ON THE STABILITY OF A FOUR SPECIES: A PREY-PREDATOR - HOST - COMMENSAL - MUTUAL - SYN ECO-SYSTEM - II (PREY AND PREDATOR WASHED OUT STATES)

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Abstract

This paper deals with an investigation on a four Species Syn-Ecological System (Prey and Predator Washed out States). The System comprises of a prey (S_1), a predator (S_2) that survives upon S_1, two hosts S_3 and S_4 for which S_1; S_2 are com-mensal respectively i.e., S_3 and S_4 benefit S_1 and S_2 respectively, without getting elected either positively or adversely. Further S_3 and S_4 are mutual. The model equations of the system constitute a set of four first order non-linear ordinary differential coupled equations. In all, there are sixteen equilibrium points. Criteria for the asymptotic stability of three of the sixteen equilibrium points: the prey and predator washed out states only are established. The system would be stable if all the characteristic roots are negative, in case they are real, and have negative real parts, in case they are complex. The linearised equations for the perturbations over the equilibrium point are analyzed to establish the criteria for stability and the trajectories illustrated.

Key Words and Phrases : Commensal, Eco-system, Equilibrium points, Host, Mutual, Prey, Predator, Stability, Trajectories.