Estimating Total Human-Caused Mortality from Reported Mortality Using Data from Radio-Instrumented Grizzly Bears [TWS]

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Tracking mortality of the Yellowstone grizzly bear (*Ursus arctos horribilis*) is an essential item of the recovery process. Agency removal of problem bears is known. Additionally, the public reports an unknown proportion of bears they kill. Estimating the number of non-agency human-caused mortalities is a necessary element that must be factored into the tally of total annual mortality. Here, we describe a method of estimating non-agency human-caused grizzly bear deaths from records of reported human-caused bear mortalities. We used a hierarchical Bayesian model, with an assumed noninformative prior distribution for the number of deaths. Information from reporting rates of deaths in radio-instrumented bears from 1984 to 1999 is used to develop 3 beta prior distributions on the probability that the public will report a death. Different prior results from different assumptions about the fates of unexplained/unresolved loss of signal incidents. We apply the method to reported human-caused mortalities in running 3-year time periods starting in 1993 through 2000. Two distinct data sets are analyzed: one with possible deaths included and one with possible deaths excluded. We believe results from the described method can be combined with agency removals to produce defensible estimates of total mortality over relevant time periods and incorporate uncertainty when evaluating mortality limits established for the Yellowstone grizzly bear population. Assumptions and limitations of this procedure are discussed.