Testing the relative influence of spatial sorting and landscape on the expansion dynamics of a major invasive amphibian

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Résumé

The fate of established population in a novel range depends on many conditions but two factors may largely modulate the expansion dynamics by determining the connectivity of the area to be colonized: spatial sorting and landscape. While spatial sorting leads to the progressive increase of dispersal capacity at the periphery range, landscape configuration determines the capacity of a population to reach suitable habitats. If configuration remains constant in a connected landscape, spatial sorting increases colonization rate over time. However, landscape is often heterogeneous over large areas. Depending on the variation in functional connectivity, population spread could be enhanced, dampened or halted, which calls for considering the eco-evolutionary context of an invasion. Such investigation is also relevant to refine forecasts about an ongoing invasion and anticipate conservation actions. *Xenopus laevi*s is one of the three most invasive amphibians in the world. We investigated the relative influence of landscape and spatial sorting on its invasion dynamics in western France. We created a connectivity map extending beyond the current colonized range. Habitat was characterized at a high resolution (6m) using remote sensing and the connectivity model parameterized using experimentally estimated resistance cost for various substrates. We simulated expansion from different introduction points in 30 km x 30 km cells of the resistance cost map at three levels of spatial sorting. We tested the effect of habitat availability (pond number), four descriptors of landscape configuration and spatial sorting. As expected spatial sorting and habitat availability increased the colonization rate. More surprisingly, landscape configuration did not affect expansion dynamics. This results contrast with other studies that simulated expansion in binary landscapes (habitat vs. non habitat), possibly questioning the relevance of investigating expansion in too simplified conditions. We discuss the limit of our approach too. On a more applied perspective, the high connectivity of landscapes

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for *X. laevis* in Western France would qualify attempts of eradication or containment as unrealistic. Instead, building on our finding that vegetation complexity in the pond positively influences invertebrate diversity, we advocate for local management oriented towards nature-based solutions.

Mots-Clés: connectivity, modelling population spread, conservation biology, African clawed frog