



Mountain forest biodiversity under climate change: compensating for negative effects by increasing structural richness

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Species in mountain environments are expected to face a high risk of range contractions, if not local extinctions, under climate change. Yet, most endothermic species may not primarily be affected by physiological constraints, but indirectly by climate-induced changes of habitat quality. In mountain forests, where species largely depend on vegetation composition and structure, climate change effects may thus be mitigated by active management aiming at habitat enhancement.

We tested this hypothesis using four mountain bird species of conservation concern, Western Capercaillie *Tetrao urogallus*, Hazel Grouse *Tetrastes bonasia*, Pygmy Owl *Glaucidium passerinum* and Three-toed Woodpecker *Picoides tridactylus*, which are considered as indicators for complementary forest structural parameters and umbrella species for the associated species communities. Based on species data and environmental information collected at 300 1-km² plots distributed across three mountain ranges in Switzerland and southwestern Germany, we investigated (1) how species' distributions as well as local occurrence were explained by climate, landscape and vegetation, (2) to what extent climate change and climate-induced vegetation changes will affect habitat suitability and (3) whether these changes could be compensated for by adaptive habitat management. Species presence was modelled under current climate, and then extrapolated to the conditions of 2050, assuming the moderate IPCC-scenario A1B.

Climate variables contributed significantly to explaining species occurrence, and expected climatic changes, as well as climate-induced vegetation trends, decreased the occurrence probability of all four species, particularly at the low-altitudinal margins of their distribution. These effects could be partly compensated for by modifying single vegetation factors, but full compensation would only be achieved if several factors were changed in concert. The results illustrate the possibilities and limitations of adaptive conservation management for supporting mountain forest biodiversity under climate change.

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For detailed information see:

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