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Abstract Proceeding

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Recycling of marine aquaculture wastewater using a microalgae-bacterial granular sludge system

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Aquaculture has become the fastest growing animal food-producing sector. In a near future, an intensification of the aquaculture practices is expected to cope with the ever-increasing fish demand. However, for land-based aquaculture farms, this growth implies the capture of higher water volumes from nearby water bodies and, consequently, the discharge of higher volumes of wastewater, containing organic carbon, nutrients, and often recalcitrant pollutants (e.g. pharmaceuticals). The expansion of the land-based aquaculture sector is currently offset due to the lack of space and water supplies, but also due to environmental concerns. Therefore, there is a need for innovative wastewater treatment systems able to reduce energy input, to improve resource use and to reduce the environmental impact.

In the present study, microalgae-bacterial granules were developed from a phototrophic microbial consortium autochthonous to the water streams of a marine aquaculture facility. The granular biomass was able to efficiently treat marine aquaculture streams, even when sporadically the antibiotic florfenicol was present, with pollutant reaching levels that allowed water recirculation in fish farms. The ammonium, nitrite, and nitrate concentrations in the treated effluents were below the toxicity limits for marine fish and, the dissolved oxygen levels were within the ideal range for water recirculation.

The granules microbial community was dynamic and, its structure was susceptible and adaptable to the changing operational reactor conditions such as the presence of the antibiotic florfenicol. The microbial diversity and functional redundancy within the microbial community seemed to be crucial for the adaptability of the system to the stressors presence.

Th symbiosis established between microalgae and bacteria within granules allowed for the effective and environmentally sustainable treatment of marine aquaculture wastewater.

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