Effects of Helicopter Net-Gunning on Survival of Bighorn Sheep

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ABSTRACT: Wildlife capture, and the data collection associated with it, has led to major advancements in ecology that are integral to decision making pertaining to wildlife conservation. Capturing wildlife, however, can cause lethal and non-lethal risks to animals. Understanding the factors that contribute to the level of risk involved in wildlife capture is therefore critical for the development and implementation of the safest and most effective methodologies. We used data from 736 animal captures of 389 individuals for two subspecies of female bighorn sheep (*Ovis canadensis canadensis* and *O. c. sierrae*) in Wyoming and California, USA, 2002–2020 to evaluate the degree and extent of time that capture via helicopter net-gunning affects survival. We compared pre- and post-capture survival during a 10-week window centered on a capture event, as well as post-capture survival between captured animals and animals that were monitored but not captured during the 10-week window. Additionally, we evaluated the effects of handling techniques (number of times captured, season of capture event, handling time, chase time, and body temperature) and biological factors (age and nutritional condition) on probability of capture mortality. Mean daily survival was 0.9992 during a 5-week pre-capture window, dropped to 0.9864 on the day of capture, and rebounded within 3 days of capture to pre-capture levels and that of sheep that were not captured. Overall, direct mortality resulting from capture was 1.36%, with 0.54% mortality occurring within the 3 days following a capture event for a total of 1.90% capture-related mortality. The only handling and biological metrics that influenced the probability of capture mortality were rectal

temperature and nutritional condition; both high initial rectal temperatures and poor body condition were associated with increased risk of mortality in the days following capture. Overall, helicopter net-gunning imposed low and short-term risk to survival of female bighorn sheep. To reduce bias in survival estimates we recommend using a 3-day censorship window for post-capture mortalities as opposed to the common practice of a 2–5-week censor window. Helicopter net-gunning, including annual or seasonal recaptures, remains an effective and comparatively safe technique for capture and associated data collection of bighorn sheep.

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