

Predators as Natural Enemies for Pest Control in Californian Orchards

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Impact on California Agriculture: On average, over 5% of total agricultural production cost is devoted to pesticide use, and 5% of global food produced is wasted due to rodent consumption, equating to about 33 million tons of food per year. Therefore, approaches that encourage natural enemies of insects and rodents into agricultural areas are likely to have an important economic impact on agriculture by simultaneously reducing pesticide costs and controlling pests.

Rationale/Introduction: Bats are an important, and potentially underestimated agent of biological control of insect pests for agriculture. In North America alone, control of insect pests by bats is likely to save farmers and growers over 3.5 billion dollars in damage to agriculture per year. Similarly, bobcats are a key rodent predator and their presence alone may be enough to deter rodent pests from agricultural areas. In agricultural mosaics, both bats and bobcats have been shown to select treed areas. Therefore, orchards may be especially suitable for attracting these natural enemies to insects and rodents.

Experimental Approach: Our study focuses on avocado and lemon orchards of the Santa Clara River Valley in Ventura County. Ventura County is the 10th highest in all CA counties for total agricultural production, but still suffers from reduced crop yield and infrastructure damage from many insect and rodent pests. In this system, we aim to determine how the structure and arrangement of orchards, in relation to natural vegetation (riparian areas and hedgerow plantings) influences how well bats and bobcats deliver pest control ecosystem services. Two Masters students and three undergraduates are using a combination of acoustic bat surveys, long-term GPS-tracking bobcat data shared by the National Park Service, and remotely sensed landscape layers to investigate how to optimize orchard design and placement in the landscape for pest control services. Our work forms part of a broader multi-taxa study led by Dr Liz Scordato, which aims to align benefits to agricultural production with biodiversity conservation and natural area restoration.

Major Conclusion: Vertebrate predators of insects (bats) and rodents (bobcats) are ubiquitous in the study area. Preliminary investigations indicate that bats use agricultural areas frequently, regardless of distance from natural areas. Further research will identify the fine-scale and landscape-scale structural features most likely to result in delivery of pest control services by bats and bobcats in agricultural mosaics.

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