AN AGENT-BASED MODEL TO CAPTURE THE DYNAMICS OF FISH POPULATION IN THE KAUDULLA RESERVOIR, SRI LANKA

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Agent-based modelling is a new approach to modelling systems with interacting, autonomous agents. NetLogo is a powerful agent-based modelling platform that can be used to observe the dynamics of populations. In this study, an agent-based model (ABM) was developed to capture the dynamics of the fish population in the Kaudulla Reservoir, Sri Lanka, and the sustainability of the fish population with fishing was studied. This reservoir has two zones; Open access fishery zone and a smaller region where fish is grown. To maintain the sustainability of the reservoir, fries (5-6 days old fish) were grown in the fish growing area, and after 30 days, fingerlings were released to the reservoir. Fishing is permitted only in the fishery zone and the fish growing area is of negligible size. As the government is unable to fund the required number of fingerlings to the reservoir at one time, the fishery management system adds fingerlings to the reservoir about three times a year. In this study, a restricted fishing area was introduced, and three zones were considered, namely; a fishing zone, a reserved zone where fishing is strictly prohibited, and a fish growing area where small fish is grown to release into the reservoir. The control setup of the common practice of the reservoir was built to compare the dynamics of the fish population with the restricted fishing area. The results indicate that the fish population reaches the carrying capacity and extinct faster when fingerlings are not released to the reservoir. Also, if the fingerlings are released to the reservoir (real-world situation), or a restricted fishing area is introduced without releasing fingerlings, the fish population sustains longer. Further, releasing fingerlings to the reservoir with a restricted area leads the fish population to survive for a longer period than the above three cases. Since, even with these controls, the fish population can go extinct, the management would have to release fingerlings to the reservoir more than once in a year. The optimal time intervals would be found to add fish populations to maintain a sustainable fish population over the years.

Keywords: Agent-based modelling, Carrying capacity, Fishing reservoir, NetLogo, Sustainability