

Hot bugs or hot trees? Responses of eucalypt feeding insects to climate change

Tara Murray ^{*1}, David Ellsworth ¹, Markus Riegler ¹

¹ Hawkesbury Institute for the Environment, University of Western Sydney, Locked Bag 1797, Penrith, NS

The ecological effects of climate change are frequently studied from a plant perspective that focuses on crop systems or Northern Hemisphere plant communities. However, climate-driven changes in plant properties, such as leaf carbon and soluble protein concentrations, can also be expected to have significant flow-on effects for herbivorous insects and all other trophic levels. In Australia, Eucalyptus dominates natural forests and woodlands, and also plantation forestry, yet eucalypt responses to climate change are only now beginning to be assessed. As with most plants, increasing temperature and CO₂ are expected to have opposing effects on eucalypt foliar C:N ratios. This will affect the balance between the nutritive value of leaves, which is naturally low, and levels of secondary plant metabolites that drive leaf defensive chemistry. It is not clear how simultaneous increases in CO₂ and temperature will interact to affect plant quality, or how plant-mediated effects will interact with direct effects of climate changes to influence insect development. Here we assess both plant-mediated and direct effects of simultaneous increases in CO₂ and temperature on eucalypt herbivores development by comparing the responses of insects reared directly under altered climates to those of insect reared under ambient conditions on leaves grown under altered climates. When fed leaves grown under elevated CO₂, larvae consumed more and took longer to develop. However, this was partially mitigated by direct and also indirect effects of increasing temperature. Based on these observations we discuss the mechanism by which predicted future climate change may affect insect communities in Eucalyptus ecosystems.

