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# Insect herbivory and herbivore predation in newly established oak forests

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## Abstract

Forest ecosystems form a network of more or less connected patches of woody habitats that can alter the relationships among organisms such as insect herbivores and their predators. However, little is known about how these organisms and their interactions are affected by woody patch size and isolation. We addressed oak-herbivore-predator interactions in 18 oak stands in Aquitaine, south-western France, chosen along a gradient of patch size and isolation (i.e., abundance of oak forests in a 500 m radius buffer around patches). We measured leaf insect herbivory on four oaks per patch. We used artificial caterpillar larvae to estimate the activity of bird and arthropod predators and recorded the abundance and diversity of insectivorous birds within patches. Leaf-miner abundance increased with patch isolation but was not affected by patch size. The percentage of leaf area removed by chewing insect herbivores increased with patch size, and this effect was stronger in isolated patches where herbivory was higher. Overall predation rate (by both birds and arthropods) increased with patch area, but was not affected by patch isolation. In contrast, abundance and diversity of insectivorous birds surveyed in oak patches increased with both patch area and isolation. Predation rate and bird diversity were unrelated and either predation rate nor bird diversity had a significant effect on herbivore damage. Altogether, our results indicate that the size and isolation of oak stands has the potential to affect trophic interactions among trees, herbivores and predators, but that their effects on insect herbivores and predators were independent. Our results therefore have important implications for the management of small isolated and expanding forest patches in complex landscapes.

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