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# Bird functional insectivory and landscape complexity in vineyard agroecosystems

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## Abstract

Insectivorous birds offer a key ecosystem service by contributing significantly to natural pest control in agroecosystems. While habitat complexity is known to increase bird foraging activity and functional diversity at both local and landscape scales, their interactive effects on avian pest control have rarely been explored. We simultaneously sampled bird communities and measured avian predation on plasticine model prey, as a proxy for lepidopteran pest control, in 20 vineyards of southwestern France. Vineyards differed both in grass cover management (local-scale complexity) and percentage of surrounding semi-natural habitats (landscape-scale complexity). We computed functional diversity metrics based on a bird species-trait matrix including diet, foraging method, nesting site, migration strategy, laying date, home range size, clutch size and body mass. Local and landscape-scale habitat complexity differentially affected the functional composition of bird communities. Bird functional diversity tended to increase under partial grass cover but, contrary to expectations, decreased with more semi-natural habitats in the surrounding landscape. In contrast, functional insectivores were more abundant in more complex landscapes, suggesting a shift in their contribution to pest control along the landscape complexity gradient. Accordingly, we found that avian predation on model prey depended on the interaction between bird functional evenness and habitat complexity at both local and landscape scales. Attacks on model prey increased with bird functional evenness in more complex landscapes and in more heterogeneous vineyards at the local scale. We suggest that optimal on-field and off-field management of habitat complexity would enhance natural pest control services provided by birds in vineyard agroecosystems.

**Keywords:** avian predation, functional diversity, pest control, plasticine models, semi, natural habitats, vineyard management

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