Abstract MSEAS 2016

<u>The letter code and the name of the theme session you are submitting the abstract for:</u>

Session B: Coupled ecological, economic and social process understanding of the drivers of change: methods and tools for scenario development and prediction

<u>Title of the abstract:</u>

Integrating socio-economic drivers in an explicit-time, qualitative fisheries model: EcoMata

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<u>Text:</u>

EcoMata is an explicit-time, qualitative modelling tool for assessing the ecosystem impacts of fishing and evaluating options for fishery management. EcoMata relies on the theory of timed automata, an original approach for modelling and verifying discrete-event systems where timing is important. Early developments of EcoMata have focused on the dynamics of predator-prey responses in a food web, under a variety of fishing intensities and natural disturbances. The dynamics of these interacting modules (food web, fishing and external disturbance) are ruled by explicit timing constraints on state transitions, with the possibility of integrating time delays in their execution. System states and properties can be verified over time using efficient model-checking techniques with the help of a dedicated high-level query language. EcoMata provides non-expert users (i.e., managers) with a friendly interface that allows the expression of user-oriented queries for testing the sustainability of fishery policies. Here, the model is being developed further by integrating simple socio-economic drivers in the fishery system. Specifically, we introduce a new module of automata that describes the profits associated to a specific fishing intensity and specific timing. This new module allows the evaluation of management strategies that are economically viable. The approach is illustrated on a coral-reef fishery in the Pacific that has been the focus of previous modelling work. Timed automata offer a unified formalism for describing a variety of processes in which timing is critical. We show that ecological, economic and social drivers can be easily integrated in the EcoMata framework for exploring the sustainability of fisheries in a data-poor context.

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