Supplementary Material

Changing relative intrinsic growth rates of species alter the stability of species communities

Thomas J. Löffler Author*, Heike Lischke

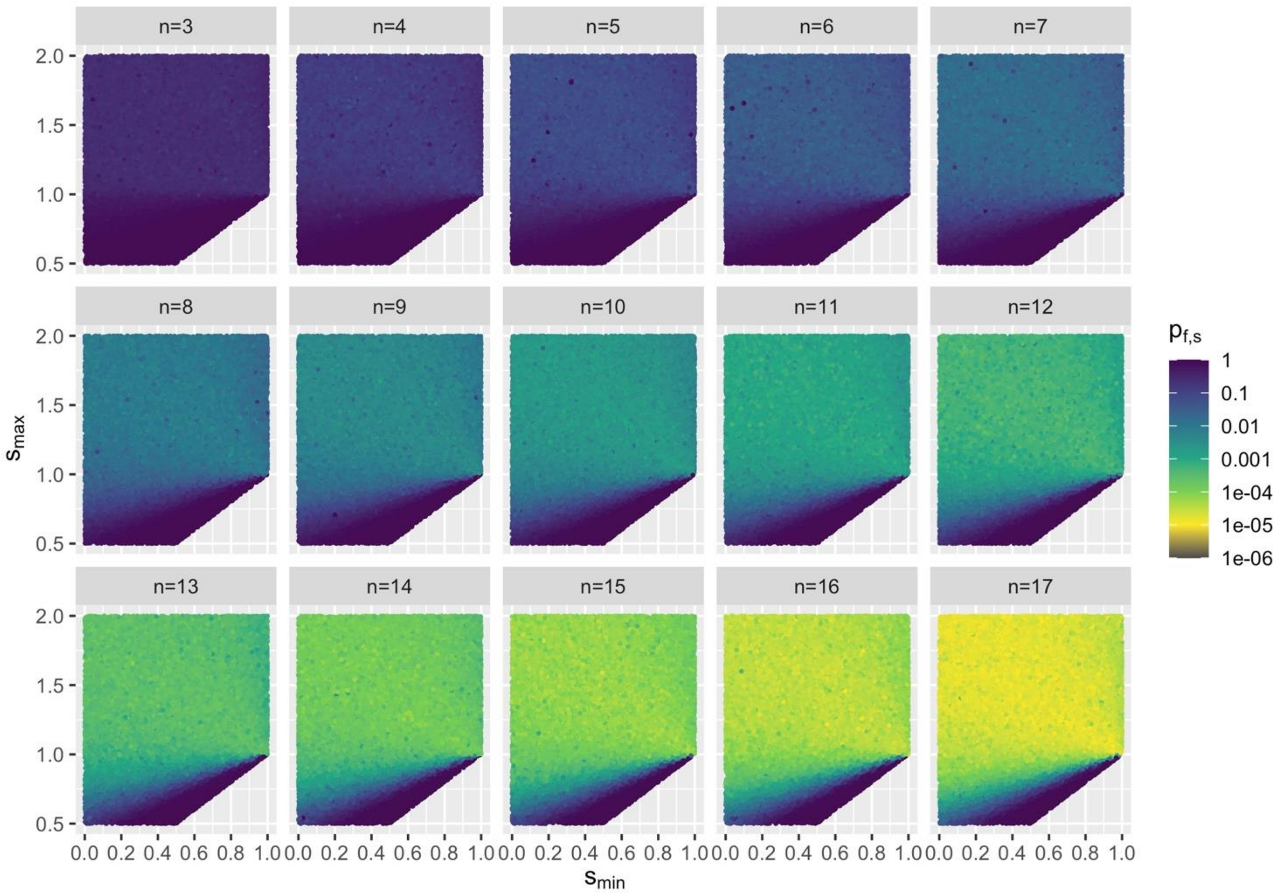
*** Correspondence:** Thomas J. Löffler: lothomas@ethz.ch, thomas.loeffler@wsl.ch

