DEPARTMENT OF NATURAL RESOURCES

# CALIBRATION OF A RUMEN BOLUS TO MEASURE CONTINUOUS INTERNAL BODY TEMPERATURE IN MOOSE[1]

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## ABSTRACT

Mortality implant transmitters (MITs), a device that can record continuous rumen temperature, have been deployed in wild moose (*Alces alces*) in Minnesota to understand physiological and behavioral responses of moose to increasing ambient temperatures. We compared temperatures collected using MITs to temperatures collected using vaginal implant transmitters in 10 captive female moose (>2 years old) at the Kenai Moose Research Center in Alaska. Both devices collected continuous body temperature measurements at 5 min intervals for 1 year. We directly observed moose behavior for a total of 384 hours during four, two-week windows distributed seasonally within the sampling period, to assess potential effects of behaviors on MIT-recorded temperatures. We documented a decrease in MIT-recorded temperatures following water intake and developed an approach for censoring these observations. After removing these observations, MIT-based temperatures were, on average, 0.03°C (95% CI = −0.57–0.55°C; $\bar{x}$ = 38.14°C) lower than VIT-based temperatures ($\bar{x}$ = 38.17°C; *n* = 760,439). We fit linear mixed-effects models to explore the relationship between MIT and VIT-based temperatures across seasons and individuals. On average, the difference between predicted and observed temperatures was 0.05°C (95% PI = −0.19–0.29°C) and 0.33°C (95% PI = 0.01–0.63°C) for winter and summer seasons, respectively. We conclude that minimally invasive MITs can accurately record internal body temperature in moose, and thus provide a tool for understanding the physiological and behavioral responses of moose to environmental stressors.

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