Environmental limits of low salinity to *Gracilaria gracilis* development. Where do we draw the line?
Influence of salinity on *Gracilaria gracilis* growth

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INTRODUCTION

- Aquaculture of macroalgae correspond to 24% of the total produced species and, within this group, the most reared species (93%) belong to the genus *Porphyra* (Nori), *Gracilaria* (Ogo), *Laminaria* (Kombu) and *Undaria* (Wakame);
- Red seaweeds (Rhodophyta, Gracilariales) are important for industrial and biotechnological purposes with considerable economic importance, being the main source of agar, the most valuable phycocolloid worldwide; several species of *Gracilaria* are being produced to extract phycocolloids. → Medicine, cosmetics and food (ice creams, jellies, soups, ...)
- In recent years, the growth and maintenance of different algae species in aquaculture has become a major research focus. It has been demonstrated that there are several beneficial effects of both micro and macroalgae as a dietary protein source in the growing food and feed industry. Other important nutrients are polyunsaturated fatty acids (PUFA), fiber, vitamins, pigments, sterols, polyphenols, among other compounds.

In this study, two experiments were conducted in order to evaluate the effects of salinity on *Gracilaria gracilis* growth and survival in closed laboratory controlled conditions.

METHODOLOGY

Fig.1- Harvesting location: Braço da Barrosa, Óbidos Lagoon, Portugal

Experiment 1

- Salinities: 0, 5, 10, 20 and 35 psu;
- Six replicates per salinity;
- Photos were taken weekly to assess growth within a time period of 44 days.

Fig. 2 - Washing

Fig. 3 – Growth in Petri dishes

Fig. 4 - Growth assessment

Experiment 2

- Four trays: Control (constant salinity 20 psu) and three replicates;
- Twenty grams of *G. gracilis* in each tray;
- Salinity starting at 20 and gradually reduced to 15, 10 and 5 psu, during 21 days;
- Growth was evaluated by measuring the initial and final weight.

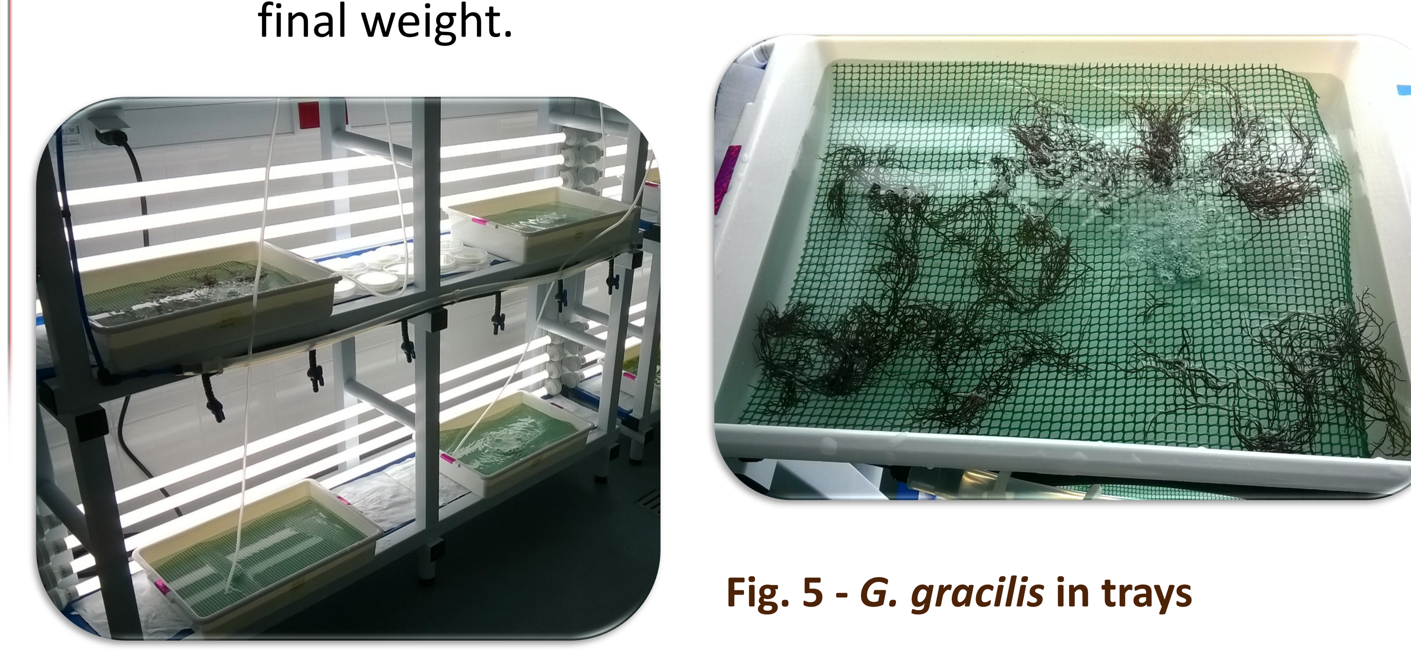

Fig. 5 - *G. gracilis* in trays

Trials Conditions:

