

Solving the Sample Size Problem for Resource Selection Analysis

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Abstract

Resource selection analysis (RSA) is a cornerstone approach for understanding animal distributions, yet there exists no rigorous quantification of sample sizes required to obtain reliable results. We provide closed-form mathematical expressions for both the number of animals and relocations per animal required for parameterising RSA to a given degree of precision. Required sample sizes depend on just two quantities: habitat selection strength and an index of landscape complexity, which we define rigorously. We validate our solutions using 5,678,623 GPS locations from 511 animals from 10 species (omnivores, carnivores, and herbivores from boreal, temperate, and tropical forests, montane woodlands, swamps, and tundra). Our results contradict conventional wisdom by showing that environmental effects on distributions can often be estimated with fewer animals and relocations than assumed, with far-reaching implications for ecologists, conservationists, and natural resource managers.

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