SPONGE MARICULTURE IN THE REMEDIA LIFE INTEGRATED MULTITROPHIC AQUACULTURE SYSTEM (SOUTHERN ITALY, NORTHERN IONIAN SEA)

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INTRODUCTION

The polyculture of fish with other organisms at different levels of the trophic web (Integrated MultiTrophic Aquaculture, IMTA) is an eco-friendly alternative that has received increasing attention and promises considerable economic potential. Among the co-cultured organisms Porifera, or sponges, show high efficiency in removing organic particles between 0.1–50 [1-4], which positively affect the quality of the surrounding water. The present study was undertaken to assess the survival and the effect of rearing method on it and the growth rate of five different sponge species within the Remedia Life IMTA system.

MATERIALS AND METHODS

The Remedia Life IMTA system, ongoing in the "Maricoltura del Mar Grande" aquaculture plant, consists of fish cages producing *Dicentrarchus labrax* and *Sparus aurata*, to which an innovative set of bioremediator organisms such as sponges, polychaetes, bivalves and macroalgae have been associated [5] (Fig. 1A). Among sponges five species were reared in: *Aplysina aerophoba*, *Geodia cydonium*, *Hymeniacidon perlevis*, *Ircinia variabilis* and *Sarcotragus spinosulus* (Fig. 1B). Sponge monthly monitoring was performed to evaluate the rearing performance in terms of **survival** ((N_{final} / $N_{initial}$) x 100) and **growth** ([(V_{final} - $V_{initial}$) / $V_{initial}$] x 100) rates. For *S. spinosulus*, an additional comparison among three rearing techniques by means of survival rate was carried out. .

