Biological Conservation **29** (1984) 63–80

Island Biogeographic Theory and Conservation Practice: Species–Area or Specious–Area Relationships?

William J. Boecklen* & Nicholas J. Gotelli

Department of Biological Science, Florida State University, Tallahassee, Florida 32306, USA

ABSTRACT

We present statistical techniques to evaluate species–area regressions and models of faunal and floral collapse and apply these techniques to several recent examples from the literature. The application of these models to the design of nature reserves is unwarranted. These models have low [illegible]

species number. Their parameter estimates are sensitive to particular cases. Consequently, estimates from these models range over several [illegible]

[redacted]
Diamond & May, 1976). Models of faunal and floral collapse are derived [redacted]
forecast the efficiency of reserves in preserving species number following insularisation (Diamond, 1972; Terborgh, 1974; Soulé *et al.*, 1979; Wilcox, 1980). Predictions from these models have been used to advance management policy (Soulé *et al.*, 1979) and inter-island transfers of endangered species (Temple, 1981).

The suitability of species–area regressions and models of faunal collapse for conservation practice will depend upon the quality of the predictions that they generate. These models could be evaluated through

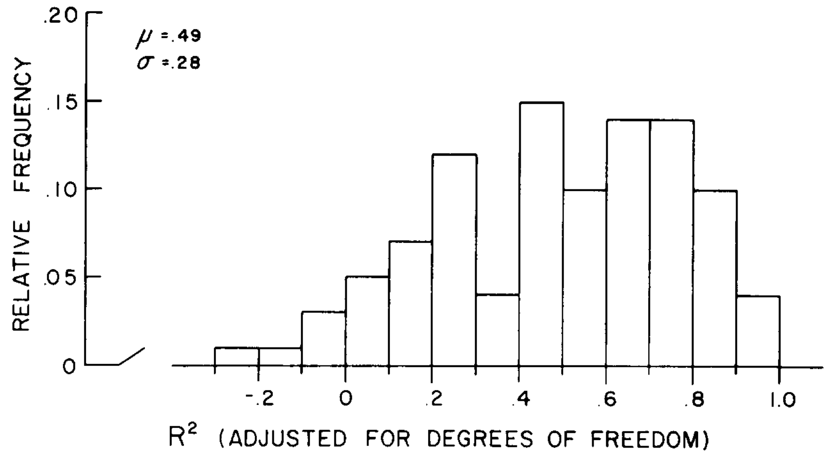

Fig. 1. Frequency histogram of the percent variation in species number explained by regression on area (R^2 adj) for the 100 log–log models in Connor & McCoy (1979). μ is the mean, σ the standard deviation.

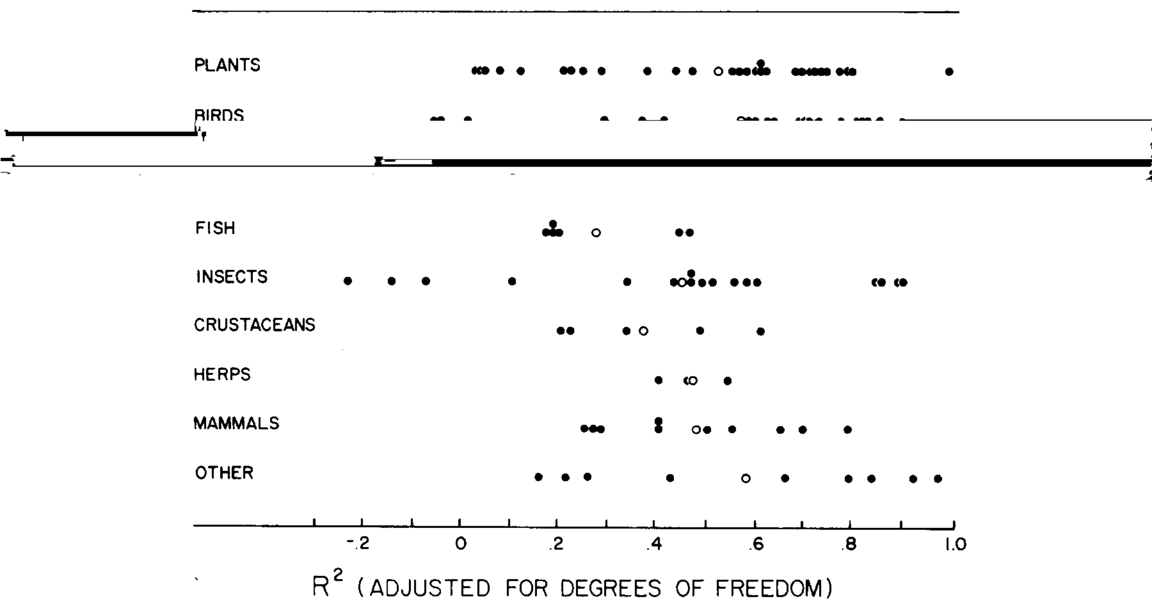

Fig. 2. Data from Fig. 1 partitioned into taxonomic groups. Open circles are the means for each group.

If the estimate from a species–area regression is the primary consideration in adopting a particular conservation strategy, then a high value for R^2 adj will be necessary (0·70 seems reasonable). On the other hand, if the estimate is a secondary consideration, then a lower value for R^2 adj may be acceptable.

We present the 100 log–log species–area regressions published in Connor & McCoy (1979) as a general assay of the explanatory power of area. On average, these models explain slightly less than half the variation in species number (R^2 adj; mean = 0·49, standard deviation = 0·28). In addition, only about 20% of the models have values of R^2 adj greater [illegible] incorporation of other variables such as a measure of habitat heterogeneity or resource availability may be necessary.

