

Boyko, A.R., R.M. Gibson, and J.R. Lucas. 2004. How predation risk affects the temporal dynamics of avian leks: Greater sage-grouse versus golden eagles. *The American Naturalist* 163:154-165.

Abstract: Leks often attract predators as well as mates, yet most evolutionary models have assumed that sexual selection, not predation, drives lekking behavior. We explored the influence of predation on lek dynamics using a stochastic dynamic game model based on the lek-breeding greater sage grouse (*Centrocercus urophasianus*) and its principal avian predator, the golden eagle (*Aquila chrysaetos*). The model predicts time-dependent male lek attendance as a function of factors affecting both mating success (female arrival rate, male numbers, and social status) and predation risk (eagle arrival rate and group size). Dominant males are predicted to arrive sooner and leave later than subordinates, especially if mating skew is high, predation risk is low, or the relationship between lek size and female arrival rate is weak. Both high mean levels of predation risk and small lek size should reduce lek attendance, but the relative tendency of predators to attack large versus small leks has little influence on predicted lekking behavior. Field observations confirmed the predicted effects of female arrival rate, lek size, male dominance, and weather-dependent predator arrival rates on lek departure times. Predicted effects of female arrival rates and male dominance on seasonal lek attendance were also supported. Our model provides an empirically supported adaptive explanation for short-term lek dynamics. It also suggests alternative interpretations for phenomena previously invoked to support the hotshot and skew models of lek formation.