

# Potential of ascidians as extractive species and their added value in marine integrated multitrophic systems

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## Objectives

Ascidians are filter-feeders with a recognized potential as co-cultured/extractive species in IMTA systems. The main objective of this review was to address their ecological importance as filter-feeders [What do we know?]; to understand their potential contribution as extractive species [How do ascidians perform in IMTA?]; and set the benchmark for their nutritional value and added value for aquaculture [For what kind of bioactive products?].



Solitary

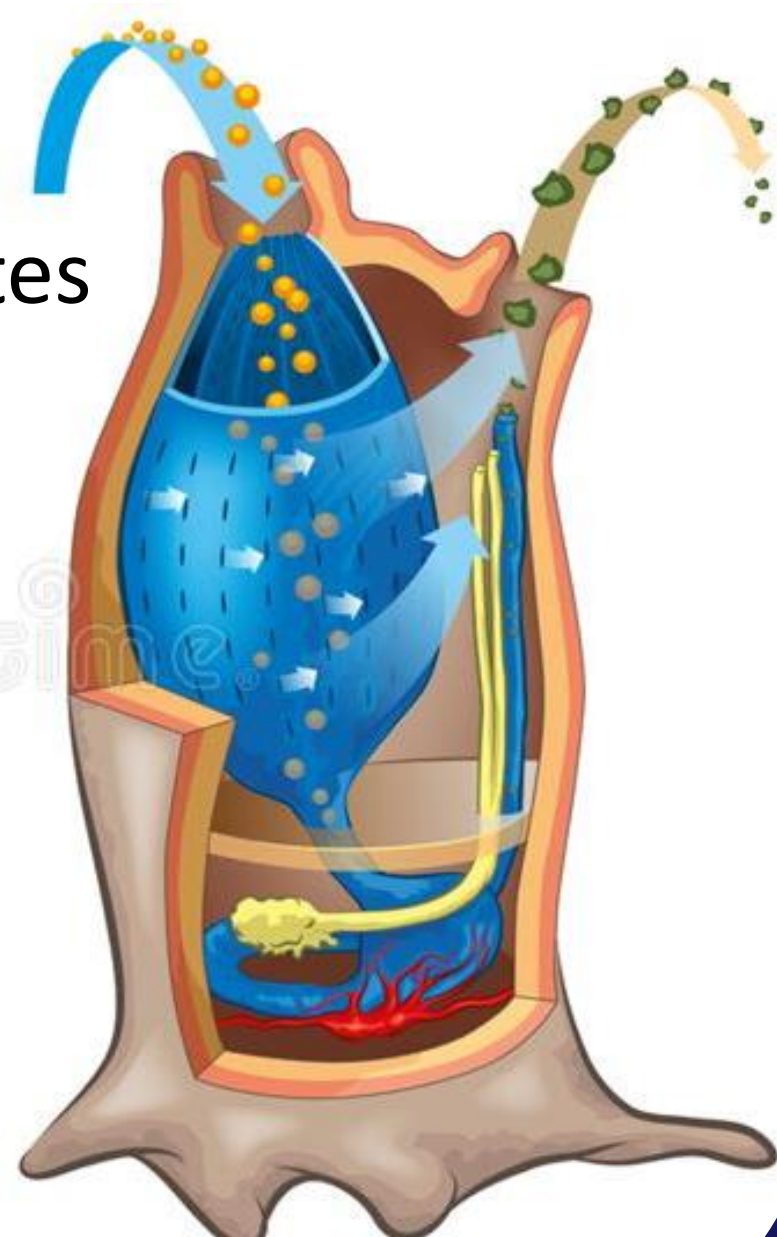
Colonial

- Benthic suspension feeders - filter dissolved organic matter
- Found in all marine habitats
- Hermaphrodites and reproduce by external fertilization
- Colonial species reproduce sexually and asexually
- Free-swimming tadpole-like larva
- Colonizing natural and artificial substrates
- Bioactive compounds

## QUESTION 1

- ❖ Filtration rates present great variability, even amongst the same species ( $3.5 \text{ L h}^{-1}$  -  $11.9 \text{ L h}^{-1}$ )<sup>1,2</sup>
- ❖ Filtration rate increases with size<sup>3</sup>

- ❖ Filtration rates may vary seasonally, displaying an increase with a temperature increase<sup>4</sup>

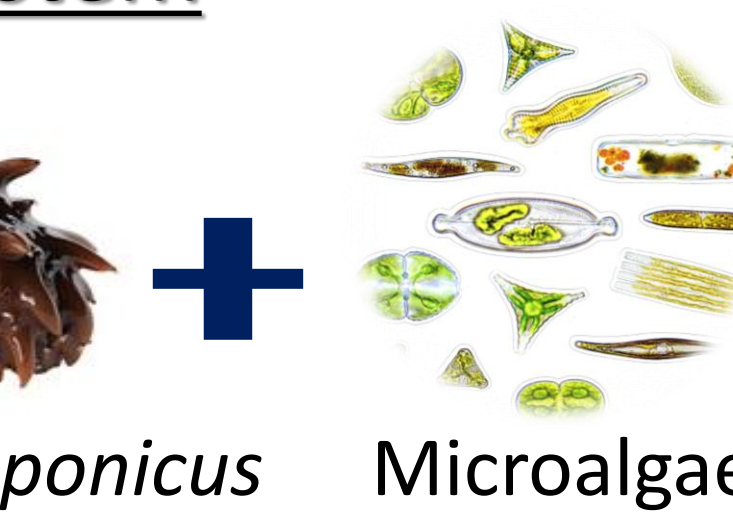


## QUESTION 2



Most studies regarding aquaculture-ascidians scenarios are focused on the impacts of ascidians on the shellfish productions.<sup>3,5,6</sup>

