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TAKING OVER MARITIME ECOSYSTEMS: MODELLING FISH-JELLYFISH DETERMINISTIC AND RANDOMIZED DYNAMICS

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Abstract. We present the results of a complete phase space analysis for a deterministic two-dimensional predator-prey model representing the key dynamics of fish-jellyfish interactions. Progressing through a series of bifurcations the biological phenomenon of jellyfish blooming is illustrated in this model and thus the taking over of the maritime ecosystem by jellyfish. We then turn to the question of how stochasticity in parameters and equations effects the emerge of blooming. Therefore, we first randomize the essential bifurcation parameter to model/ simulate and discuss stochastic environmental impact and, second, use first principle Markovian birth/ death processes to set-up a system of stochastic differential equations to model/ simulate and discuss the effects of intrinsic noise. In both cases, knowledge about the dynamics of the underlying deterministic system is indispensable and, in particular, in the intrinsic noise case a sooner occurrence of blooming can be observed.

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