**Applying Dead-Reckoning Techniques to Monitor Movements and Map the Burrow Systems of a Fossorial Species, the Black-TailedPrairie Dog

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The black-tailed prairie dog (*Cynomys ludovicianus*) is a keystone species that promotes grassland biodiversity throughits foraging and burrowing behaviors. However, prairie dogs face significant threats from the sylvatic plague (*Yersinia pestis*). Plague can disrupt prairie dog behavior, movement patterns, and burrow system dynamics, ultimately compromising colony health and resilience. Understanding the movements and burrow systems of semi-fossorial animals, such as BTPD, poses significant challenges due to the difficulty of direct observation and the limitations of most tracking systems, which cannot collect location underground. This study explores the potential of combining 'Daily-Diary' tags with dead-reckoning techniques to map underground movement. The tags are equipped with accelerometers and magnetometers and collect data in3 axes at a rate of 40 times per second. We deployed 12 tags on prairie dogs in northeast Montana to test the efficacy of dead-reckoning for tracking underground activity. To validate dead-reckoning trajectory estimation, we conducted controlled trials in artificial burrows constructed from plastic tubing with known dimensions and layouts. This allowed us to test theaccuracy of movement reconstructions against a known reference. The 2D dead-reckoning process captured all turns in our plastic tunnel system with a mean error of 15.38 cm across tunnel lengths of up to 4 m. These findings offer a promising avenue for studying fossorial species where traditional tracking methods are not feasible. Building on this work, we are now applying tags to prairie dog colonies under different plague management schemes to evaluate how these practices influence prairie dog movement and burrow system complexity.