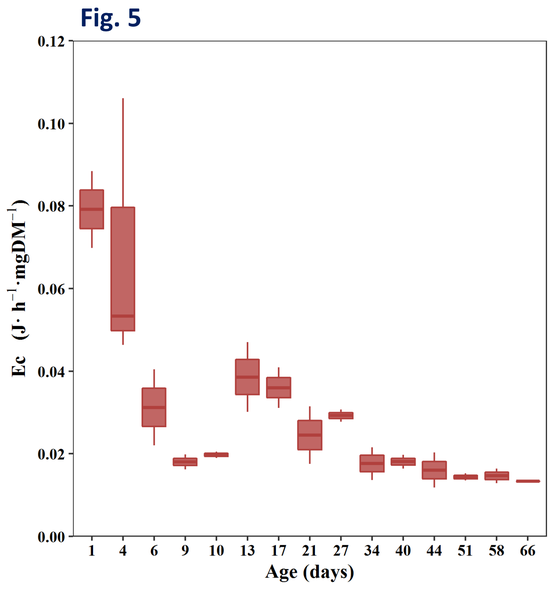
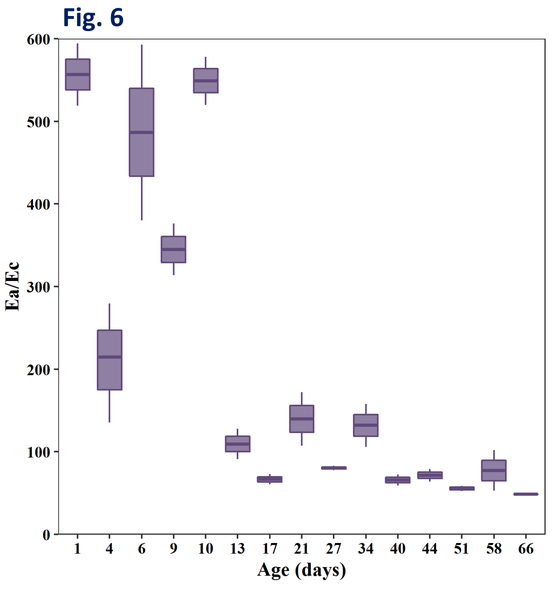


Fig. 6



AS CONCLUSION:

- ***Aurelia aurita* presented changes in its biochemistry while growing.**
- **From day 13 to 40 there was changes between LIP and PROT predominance in organic composition and energy content.**
- **From day 40, all parameters seem stabilize, indicating a regulation of their biochemistry and energy metabolism when the organisms becomes an adult.**
- **Results represent a first evaluation about *A. aurita* metabolism. For a better understanding more studies are needed.**

ACKNOWLEDGMENTS:

The PERSEO project (ProID201710051) of the Canary Island government and ERDF funds granted to M.G. supported this study

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