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Tracking Livestock - How Do Different GPS Measurement Intervals Affect Movement Pattern Results?

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Abstract

Animal tracking has been widely practiced in rangelands over the last years to understand livestock and wildlife spatial and temporal movement patterns. Globally, rangeland degradation is progressive and effective management strategies are crucial to maintain healthy pastureland for livestock and wildlife. GPS collars help to understand movement dynamics with minimal animal interference. However, little is understood how frequently GPS positions need to be recorded to receive sufficient detail on distances travelled and preferred grazing locations. To understand appropriate tracking intervals, we used GPS collars on livestock herds (goat/sheep and cattle) in the semi-arid savanna of Tanzania and in the desert-steppe of Mongolia. The Maasai herders of Tanzania tend their livestock in a tropical climate with rainy and dry seasons, whereas nomadic herders of Mongolia live in a continental climate with four seasons and high temperature differences throughout the year. Data of 6 livestock herds (n^{goat} =6) in south-western Mongolia and of 10 livestock herds (n^{goat} = 5, n^{cattle} = 5) in northern Tanzania were collected over a period of 2 months. We tested whether different GPS point intervals (3 minutes, 15 minutes, 30 minutes and 60 minutes) affected the outcomes on daily walking distance and maximum daily distance from herder camp in both ecosystems. We further tested influence of daily elevation, average altitude of livestock per day and average temperature per day on the daily walking distance of goats in both study sites. Our results suggest that mean values of daily walking distance decrease with reduced measurement density in each study area. Further, in both ecosystems, daily elevation had a significant influence on daily walking distance [Tanzania: $X^2 = 14.0983$, $P < 0.001$; Mongolia: X^2 =57.9977, $P < 0.001$]. In Mongolia, average altitude per day was as well significant [X2 = 47.5285, p-value < 0.001]. Our study adds valuable information to optimize GPS tracking and, therefore, contributes to improving the understanding of animal movement patterns and the appropriate tools.

Keywords: GPS Tracking, mobility, Mongolia, pastoralism, Tanzania

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