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Appendix D from A. C. Iles and M. Novak, "Complexity Increases Predictability in Allometrically Constrained Food Webs" (Am. Nat., vol. 188, no. 1, p. 87)

Predictability Related to Stability, Matrix Condition Number, and Matrix Determinant

Assessing asymptotic stability by the maximum eigenvalue (λ_{max}) shows no relationship with predictability, as defined by directional determinacy, or the sensitivity of qualitative predictions to an order-of-magnitude ($F = 10$) variation in interaction strength estimates (fig. D1*A*, D1*D*). The matrix condition number ($|\lambda_{max}/\lambda_{min}|$) is often used to quantify the sensitivity of a matrix to inversion. The networks of our analyses were all well conditioned and evidence no relationship between condition number and predictability (fig. D1*B*, D1*E*). The determinant of the community matrix, $\det(\mathbf{A})$, scales the magnitudes of $-\mathbf{A}^{-1}$ and reveals a positive relationship between predictability and the overall magnitude of species responses. Like network predictability, the matrix determinant is sensitive to network size and connectivity (fig. D1*C*, D1*F*).

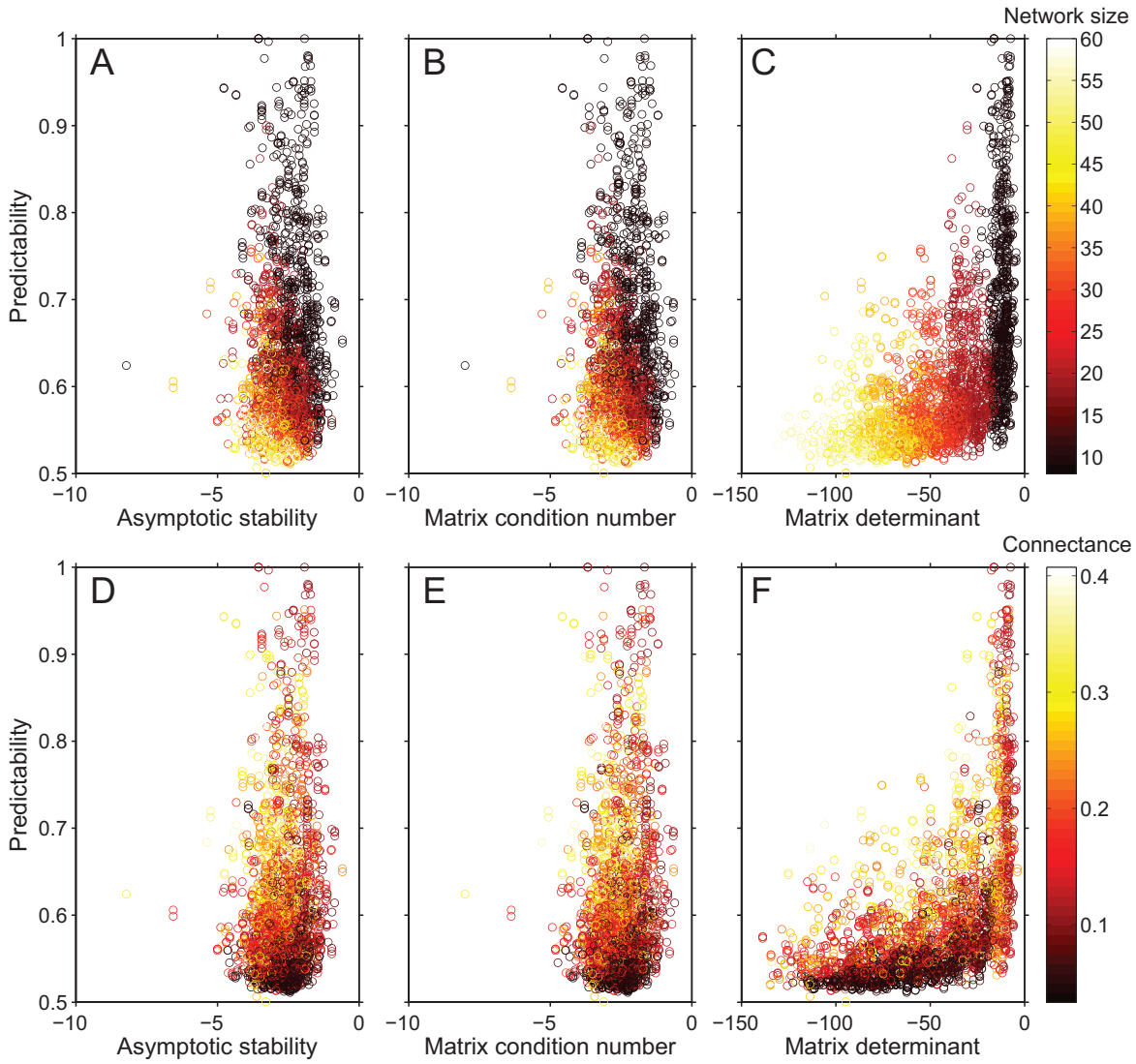

Figure D1: Relationship between network predictability (as measured by directional determinacy) and asymptotic stability ($\log_{10}(|\lambda_{max}|)$) (*A*, *D*), matrix condition number ($\log_{10}(|\lambda_{max}/\lambda_{min}|)$) (*B*, *E*), and the matrix determinant ($\log_{10}(\det(\mathbf{A})$; *C*, *F*) for networks of varying size (*A*–*C*) and connectance (*D*–*F*). Predictability reflects the mean proportion of net effects with the correct sign after up to an order-of-magnitude error is introduced to all interactions ($F = 10$).