

Habitat split, climate change, and amphibian host-microbial interactions

C. Guilherme Becker

The Pennsylvania State University

Anthropogenic habitat disturbance and climate change are fundamentally altering patterns of disease transmission and immunity across the vertebrate tree of life. Most studies linking anthropogenic habitat change and disease focus on habitat loss and fragmentation, but these processes often lead to a third process that is equally important, namely *habitat split*. Defined as spatial separation between the multiple classes of natural habitat that many vertebrate species require to complete their life cycles, habitat split has been linked to population declines in vertebrates, e.g., amphibians breeding in lowland aquatic habitats and overwintering in fragments of upland terrestrial vegetation. Furthermore, deforestation is increasing the likelihood of droughts in several tropical regions. Here, we link habitat split and droughts to enhanced disease risk in amphibians by (i) reviewing the biotic and abiotic forces shaping elements of immunity and (ii) through spatially oriented field studies focused on tropical frogs. Our results highlight that habitat split contribute to host-associated microbiome dysbiosis and chronic stress that often facilitate pathogenic infections and disease in amphibians. Drought was also a strong predictor of disease and mortality in an endemic tropical frog. We highlight that targeted habitat restoration strategies aiming to connect multiple classes of natural habitats (e.g., terrestrial-freshwater) could enhance priming of the vertebrate immune system through repeated low-load exposure to enzootic pathogens and reduced stress-induced immunosuppression.