Influence of Climate And Density on Fluctuating Asymmetry in Elk Antlers

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Antler size and symmetry can be an excellent indicator of individual fitness and social rank among North American elk (*Cervus elaphus*). When environmental conditions are favorable elk allocate resources to antler development over body weight to increase secondary sexual traits and enhance reproduction. Research indicates that size and fluctuating asymmetry (FA), the measure of random deviations from perfect bilateral symmetry, of elk antlers due to poor nutritional condition is a result of a tradeoff between body size and antler size. Using antler measurements (n = 2521), collected at the Gardiner Montana hunter check station by Montana Fish, Wildlife, and Parks (MTFWP) we tested two hypotheses expected to drive antler characteristics in elk. Our first hypothesis is that extreme climatic conditions (heavy snow and drought) in the northern Yellowstone area have altered the nutritional condition of elk, and thus FA. Second, we hypothesized that the occurrence of FA in elk antlers is associated with elk density where higher density of elk increases FA because of food-limitation. To test these hypotheses, we used mixed-effects time-series model of FA expressed as a function of climate covariates and elk density from winter aerial surveys. Our preliminary results support our hypotheses that harsh environmental conditions coupled with high elk densities influence the occurrence of FA in elk antlers. These results provide MTFWP with useful information on the effects of climate and density on antler characteristics of elk, an important big game species.