

The mark-resight estimator was an important outcome of 3 scientific workshops on the demographics of the Greater Yellowstone Ecosystem grizzly bear population organized by the Interagency Grizzly Bear Study Team (Study Team) during 2011-2012. The impetus for those workshops was to address the known underestimation bias of a technique that is currently used (referred to as the Chao2 estimator). The mark-resight technique was documented in a peer-reviewed paper published in a statistical journal (Higgs et al. 2013). The basis of this technique is the ratio of marked (with radio collar) vs. unmarked (no radio collar) females with cubs-of-the-year seen during systematic observation flights throughout the ecosystem. This estimator provides a relatively unbiased estimate of female grizzly bears accompanied by cubs-of-the-year, which can then be used to determine overall population size. The consensus among the Study Team is to start using this technique for annual estimation of the Yellowstone grizzly bear population.

Although the mark-resight estimator is unbiased, the uncertainty around the point estimate is relatively large with few opportunities to improve this. Because the mark-resight technique translates into substantially larger estimates of total population size compared with the previous technique (Chao2), the Study Team recently decided to evaluate whether independent data support these larger estimates.

Genetic data represent one independent source and can be used to calculate what is referred to as “effective population size”, a measure of the number of animals contributing to the population in terms of reproduction. With over 800 individual bears genotyped from the Greater Yellowstone Ecosystem, we have a strong dataset. We are investigating trend, and potentially total population size, based on this genetic approach. These analyses are nearly completed. The next step is to prepare a manuscript for publication that not only documents the details of the genetic population analyses but also compares population estimates and trends based on the mark-resight technique. We plan to submit this paper to a peer-review journal early next year.

If the manuscript describing the genetic-based technique is accepted for publication and results indicate similar estimates of population size and trend compared with the mark-resight technique, we would formally adopt the mark-resight technique as the primary population estimation approach for the Greater Yellowstone Ecosystem. We would use the earliest Yellowstone Ecosystem Subcommittee and Interagency Grizzly Bear Committee meetings to announce this formal adoption of the mark-resight technique (spring/summer or fall/winter 2015).

If the mark-resight estimator is adopted as the primary population estimation technique, a continuing commitment would be required to maintain at least 25 radio-marked females within the area that we monitor for demographic analyses. We will continue population trend analysis estimation based on the currently used technique based on the Chao2 estimator; these estimates will continue to serve as a benchmark to assess and compare population trends over time.

Literature Cited

Higgs, Megan D., William A. Link, Gary C. White, Mark A. Haroldson, and Daniel D. Bjornlie. 2013. [Insights Into the Latent Multinomial Model Through Mark-Resight Data on Female Grizzly Bears With Cubs-of-the-Year](#). Journal of Agricultural, Biological, and Environmental Statistics. doi: 10.1007/s13253-013-0148-8