Sensitivity of parameter estimates to influential cases

Each observation in a regression influences the estimation of the slope and intercept. However, all observations do not have equal weight; points that are far removed from the average species number or the average area may have inordinate influence. The observations in species–area regressions frequently span several orders of magnitude. These models may be especially sensitive to influential cases even when the data are log-transformed. For example, Johnson & Simberloff (1974) analyse the number of plant species in the British Isles and conclude that habitat heterogeneity, as measured by the number of soil types, is an important predictor of species diversity. McCoy & Connor (1976) reanalyse these

…$\hat{B}_{1,-1}$ represents the Recomputed Slope

…ge of $\hat{B}_{0,-1}$	Range of $\hat{B}_{1,-1}$
…56–11·05	6·18–8·63
…·96–5·20	4·16–5·76
…·29–−0·48	0·35–0·42
…·37–0·55	0·23–0·33
…·00–−3·78	−0·05–−0·24
…·27–−4·42	−0·19–−0·46
…·35–−4·98	−0·34–−0·72
…·28–−5·55	−0·48–−0·99
…·97–−5·53	−0·17–−0·74
…·95–2·52	3·49–3·91
…·78–1·01	0·11–0·17

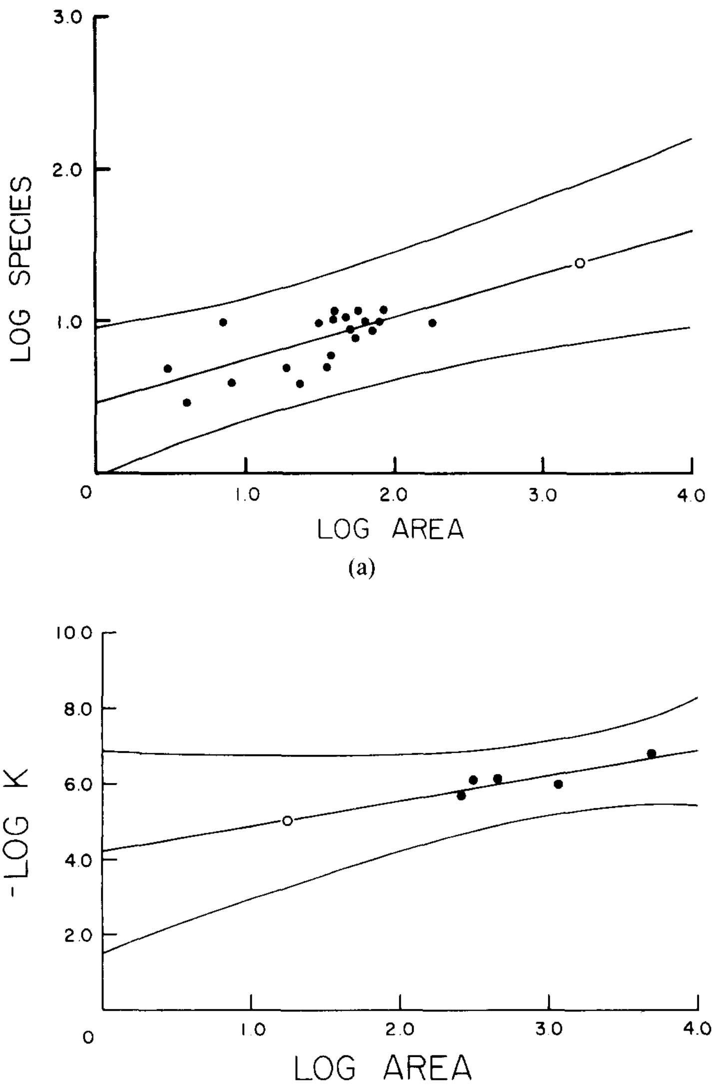

Fig. 4. (a) Species–area regression for the number of butterflies in woodlands and (b)

…e-Prediction Intervals

…diction …terval	Inverse prediction interval
…4–65·7	
	$2·0 \times 10^8$–$3·2 \times 10^{12}$
	$8·9 \times 10^3$–$6·2 \times 10^5$
	$2·6 \times 10^2$–$1·8 \times 10^5$
…^{2}–$6·1 \times 10^{-2}$	
…^{7}–$1·4 \times 10^{-4}$	
	$2·8 \times 10^2$–$7·1 \times 10^4$
…1–34·4	
…4–26·0	
…6–24·5	
…3–22·4	
…1–21·9	
…8–20·3	

> ...the luxuries of confidence limits and certainty are ones that conservation biologists cannot now afford, given the rate of habitat destruction documented in many of the chapters of this book. Constructive criticism is welcome, but to embrace the purist's motto of 'insufficient data' is to abandon the bleeding patient on the table. (p. 268)

We agree that the situation is serious, but we do not agree that the urgency of conservation makes demonstrably inadequate models acceptable. Soulé's contention of 'insufficient data' is valid if *only* area is considered in nature reserve design. Ecologists must shift their attention from area alone, and consider more specific autecological factors in the preservation of endangered species. The urgency of preserving natural diversity demands this.

ACKNOWLEDGEMENTS

We thank D. Simberloff, S. Mopper, D. Strong, P. Price, R. Fritz, C. Slobodchikoff, the FSU ecology group, the NAU ecology group, and an anonymous reviewer for insightful criticisms and suggestions.

REFERENCES

[illegible]

259–72.
Spiridonov, V. N. (1979). Change in species composition of the herbage in herb birch forest under the effect of recreational stress. *Soviet J. Ecol.*