### IMTA system



- ❖ Reduce organic matter in the surrounding sediment<sup>7</sup>
- ❖ Reduce harmful bacteria<sup>8</sup>
- ❖ Purify the water body from nitrogen and phosphorus<sup>7</sup>
- ❖ Positive impact on growth of holothurians species<sup>9,10,11</sup>

## QUESTION 3

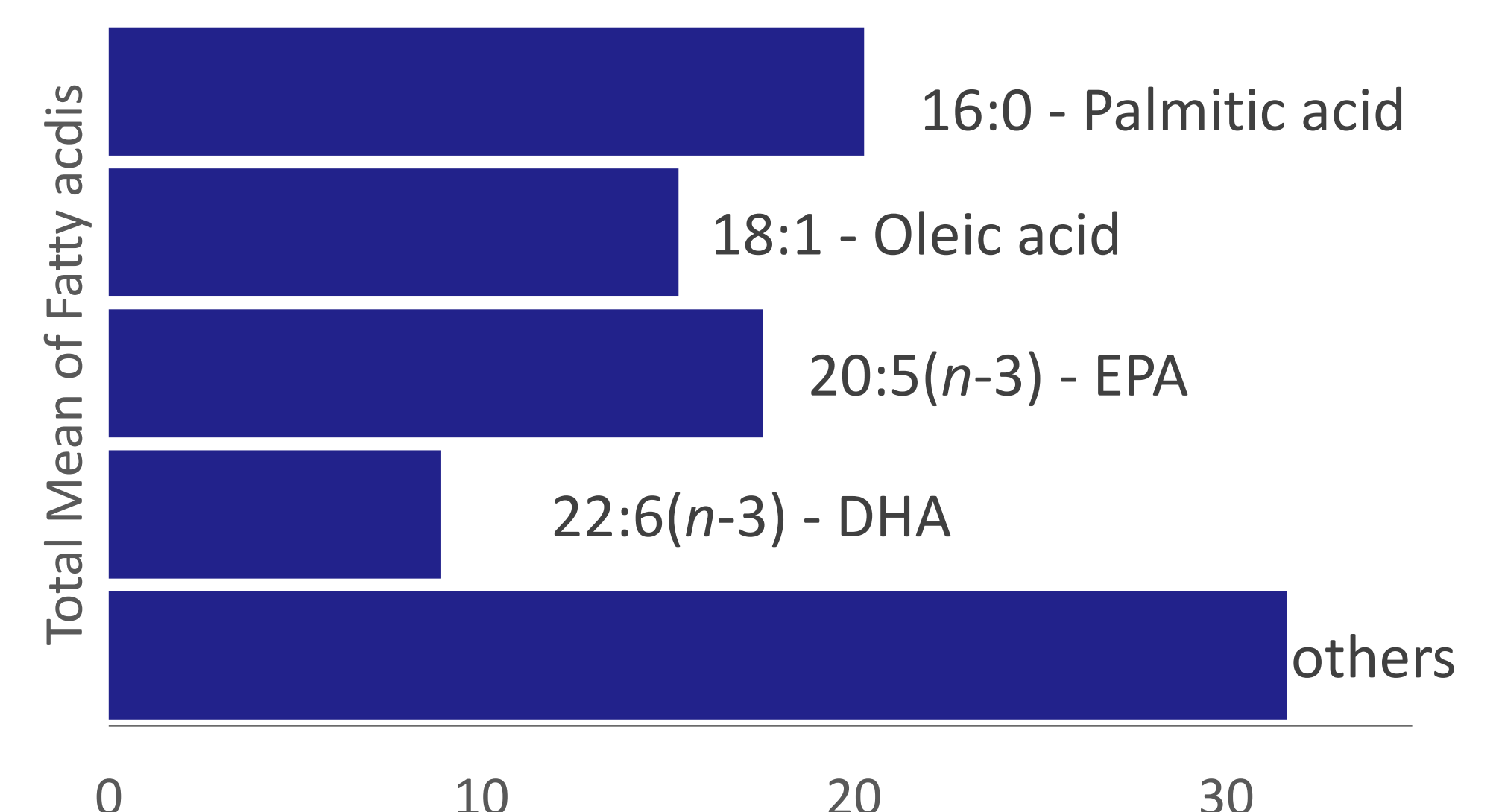


Figure 1: Mean relative percentage values of total fatty acids of the ascidians addressed in this review.

- ❖ Ascidians are a source of polyunsaturated fatty acids of the omega-3 family
- ❖ Essential fatty acids EPA and DHA were detected in essentially all ascidians<sup>12,13</sup>
- ❖ Present a high nutritional value<sup>14</sup>
- ❖ Good alternative for fish oil and fish meal<sup>14</sup>

## Conclusion

Despite the many variations on ascidians filtration rates, ascidians present high filtration rates and they can retain submicron and picoplankton particles. Under na IMTA framework, competition for resources and space with other filter-feeders might occur. Ascidians achieve higher performance in na IMTA system with the presence of holothurians, possibly other echinoderms, fish, or other taxa. Ascidians represent a rich source in EPA and DHA, essential fatty acids. The utilization of ascidians as an ingredient for aquafeed formulations seems to be a viable option, they are excellent candidates for dietary supplements, and represent a healthy seafood choice as well for human consumption, with essential amino acids and fatty acids. This work supports that ascidians can serve as na initial step towards reducing negative environmental impacts as they are a valuable resource and can bring added value to the aquaculture world, promoting the circular economy by increasing the income for farmers and producers. The present findings clearly point towards the need to further investigate the carrying capacity of IMTA systems employing ascidians as co-cultured/extractive species.

## Acknowledgements

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