Predicting Prey Population Dynamics From Kill Rate, Predation Rate And Predator-Prey Ratios In Three Wolf-Ungulate Systems

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Predation rate (PR), kill rate and predator-prey ratio's are all thought to be fundamental statistics for understanding and managing predation. However, relatively little is known about how these statistics explain prey population dynamics. We assess these relationships across three systems where wolf–prey dynamics have been observed for 41 years (Isle Royale), 19 years (Banff) and 12 years (Yellowstone). Theoretical simulations indicate that kill rate can be related to PR in a variety of diverse ways that depend on the nature of predator–prey dynamics. These simulations also suggested that the ratio of predator to-prey is a good predictor of prey growth rate. The empirical relationships indicate that PR is not well predicted by kill rate, but is better predicted by the ratio of predator-to-prey. Kill rate is also a poor predictor of prey growth rate. However, PR and predator-prey ratio's each explained significant portions of variation in prey growth rate for two of the three study sites. Our analyses offer two general insights. First, it remains difficult to judge whether to be more impressed by the similarities or differences among these 3 study areas. Second, our work suggests that kill rate and PR are similarly important for understanding why predation is such a complex process. We conclude with a review of potential management applications of predator-prey ratio's and the assumptions required to understanding prey population dynamics.