

Abstract for Using Predator Carrying Capacity for a Pathogenic Vector-Dynamic Differential Model

Schistosomiasis, also known as bilharzia or “snail fever”, is a parasitic disease carried by freshwater snails that has affected 240 million people in as many as 78 countries worldwide, with a majority of cases in sub-Saharan Africa. Schistosomiasis is transmitted by contact with contaminated fresh water (rivers, lakes and ponds) inhabited by snails carrying the parasite, which are kept in check by freshwater prawns (predators). The parasites grow in the human bodies and produce eggs which are eventually released by humans into the water, completing the cycle. We adapt a classical Ross-MacDonald model to account for predator-prey interaction between these three populations, with the snail population divided into infected and uninfected individuals. Other features of the model include predator and prey carrying capacity, a fixed human population and mass-action assumption for the interaction terms. Our model exhibits oscillatory behavior for the predator and prey populations, while slowly reducing prey (infected) numbers, which is a new finding that is in agreement with experimental data. This points out to avenues of reducing the threat of infection with Schistosomiasis by increasing the negative impact the predator population has on the infected snails. Future research will focus on introducing more detailed components for this ecological system, such as other natural predators for snails and detailed spatial interactions.