Science AAAS

Comment on "Productivity Is a Poor Predictor of Plant Species Richness"

Xubin Pan, *et al.*

Science **335**, 1441 (2012);
DOI: 10.1126/science.1214786

Comment on "Productivity Is a Poor Predictor of Plant Species Richness"

Xubin Pan,[1,2]* Fengqiao Liu,[3] Mi Zhang[4]

Adler *et al*. (Reports, 23 September 2011, p. 1750) analyzed the standardized sampling data from 48 herbaceous-dominated plant communities and concluded that "Productivity is a poor predictor of plant species richness" at fine-scale. However, their method was biased toward site-number–dominated plant communities. They also failed to provide enough data for regional analysis and detailed information for within-site analysis.

Adler *et al*. (*1*) presented the results of statistical regression between live biomass and species richness at three scales: within sites, within regions, and across the globe. They adopted standardized and observational sampling methods to minimize the methodological difference in other meta-analyses, which is of particular importance in enriching the data set for the productivity–plant species richness (P-PSR) relationship. However, we challenge the statistical method they used and the conclusions they reached.

[1]Department of Environmental Engineering, Texas A&M University–Kingsville, 700 University Boulevard, Kingsville, TX 78363, USA. [2]School of Environment, Tsinghua University, Beijing 100084, China. [3]School of Sustainability, Arizona State University, Post Office Box 872511, Tempe, AZ 85287, USA. [4]Northwest Institute of Plateau Biology, Chinese Academy of Sciences, 23 Xining Road, Xining 81008, China.

*To whom correspondence should be addressed. E-mail: xubin.hu.pan@gmail.com

To adequately test P-PSR at global and regional scales, data from many and randomly distributed sites should be used (*2*). Although the 48 experimental sites were from five continents, the number of sites of different vegetation types varied from one to six, with only one site each for grassland, desert grassland, and mixed-grass prairie, and six sites for annual grassland. In addition, the total number of sites is only 48, making the global analysis biased toward site-number–dominated plant communities. To address this concern, using the vegetation type in the regression analysis (*3*) could reduce the statistical effect of site-number difference between different vegetation types. Thus, we used the average vegetation-type value calculated from site mean live biomass and site mean richness to conduct a global regression analysis. The managed and anthropogenic sites were excluded from this analysis to preclude the effects of human activities, and salt marsh was also excluded because of its special feature of land-ocean interfaces. Then, within 30 sites we included 12 vegetation types in total: alpine grassland, annual grassland, desert grassland, grassland, mesic grassland, mixed-grass prairie, montane meadow, savanna, semiarid grassland, shortgrass prairie, shrub steppe, and tallgrass prairie. The regression analysis results showed a significantly positively linear relationship between productivity and species richness at the global level in Fig. 1 (P = 0.016, R^2 = 0.454), which was in conformity with other studies (*2*).

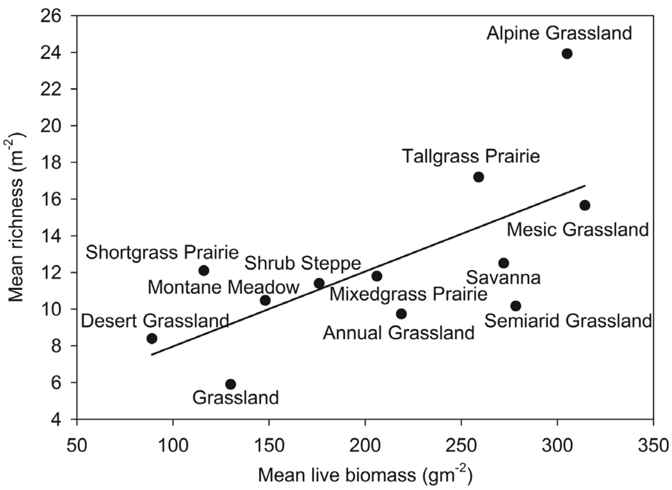

Fig. 1. Global P-PSR relationship analysis between mean live biomass and mean richness based on vegetation-type category. The solid line shows the linear relationship between productivity and biodiversity.

We also challenge the rationality of the regional analysis in Adler *et al*. (*1*). Whether comparing the same vegetation type in different regions or different vegetation types within the same region, the authors failed to provide enough data for the analysis; in addition, 5 out of 13 sites were anthropogenic. For within-site analysis, they needed more detailed information to conduct P-PSR analysis based on case-by-case evaluation (*4*), such as considering the sampling location difference at each site and the species composition of samplings at each site.

References and Notes

1. P. B. Adler *et al*., *Science* **333**, 1750 (2011).
2. L. N. Gillman, S. D. Wright, *Ecology* **87**, 1234 (2006).
3. Y. F. Bai *et al*., *J. Appl. Ecol.* **44**, 1023 (2007).
4. R. J. Whittaker, *Ecology* **91**, 2522 (2010).

Acknowledgments: This work was supported by the Green Design and Planning, Chinese Government Award for Outstanding Self-Financed Students Abroad and Texas A&M University–Kingsville.

3 October 2011; accepted 15 February 2012
10.1126/science.1214786