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# Agent-Based Modeling Approach in Single Fish Population Management

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## Keywords

Agent-based model, Fishery management, MEY, MSY, Sustainable fishery

## Abstract

Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY) are key concepts in population and resource management, critical for optimizing exploitation and ensuring long-term sustainability. MSY represents the largest possible yield that maintains the resources' ability to regenerate, while MEY maximizes the economic benefits. Traditional models, such as Schaefer's logistic growth, provide valuable insights but often oversimplify ecological dynamics, social influences, and spatial factors. In contrast, Agent-Based Modeling (ABM) offers a dynamic and flexible approach by simulating complex interactions between agents and their environment and incorporating stochastic events, thus better capturing real-world complexities. This paper explores the potential of ABM to enhance the understanding of MSY and MEY in fisheries management, using the case of anchovy fisheries in the Gulf of Thailand as a study. Results from simulations demonstrate ABM's effectiveness in analyzing both biological and economic outcomes, revealing differences between traditional and ABM-derived estimates of MSY and MEY. While still in the early stages of application, ABM shows promising results for fisheries management, making it valuable for both scientists and stakeholders. The research may also open various developing and application opportunities in similar fields. However, it also suffers from some notable drawbacks in the development stage such as intensive requirements of time and resources, thorough consideration of the model's realism trade-off, and lack of initial input.

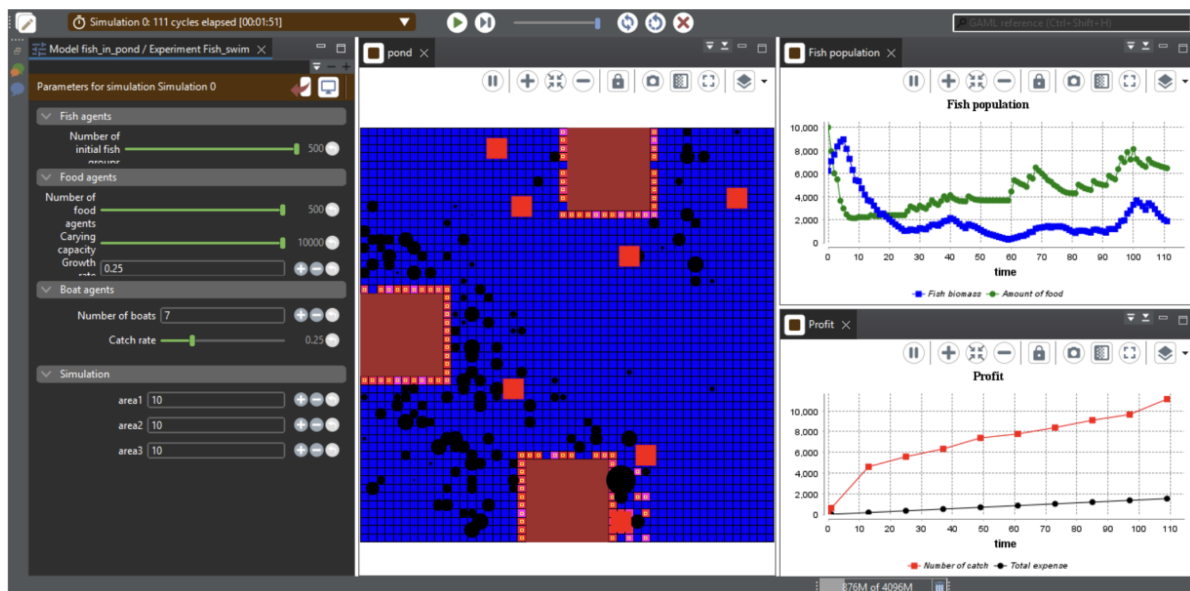


Figure 1: The parameter panel on the left enables users to configure agents and environment inputs. The map in the center represents the sea environment, where black dots depict fish agents, red squares show fishing boats that pursue and capture fish, brown geometries represent land, and food is indicated by a heat map that ranges from blue, signifying scarce food, to red, denoting abundant food. This helps visualize the schools' movement, their population density, and interactions with the environment. The charts track performance metrics, with the "Fish population" chart showing fish biomass and food availability, and the "Profit" chart displaying catch numbers, expenses, and profits to assess ecological and economic outcomes.