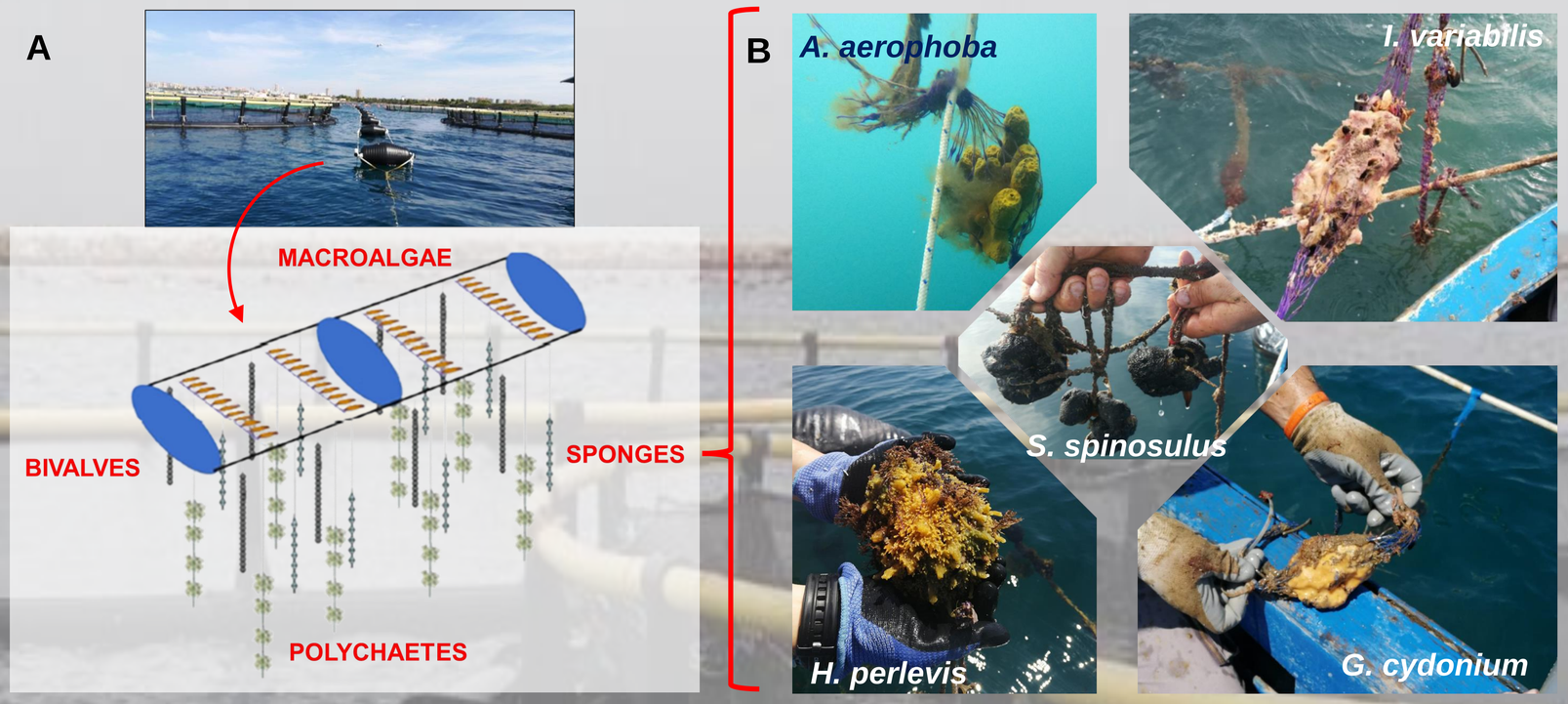

Fig 1. (A) Remedia Life IMTA system photo and scheme; (B) the five sponge species reared in the plant.

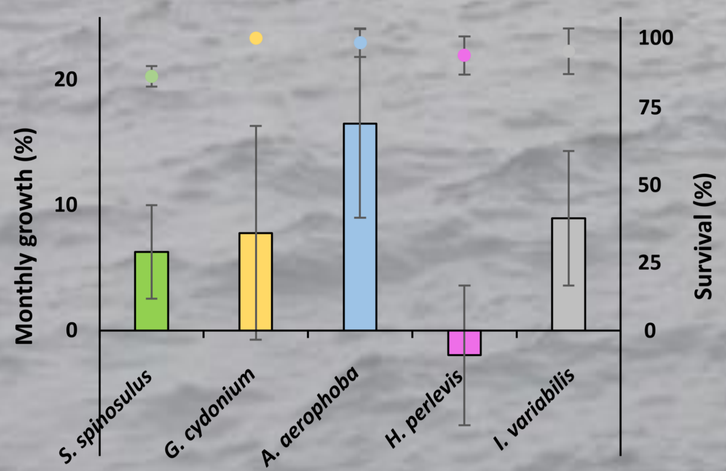

Fig 2. Rearing performance of selected species in terms of monthly growth rate (columns) and survival (dots) (± SE).

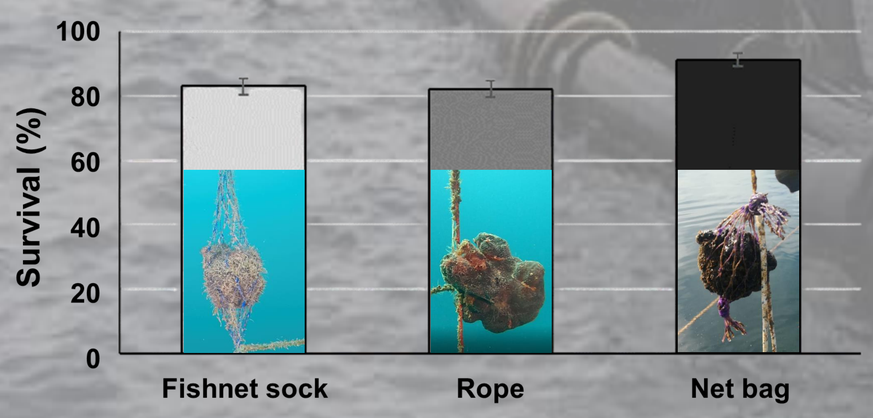

Fig 3. Effect of the rearing method in the survival (± SE) of *Sarcotragus spinosulus*.

RESULTS

All sponge species during the first year of rearing showed a high survival ratio, with values not lower than 82% (for *S. spinosulus*). Similarly, all species showed values of more than 6% monthly biomass increase (with values up to 16% for *A. aerophoba*), with the exception of *H. perlevis*, which has maintained its volume over the rearing months (Fig. 2).

Regarding the first-year culture methods of *S. spinosulus,* all of them resulted in a survival rate of more than 82%, reaching 91% of the cases when the "net bag" was used (Fig. 3).

DISCUSSION AND CONCLUSIONS

Overall, all tested sponge species promise great results in the IMTA activity, with high survival and growth rates. When compared with same taxonomic subclass sponges reared in net systems, the five species cultured in Remedia Life IMTA plant show a higher mean survival rate, even when rope system was used for *S. spinosulus* [6]. Growth, however, is a less studied parameter among in situ cultured sponges of the selected species and makes the comparisons complicated, which at the same time highlights the importance of the present research in order to improve productivity in this type of aquaculture systems. All in all, the increase up to 300% of additional biomass and high growth rates for some reared species together with their demonstrated filtering activities [e.g. 7] make these sponge species ideal candidates for co-culturing in IMTA plants.

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