Canopy and litter ant assemblages share similar climate–species density relationships

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either negatively correlated with or were not significant predictors of ant species density (table 1). Both of the more complex models performed better, based on AIC scores than the simpler models (table 1). Model predictions of species density accounted for 52 per cent of the variation in the combined observed data and 73 per cent of the variation in canopy species density (figure 1).

To investigate whether the effects of the predictor variables differed between canopy and litter samples, we created three (non-nested) generalized linear models separately, adding the interaction term for canopy/litter × temperature, canopy/litter × precipitation and canopy/litter × abundance. All three interaction terms were significant (table 2) and the confidence intervals for most parameter estimates overlapped (excepting precipitation in the precipitation–interaction model; table 2) with the '+abundance' model (i.e. the best model without interaction terms). Of the six models presented here, the 'best' model (i.e. the lowest AIC score) includes the effects of temperature, precipitation, precipitation seasonality, abundance and the abundance–canopy/litter interaction.

4. DISCUSSION

As would be expected (Kaspari *et al.* 2004; Sanders *et al.* 2007; Dunn *et al.* 2009), ant species density was highest in warmer, wetter and relatively stable forests. More important to our goals, three details of the models presented here indicate that species density of canopy and litter ants share similar climatic drivers. First, when considering only climate and habitat, canopy/litter was a significant predictor of species density, but adding abundance to the model made canopy/litter non-significant. Thus, the apparent differences in species density between canopy and

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be more sensitive to the positive effects of temperature and precipitation (i.e. the interaction terms for both predicted higher species density for canopy samples). Additionally, the interaction of canopy/litter and abundance indicates that for a given abundance, canopy samples have fewer species than litter samples (underscoring the potential differences in abundance–species density relationships and supporting the suggestions of Davidson *et al.* 2007).

While the forest canopy is of great interest to biologists, it remains difficult to study and relatively poorly known. Consequently, canopy biodiversity has played a relatively minor role in understanding and conserving biodiversity. The tendency to date has been to emphasize the differences between canopy and forest floor faunas (e.g. Yanoviak & Kaspari 2000), but here we highlight their similarities. Both faunas increase in species density with increasing temperature, precipitation and climatic stability (Kaspari *et al.* 2004; Sanders *et al.* 2007; Dunn *et al.* 2009) and the differences in their diversity for a given set of climatic conditions appear to be primarily owing to differences in abundances (whether in abundances in samples or abundances per some area or volume). A key remaining question is how best to determine the relevant area or volume over which such abundances should best be considered. If, despite their differences in life history and diet, canopy and litter ants have similar species abundance distributions, it would suggest broad generalities among ant assemblages regardless of whether the ants are walking overhead or underfoot.

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