The Effectiveness of Corridors and Stepping Stones Depends on Matrix Quality

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Résumé

Habitat fragmentation poses a significant threat to biodiversity, necessitating the exploration of strategies to mitigate isolation and enhance population persistence. While some studies suggest that corridors and stepping stones enhance dispersal between habitat patches in fragmented landscapes, others suggest that they may have neutral or negative effects on population persistence. Overall, the effectiveness of these elements in enhancing dispersal and reducing mortality risk depends on landscape structure and animal behavior. Here, we established a population-level microcosm for a landscape-scale experiment with *Folsomia candida*, a soil-dwelling arthropod. We aimed to assess the effectiveness of corridors and stepping stones in reducing habitat isolation and preventing population extinction in fragmented landscapes. We manipulated fragmentation levels by varying distances between four habitat patches surrounded by hostile matrices and introduced corridors and stepping stones to facilitate linear connectivity between patches. We monitored patch colonization success, reproduction, and survival for 12 weeks, comparing responses with and without connectivity elements. Increasing the distance between patches negatively affected colonization, reproduction and survival in all experimental setups. Corridors and stepping stones inserted into low-quality matrices increased patch colonization rates but also increased mortality risk for dispersing individuals. The total population peaked in landscapes without connectivity elements, due to low dispersal rates. Individuals remained predominantly within the release patch and showed minimal dispersal into the low-quality matrix. As a result, survival was higher for adults initially introduced into the release patch at the beginning of the experiment. Conversely, populations were significantly higher in target patches within landscapes connected by corridors compared to all other treatment conditions. Our study highlights the importance of addressing both connectivity and matrix quality in conservation strategies. Increasing connectivity for an organism depends not only on the presence of corridors and stepping stones but also on the composition of the surrounding matrix. While increasing connectivity facilitates dispersal, ensuring matrix quality is essential for the long-term persistence of species.

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Mots-Clés: habitat fragmentation, corridors, stepping stones, Folsomia candida, matrix quality, connectivity