

Dynamic bioeconomic management of blue crab invasion in coastal lagoons under climate risk

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Abstract

We develop a dynamic bioeconomic model of blue crab invasion in Mediterranean coastal lagoons. The model couples seasonal blue crab pressure with a stage-structured shellfish production system and explicitly represents periodic stocking, maturation and harvesting. Numerical simulations compare alternative seasonal removal schedules under the same annual intervention effort and assess how the temporal allocation of removal affects invasion pressure and aquaculture production. We then examine the robustness of these strategies under climate-related environmental variability and extreme conditions, with particular attention to production losses and risk. The framework highlights how biological invasion, seasonal production and climate risk jointly shape management effectiveness and the resilience of lagoon aquaculture systems.

Keywords: Blue crab, Invasive species, Bioeconomic model, Aquaculture, Climate risk, Environmental uncertainty.