



# The Dynamics and Stability of Prey-Predator Model of Migration with Holling Type-III Response Function and Interspecific Competition for Prey

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**Abstract:** This paper discusses the prey-predator model with habitats in reserved and unreserved areas. The prey population can migrate from the reserved area to the unreserved area and vice versa. The prey lives in the reserved and unreserved areas. The predator freely hunts for the prey in the unreserved area. The Holling type III is considered on the basis of its predatory characteristics. Interspecific competition for prey occurs in the migration process. The dynamics of prey-predator is expressed as a system of nonlinear differential equations. The stability of the interior equilibrium point is analyzed locally. The eigenvalues of the Jacobian matrix together with the Routh-Hurwitz stability test are used to determine the stability of the equilibrium point. Using appropriate parameter values, simulations were conducted by varying the parameter values of migration and interspecific competition. It was found that there are up to three interior equilibrium points and there are conditions in which there is no interior equilibrium point. It was also found that there are three interior equilibrium points, one of which is unstable while the other two are bistable. The change in migration rates and competition levels allows the prey population in the reserved and unreserved areas and their predator to live together.

**Keywords:** *prey-predator; Holling type; reserved area; interspecific competition; bistable equilibrium points.*

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