# The 4th dimension in animal movement: The effect of temporal resolution and landscape configuration in habitat selection analyses

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## Abstract

1: Understanding how animals use their habitat is essential to understand their biology and support conservation efforts. Technological advances in tracking technologies allow us to follow animals at increasingly fine temporal resolutions. Yet, how tracking devices' sampling intervals impact results remains unclear, as well as which method to use. 2: Using simulations and empirical data from wild boars tracked in Germany, we systematically examine how temporal resolution of movement data in interaction with spatial autocorrelation of the landscape affects the outcomes of two common techniques for analyzing habitat selection: Resource Selection Analysis (RSA) and an autocorrelation-informed weighted derivate (wRSA) as well as integrated Step Selection Analysis (iSSA). Each method differs in the definition of "available" locations (RSA) and implementation of the movement model during parameter estimation (iSSA). 3: Our simulations suggested that landscape autocorrelation has a much stronger effect on the estimated selection coefficients and their variability than the sampling interval. Higher sampling intervals (i.e. longer time between steps) are required for landscapes with high autocorrelation, enabling the animal to experience enough variability in clumped landscapes. Short sampling intervals generally led to higher variability and fewer statistically significant estimates (in particular for wRSA). 4: Our results complement recent attempts to outline a coherent framework for habitat selection analyses and to explain them to practitioners. We further contribute to these efforts by assessing the sensitivity of two commonly used methods, RSA and iSSA, to the changes in sampling interval of movement data. We expect our findings to further raise awareness of pitfalls underlying comparison of estimated selection coefficients obtained in different studies and to assist movement ecologists in choosing the appropriate method for habitat selection analysis.

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