Marine sponges: an eco-friendly and profitable by-product of Integrated Multi-Trophic Aquaculture (IMTA)

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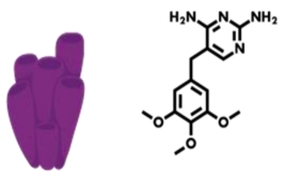
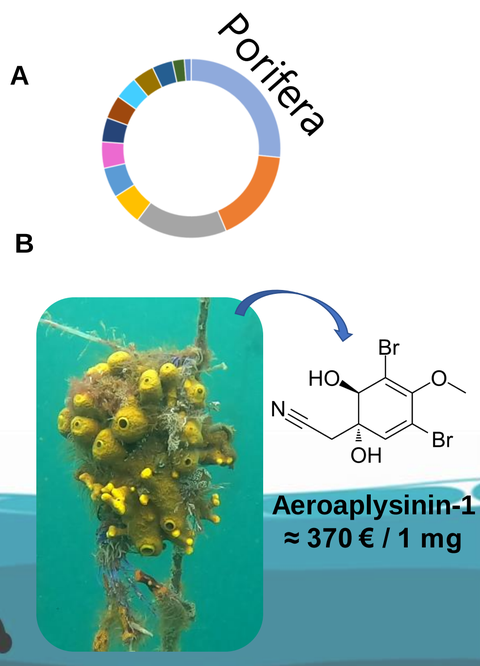
INTRODUCTION

Coastal fish farming plants can have a significant environmental impact causing an overall increase in organic matter and bacterial load. In this sense, Integrated MultiTrophic Aquaculture (IMTA), the practice that combines the cultivation of fed aquaculture species with other organisms, represents an eco-friendly alternative which allows water quality improvement, promises high economic return and social suitability. Among extractive organisms, filter-feeders and particularly Porifera seem the most promising due to their environmental and economic potential.

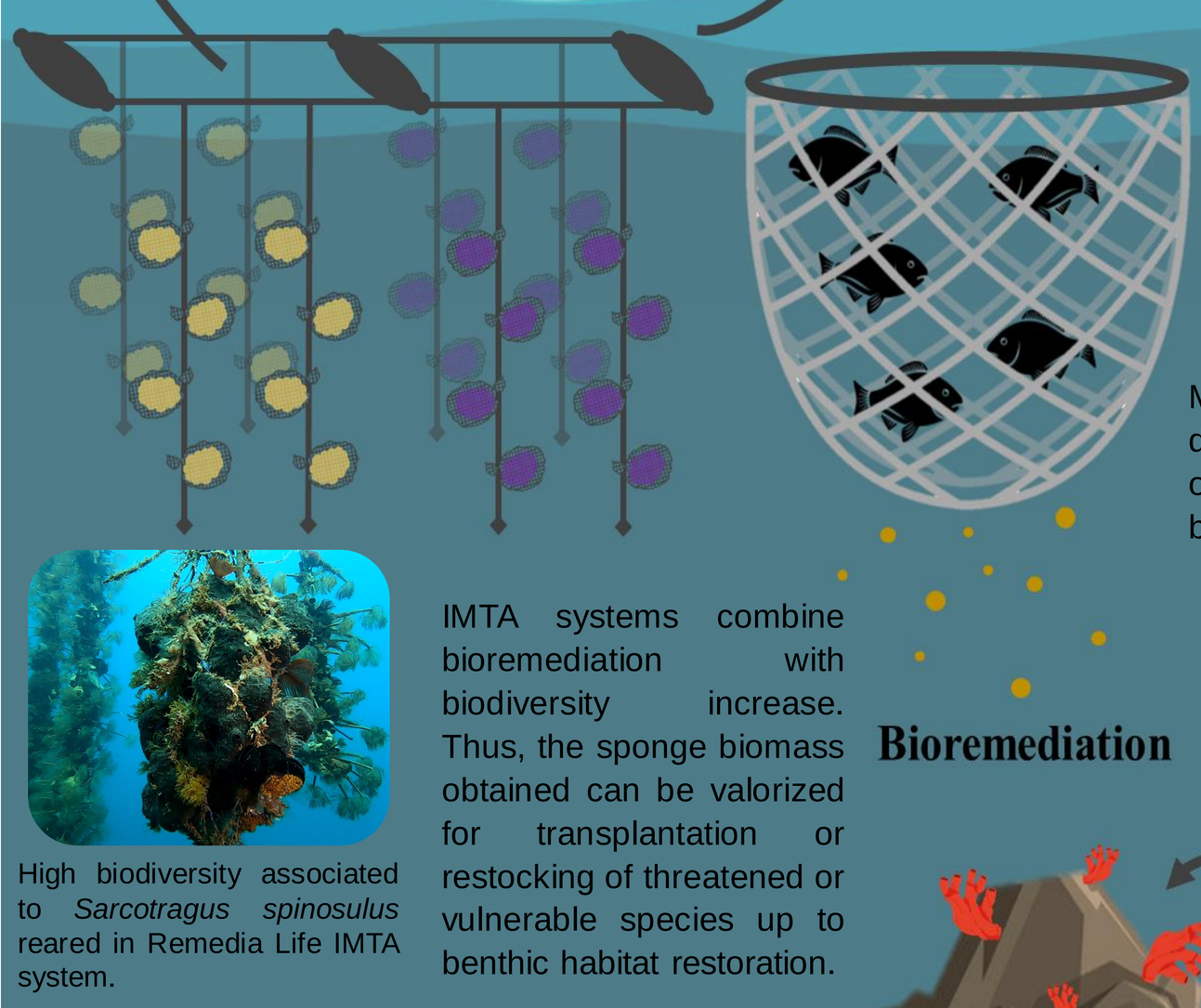
The trade of sea sponges dates back thousands of years to when they were collected mainly for cosmetic use and known as “bath sponges”. Even so, today in the Mediterranean basin many countries still maintain this economic sector based on traditional harvesting



