Ecography

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Parolari, A. J., Paul, K., Griffing, A., Condit, R., Perez, R., Aguilar, S. and Schnitzer, S. A. 2019. Liana abundance and diversity increase with rainfall seasonality along a precipitation gradient in Panama. – Ecography doi: 10.1111/ecog.04678

Supplementary material

Appendix 1

Dry season precipitation and length analysis. In the main text, we standardized the dry season length from January until May, since all sites are within 65 km and they all generally experience the same larger weather patterns. However, a variable dry season length can be defined as the period of time when monthly potential evapotranspiration exceeds monthly precipitation (Condit et al. 2000, 2013). To study the impact of the dry season length assumption on our results and conclusions, we estimated the start and end of the dry season using local rain gauge data and remotely sensed estimates of potential evapotranspiration (PET). Rain gauge data were obtained from the Smithsonian Tropical Research Institute (STRI) Physical Monitoring Program, which provides access to data collected by STRI as well as data collected by the Panama Canal Authority (ACP). Rainfall measurement frequency ranged between 5 minutes and 1 hour and the data were aggregated to monthly for analysis. Monthly PET estimates were obtained from the Moderate Resolution Imaging Spectroradiometer (MODIS) Global Evapotranspiration Project, which provides a global, model-based estimate of PET at one square kilometer and monthly space- and time-scales. We used the nearest ACP rain gage and MODIS grid cell to assign rainfall and PET for each liana survey plot. We separated the wet and dry season periods using the monthly rainfall (P_{mo}) and PET (PET_{mo}) data. We defined the dry season as the period when $P_{mo} < PET_{mo}$ and the wet season as the period when $P_{mo} > PET_{mo}$, with the length of each specified in days. The mean dry season precipitation MDP was then defined as the total rainfall during the dry season averaged across all years.

Measures of liana abundance and diversity were regressed against the dry season length as well as MDP defined for the standard dry season (January 1 – May 1) and the dry season based on monthly water deficit. The results of this analysis are presented in Table A2.

References

Condit, R., B. M. J. Engelbrecht, D. Pino, R. Perez, and B. L. Turner. 2013. Species distributions in response to individual soil nutrients and seasonal drought across a community of tropical trees. Proceedings of the National Academy of Sciences 110:5064–5068.

Condit, R., K. Watts, S. A. Bohlman, R. Pérez, R. B. Foster, and S. P. Hubbell. 2000. Quantifying the Deciduousness of Tropical Forest Canopies under Varying Climates. International Journal of Vegetation Science 11:649–658.

Table A1. Regression results for rainfall predictors (mean annual precipitation, mean dry season precipitation, and normalized seasonality index).

		Predictor variable			
Response variable		MAP	MDP	D	S
Mean annual precipitation (MAP)	All				
	Surveys				
Mean dry season precipitation (MDP)	All	$r^2 = 0.62$ $p = 10^{-9}$			
	Surveys	$r^2 = 0.87$ $p = 0.02$			
Relative entropy (D)	All	$r^2 = 0.31$ $p = 10^{-4}$	$r^2 = 0.82$ $p = 10^{-16}$		
	Surveys	$r^2 = 0.19$ $p = 0.46$	$r^2 = 0.52$ $p = 0.17$		
Normalized seasonality index (S)	All	$r^2 = 0.032$ $p = 0.26$	$r^2 = 0.19$ $p = 0.0048$	$r^2 = 0.50$ $p = 10^{-7}$	
	Surveys	$r^2 = 0.57$ $p = 0.14$	$r^2 = 0.23$ $p = 0.41$	$r^2 = 0.06$ $p = 0.68$	

Table A2. Regression results for analysis of dry season precipitation and length. The standard dry season was defined as January 1 – May 1 for all sites and the water deficit dry season was defined as the period of time when monthly potential evapotranspiration exceeded monthly precipitation.

	Predictor variable					
Response variable	Standard dry season MDP		Water deficit dry season MDP		Dry season length	
	r^2	p	r^2	p	r^2	p
Liana density (ind. 0.1 ha^{-1})	0.0002	0.97	0.28	0.095	0.050	0.51
Liana relative density	0.019	0.69	0.23	0.14	0.021	0.67
Liana species richness (spp. 0.1 ha^{-1})	0.0069	0.81	0.20	0.17	0.00060	0.94
Liana relative species richness	0.0005	0.95	0.21	0.16	0.0072	0.80