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Duckweed production at an IMTA system in Ireland

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Integrated Multi-Trophic Aquaculture is an aquaculture system in which extractive species (algae, aquatic plants, bivalves, etc.) recycle the waste produced by fed species (fish, shrimp, etc.). By integrating organisms from different trophic levels, IMTA reduces the potential environmental impacts of aquaculture and improves the sustainability and economic value of production systems.

The CIRCULAR-IMTA-DEMO pilot site at Mount Lucas, County Offaly, Ireland, comprises an IMTA farm producing 30 tonnes of rainbow trout in four split-ponds. Fish effluents are directed into 16 channels (12,800 m²) where duckweed is cultivated. Duckweed removes nutrients, improving water quality for recirculation while producing valuable biomass. The main duckweed species are *Lemna minor* “Blarney” and *Lemna gibba* “Keywater”, together with a spontaneous hybrid.

Studies conducted in 2019 and 2020 estimated a production potential of 35–48 t yr⁻¹ of dry duckweed biomass (Paolacci et al., 2022). However, productivity remains dependent on environmental conditions, including fish density and feeding regime, which determine waste production.

Following six years of inactivity, the site has restarted and has undergone structural changes. Vegetation has expanded within and around the channels, providing shelter and shade. However, the invasive aquatic plant *Elodea nuttallii* remains a problem, competing for nutrients. A diverse fauna, including swans, herons, amphibians and insects, has become established. Swans consume large amounts of duckweed, prompting the construction of exclusion zones. In addition, heatwave events in July 2026 caused changes in water physico-chemical properties, affecting trout and duckweed production. Our work aims to identify management strategies to maintain duckweed growth under varying conditions

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References

Paolacci, S., Stejskal, V., Toner, D., & Jansen, M. A. (2022). Wastewater valorisation in an integrated multi-trophic aquaculture system; assessing nutrient removal and biomass production by duckweed species. *Environmental Pollution*, 302, 119059.

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