

Which landscape features affect species movement and dispersal?



Amy Eycott¹, Kevin Watts¹, Gemma Brandt¹, Gavin Stewart², Lisette Buyung-Ali², Diane Bowler², Andrew Pullin²
¹Forest Research, Alice Holt, Farnham UK; ²Centre for Evidence-Based Conservation, Bangor University, UK



Increasing species movement and improving landscape connectivity is widely believed to be important for biodiversity conservation to limit the consequences of climate change and habitat fragmentation.

In this study, we use systematic review and meta-analyses to assess the strength of evidence for the impact of different landscape features on movement rates.

Systematic review in ecology

Systematic review is a technique used to search, collate, critically appraise and synthesize the results of primary research studies in order to answer a particular question (Pullin & Stewart, 2006). It involves an exhaustive search of peer-reviewed journal publications, grey literature and unpublished research and the findings of relevant articles are summarised qualitatively or quantitatively with meta-analysis.

Quantitative Meta-analysis: Corridors or habitat permeability?

We analysed the data from studies that measured the number of individuals making a successful inter-patch movement and that compared either (1) patches connected with a corridor to those without a corridor, or (2) patches connected by matrix habitats expected to differ in permeability.

(1) Individuals are more likely to move between patches connected by a corridor than between patches without a corridor (risk ratio 1.65, 95%CI 1.04 to 2.61; $p = 0.03$; Figure 1). This means that approximately one additional individual will successfully move between patches for every 15 animals in habitat patches connected by a corridor compared to identical but unconnected patches. Evidence came from small scale (< 500 m) studies of rodents and winged insects.

(2) Individuals are more likely to move between patches across expected favourable than unfavourable matrix (risk ratio 1.44, 95%CI 1.01 to 2.05, $p = 0.04$; Figure 2). This means that overall, approximately one additional individual will successfully move between patches for every 96 animals in more favourable matrix habitat compared to less favourable matrix habitat. Evidence came from small scale (< 100 m) studies of birds, rodents, fish and insects.

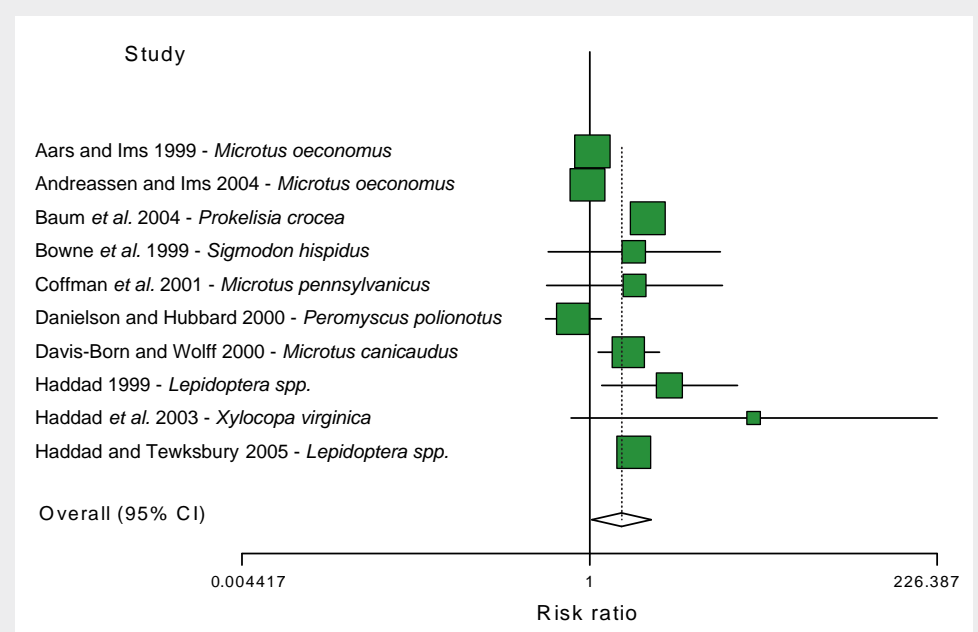


Figure 1. Studies comparing inter-patch movement with and without corridors. Solid boxes represent data points. Horizontal lines are 95% confidence intervals. The solid vertical line marks the line of no effect (risk ratio = 1) and the dotted line marks the mean effect size. Where the risk ratio is > 1 the species is more likely to move between patches in a corridor than across matrix.

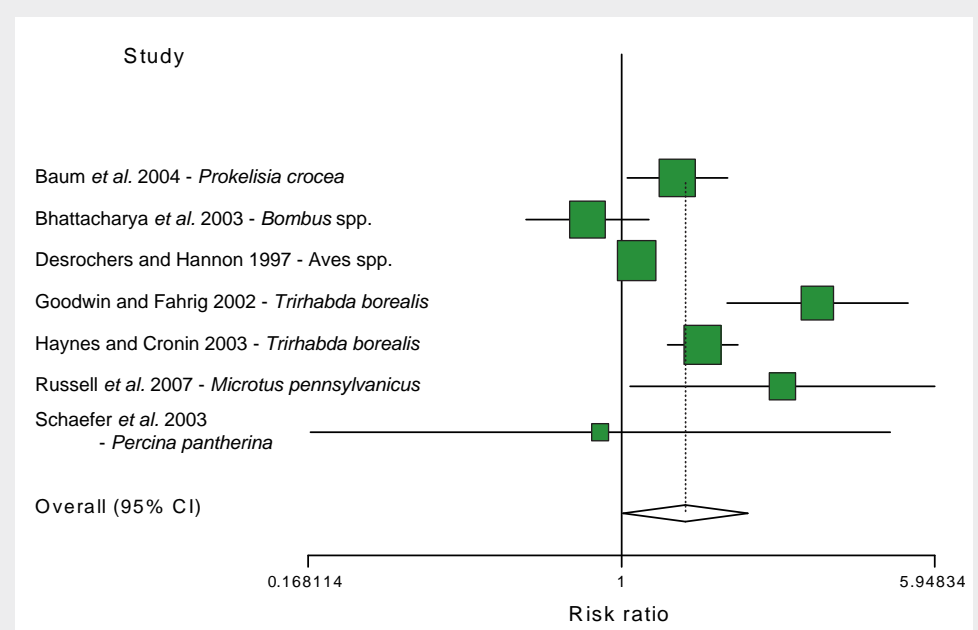


Figure 2. Studies comparing inter-patch movement with more and less permeable matrix types. Symbols same as Figure 1.

Summary

The balance of evidence suggests corridors and permeable matrix types both increase inter-patch movement. However, it remains unknown if the observed magnitude of the increase would have a significant impact on populations. The number of studies that could be included in the meta-analysis was too low to explore the factors generating differences in results among studies. For environmental management, further work is necessary to predict when, where and for which species landscape features will be important.