## (3) DETECTING TOP-DOWN VERSUS BOTTOM-UP REGULATION OF UNGULATES BY LARGE CARNIVORES: IMPLICATIONS FOR CONSERVATION

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*Abstract:* We set forth predictions for determining whether populations of large herbivores are regulated primarily via top-down or bottom-up processes. We contend that existing models of predator–prey dynamics based on kill rates, including prey-dependent, ratio-dependent, and predator-dependent approaches, are not well suited for understanding top-down and bottom-up regulation of ungulates by their predators. These models make predictions that are not realistic, do not cope with carrying capacity ($K$) of ungulate prey, fail to consider that some mortality of prey may be compensatory, or do not explicitly deal with multiple prey-multiple-predator systems. Similarly, the four conceptual models, which consist of recurrent fluctuations, low-density equilibrium, multiple equilibria (predator pit), and the stable-limit cycle, are predator-centric, and offer limited promise to explain population dynamics of large mammals. We have demonstrated that, except at very low density of prey relative to $K$, where kill rates are most difficult to measure, population density of prey with respect to $K$ is most important in determining potential points of equilibria, and thereby whether regulation is from above or below. Moreover, funding necessary to collect data sufficient to fit models that predict kill rates across seasons for a sufficient number of years seldom are available; conservation issues would be long-resolved before the best model could be selected. We have constructed a conceptual framework to make predictions about whether populations of large herbivores are regulated by top-down or bottom-up processes, and propose criteria to assess whether predator control would be effective in releasing ungulate populations from low-density equilibria.

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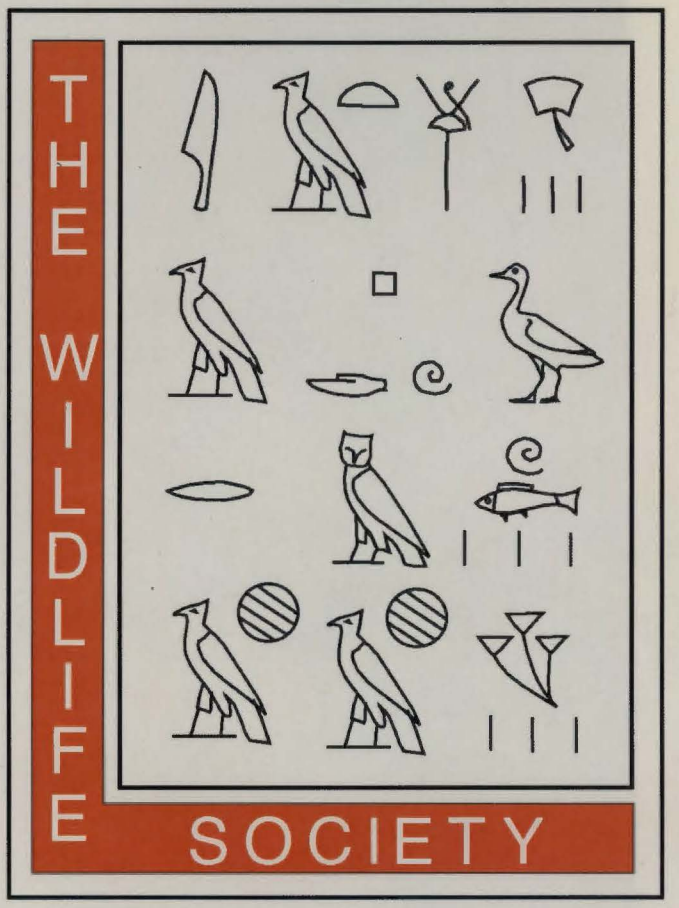


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# Program & Abstracts