1 Supplementary Figures and Tables

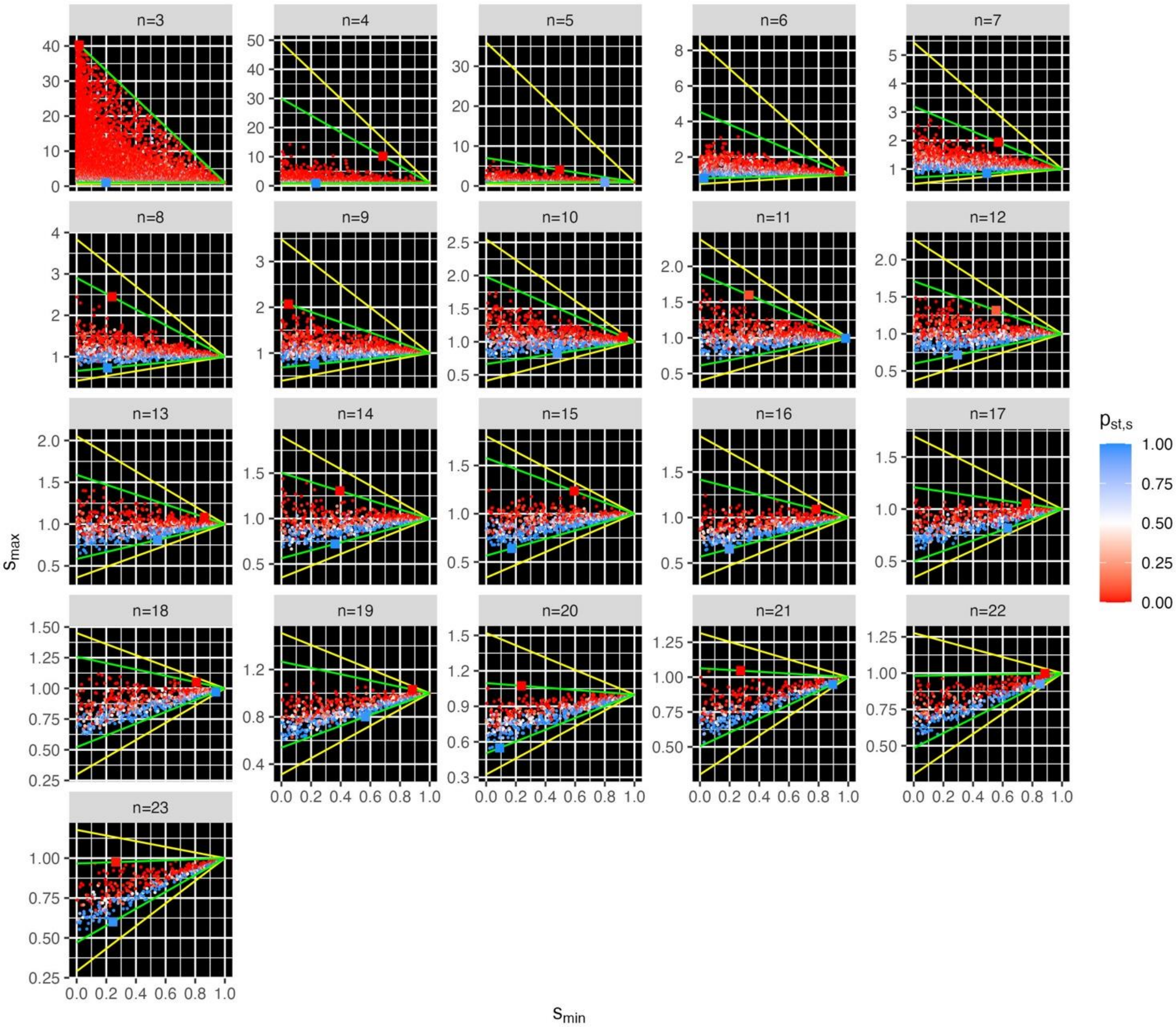
Supplementary Table T1: Best fitting functions in dependence on the number of species n on the upper and lower intercepts $s_{\max,u,n}$ and $s_{\max,l,n}$ of the triangle T_n with the $s_{\min} = 0$ axis. The best fitting functions (second-order Akaike Information Criterion, i.e., smallest value and ΔAICc < 2) are $a_0 + a_1 n^{-c}$ for $s_{\max,l,n}$ and $a_0 + a_1 e^{-cn^d} + a_2 e^{-fn}$ for $s_{\max,u,n}$.

