

Mass-action vs. the Gauntlet: Survival of migrating prey in predator fields

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POSTER SESSION ABSTRACT: Ecological theory traditionally describes predator-prey interactions in terms of a law of mass action in which the prey mortality rate depends on the density of predators and prey. In such models, the mortality rate is a function of the exposure time of the prey to predators. However, observations on migrating prey through a field of predators (eg. ocean-bound juvenile salmon among piscivores) reveals mortality depends mostly on distance traveled and only weakly on travel time. This is due to the effects of explicit spatial structure. If, for example, prey migrate through a stationary gauntlet of predators, mortality depends strongly on distance. At the opposite extreme of random prey and predator motions, mortality is time-dependent. These effects have been explicitly described by an analytical mean-free path model based on predator-prey encounter areas and relative velocities. I use a Swarm simulation to test the analytical model and to further explore the time and space dependencies of survival with heterogeneous agent structure and behaviors.