Since the extraction of the first marine drug from a marine sponge in 1951, the number of the discoveries of these compounds has only increased exceeding 200 per year. They have a wide range of applications: from anti-tumor, antiviral and antimicrobial in human medicine up to antimicrobial and antifouling activities in the aquaculture industry or biomaterial production.



(A) Number of bioactive compounds of sponge origin [1]; (B) an example of a compound isolated from *Aplysina aerophoba* and its market price.



Marine sponges filtrate organic particles between 0.1-50 µm (such as dissolved organic matter, bacteria and even viruses) and, thus, metallic and organic pollutants as well, which makes them target organisms as bioremediators or bioindicators.

High biodiversity associated to *Sarcotragus spinosulus* reared in Remedia Life IMTA system.

IMTA systems combine bioremediation with biodiversity increase. Thus, the sponge biomass obtained can be valorized for transplantation or restocking of threatened or vulnerable species up to benthic habitat restoration.

Due to their diverse colors and shapes, they are particularly attractive to recreational aquariums; besides, sponge-based food supplies have already been developed.

CONCLUSIONS

The production of biomass from non-edible species in IMTAs such as marine sponges with important profitable applications promotes a blue circular economy. In this sense, Remedia Life IMTA system represents an eco-friendly sponge biomass supply not only for economic interests such as green extraction of bioactive molecules and aquariology (ornamental species, food or shelter for fishes) but also for environmental welfare as bioremediators or restoration purposes that increase ecosystem biodiversity.

[1] CMNPD - Comprehensive Marine Natural Products Database.
[2] Trani, R., Corriero, G., de Pinto, M. C., Mercurio, M., Pazzani, C., Pierri, C., Scrascia, M., Longo, C. 2021. Filtering Activity and Nutrient Release by the Keratose Sponge Sarcotragus Spinosulus Schmidt, 1862 (Porifera, Demospongiae) at the Laboratory Scale. J. Mar. Sci. Eng., 9(2), 178.
[3] Bierwirth, J., Mantas, T. P., Villechanoux, J., & Cerrano, C. 2022. Restoration of Marine Sponges—What Can We Learn from over a Century of Experimental Cultivation? Water, 14, 1055.
[4] United Nations Department of Economic and Social Affairs. 2022. The Sustainable Development Goals Report; United Nations:, NY, USA, p. 68.