- **Photoperiod condition: 12 h light: 12 h dark (LD)**
- **Nutrient medium: Provasoli's Enriched Solution**
- **Temperature ≃ 20ºC**

RESULTS AND DISCUSSION

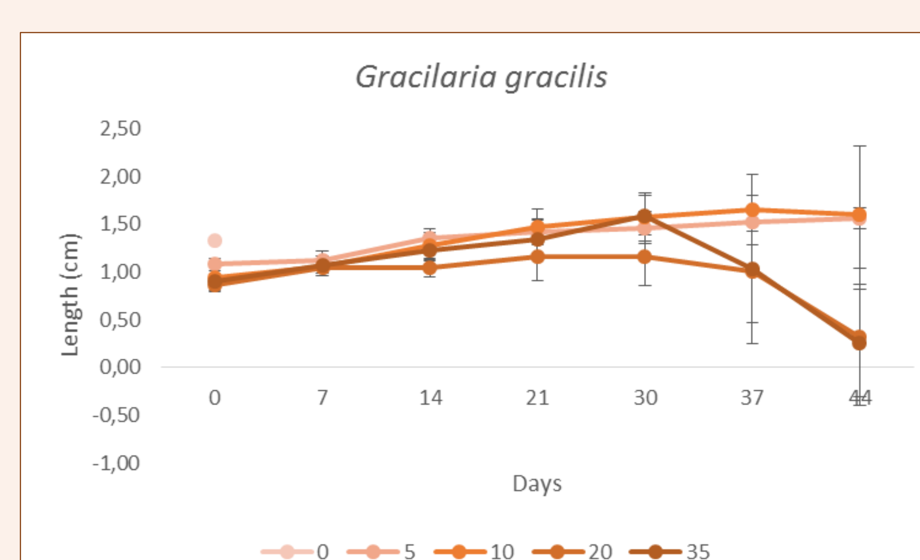

Fig. 6 - Length of *G. gracilis*, exposed to different salinities, in Petri dishes, during 44 days.

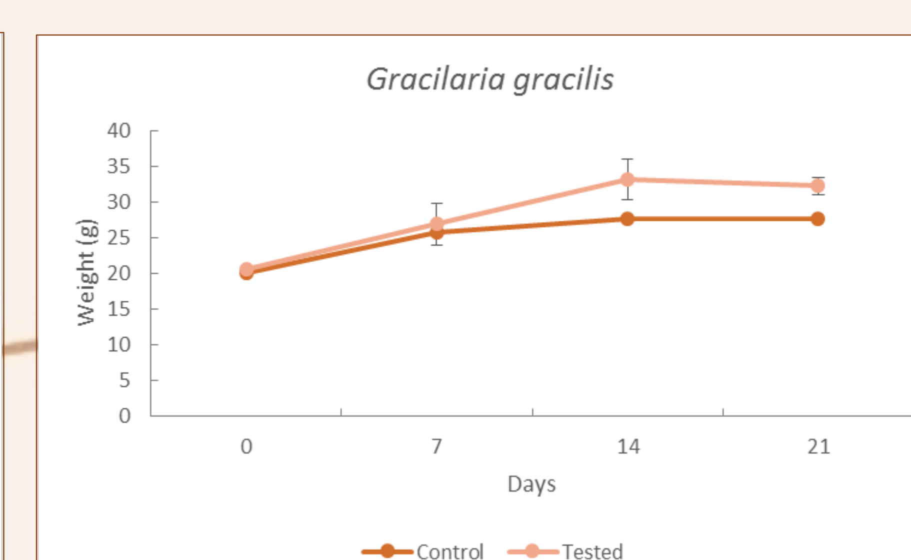

Fig. 7 - Weight of *G.gracilis*, exposed to different salinities, in trays, during 21 days.

Experiment 1:

- Results showed that *G. gracilis* had higher growth rates at lower salinities, namely 5 and 10 psu;
- At the absence of salt, seaweed did not survive, gradually dying in the first 3 days of the assay;
- At salinities of 20 and 35, the results were similar until day 30 but, afterward, seaweed talli exposed to these salinities revealed weakness and lower quality.

Experiment 2:

- With the decrease of salinity, the weight of *G. gracilis* increased when compared with control conditions (salinity 20 psu);
- When exposed to salinity of 5, macroalgae died ⇨ Can be explained due to the density increase or due to osmodisruption.

- Naturally, macroalgae *G. gracilis* endures a wide range of salinities ⇨ Until today, the lowest salinity observed was 10 psu (Skriptsova & Nabivailo, 2009; Redmond *et al*, 2014);
- In this work, it was observed better survival and growth rates at lower salinities of 5 and 10 psu;
- The results demonstrated that these are euryhaline marine organisms, with osmoregulation mechanisms allowing them to tolerate a wide range of salinity conditions.

References:
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Skriptsova, A. V., Nabivailo, Y. V., 2009. Comparision of three gracilarioids: growth rate, agar content and quality. J Appl Phycol, 21: 443-450.

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