

BENEFITS OF GROWING *ULVA* IN LAND-BASED PARTIALLY RECIRCULATED IMTA SYSTEMS

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As part of the All-Atlantic Ocean Sustainable, Profitable and Resilient Aquaculture (ASTRAL) project, we have investigated the benefits of growing the green seaweed *Ulva lacinulata* in land-based, partially recirculated aquaculture systems with either abalone, *Haliotis midae* or sea urchin, *Tripneustes gratilla*. We demonstrated that integrated multitrophic aquaculture (IMTA) grown *Ulva* is an excellent source of minerals, vitamins, AA's, FA's, protein, complex polysaccharides, and other bioactive compounds. When used as a feed or a feed component, *Ulva* enhanced the chemosensory properties of formulated feeds and significantly improved feed consumption, reducing reliance on harvesting of natural seaweeds and dependence on the use of protein-rich formulated feeds. The nutrient uptake efficiency of *Ulva* was shown to be ~60% in the abalone-*Ulva* IMTA with 50% recirculation, and ~80% in the urchin-*Ulva* IMTA with 90% recirculation. When recirculation rates were increased from 0-50% for the abalone and 0-90% for the urchin IMTA systems, energy consumption was reduced from 10.35-6.80 kWh per ton abalone and 12.45-3.54 kWh per ton urchin biomass harvested. A perceived risk of growing *Ulva* in abalone effluent and utilizing it as a supplementary feed is biosecurity. However, our comprehensive microbiome studies have revealed high microbial diversity in all compartments of the IMTA, indicative of a healthy system, and *Ulva* exhibited a modulatory effect on the microbiome, reducing the abundance of opportunistic pathogens (e.g., *Vibrio* spp.). Collectively, our studies revealed several benefits associated with the cultivation of *Ulva* in IMTA systems and high potential for IMTA to support sustainable aquaculture and a circular bioeconomy.

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