

Modelling Schistosomiasis Biological Control Using a Competitor Snail and a Molluscivorous Fish

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An estimated number of 240 millions people worldwide suffer of schistosomiasis (mainly in Africa and Asia). Also known as bilharzia, it is a disease caused by parasitic worms. There are three main trematode worm parasites transmitted by freshwater snails (*Schistosoma mansoni*, *S. haematobium*, and *S. japonicum*) which can cause illness in humans and bovine.

Freshwater becomes contaminated by schistosoma eggs when infected people urinate or defecate in the water. The eggs hatch, release parasites which infect the appropriate species of intermediate snails in the water. The parasite develop and multiply inside the snails, leaves them and enters the water where it can survive for about 48 hours. Schistosoma parasites can penetrate the skin of persons who come in contact with contaminated freshwater, typically when wading, swimming, bathing, or washing.

Schistosomiasis can be contained by controlling the intermediate snails. This is mostly done using the pesticides/molluscicides which can be very harmful to aquatic ecosystem. One possible way of tackling the problem is the biological control by introduction of snails predator fishes and competitor snails.

In this talk, we extend the model proposed in [1] by introducing a molluscivorous fish. This predator fish can feed both on intermediate snails and competitor snails. Consequently, we consider three different important scenarios of biological control: (1)- the model with competition only; (2)- the model with intermediate snail and predator only; (3)- the full model with competition and predation.

The long term dynamics of each of the sub-models is mathematically investigated. Using the numerical simulations, the three different control strategies are compared.

References

- [1] E.J. Allen, H.D. Victory, Jr, *Modelling and simulation of a schistosomiasis infection with biological control*, Acta Tripica, 87 (2003) 251–267.