Parameter	**Function**	**a_0**	**a_1**	**a_2**	**c**	**d**	**f**	**AICc**	**ΔAICc**
$s_{\max,I,n}$	$a_0 + a_1 e^{-c}$	**0**	**1.42**		**0.35**			**-84.21**	**0**
$s_{\max,I,n}$	$a_0 + a_1(\pi/2 - arctan(cn))$	0.29	0.43		0.09			-84.08	0.13
$s_{\max,I,n}$	$a_0 + a_1 e^{-cn}$	0.39	0.58		0.08	69.68	0.2	-83.88	0.33
$s_{\max,u,n}$	$a_0 + a_1 e^{-cn^d} + a_2 e^{-fn}$	**0.58**	**6.02**	**19324**	**0.21**	**6.6**	**0.82**	**-0.39**	**0**

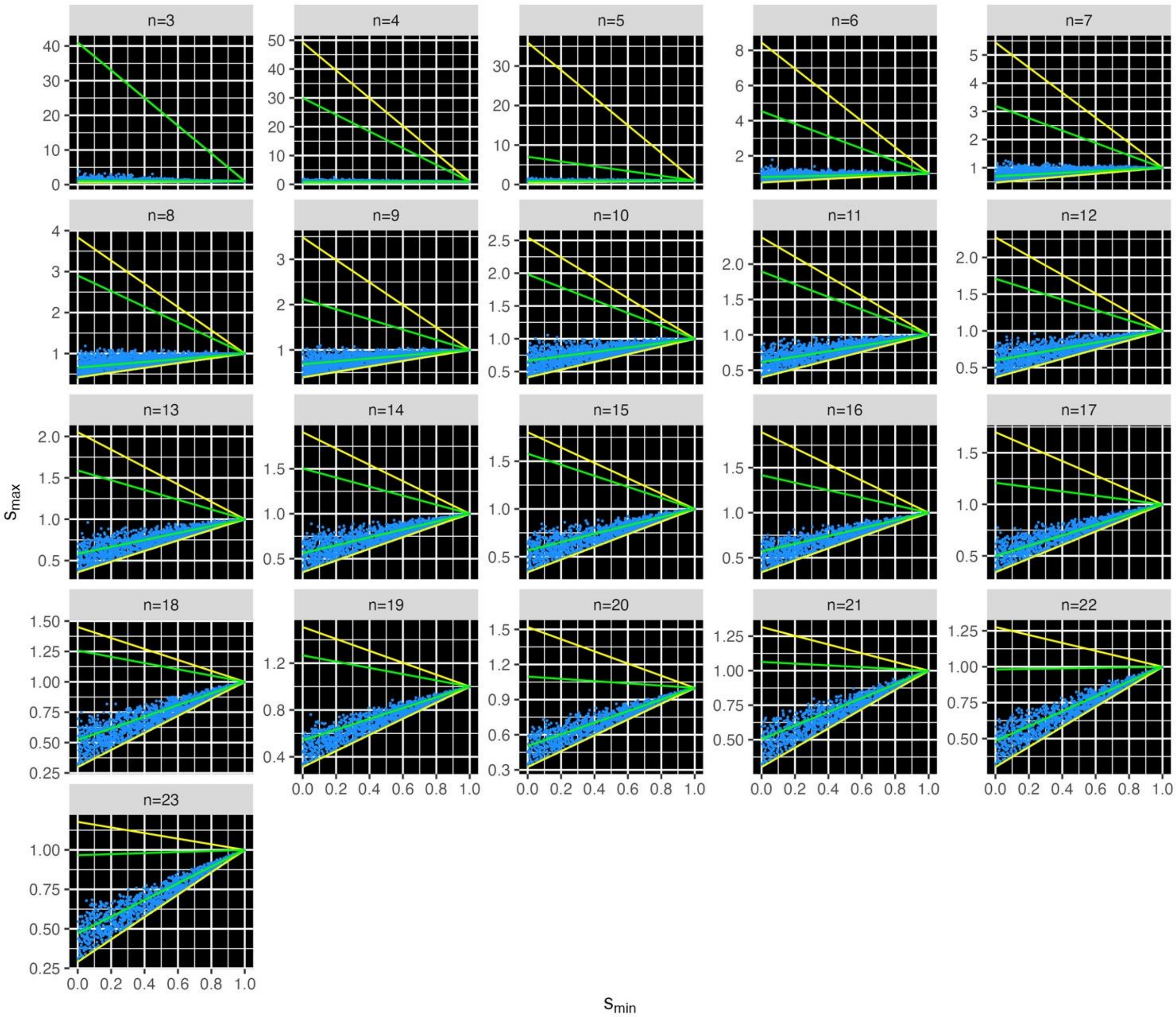
1.1 Supplementary Figures



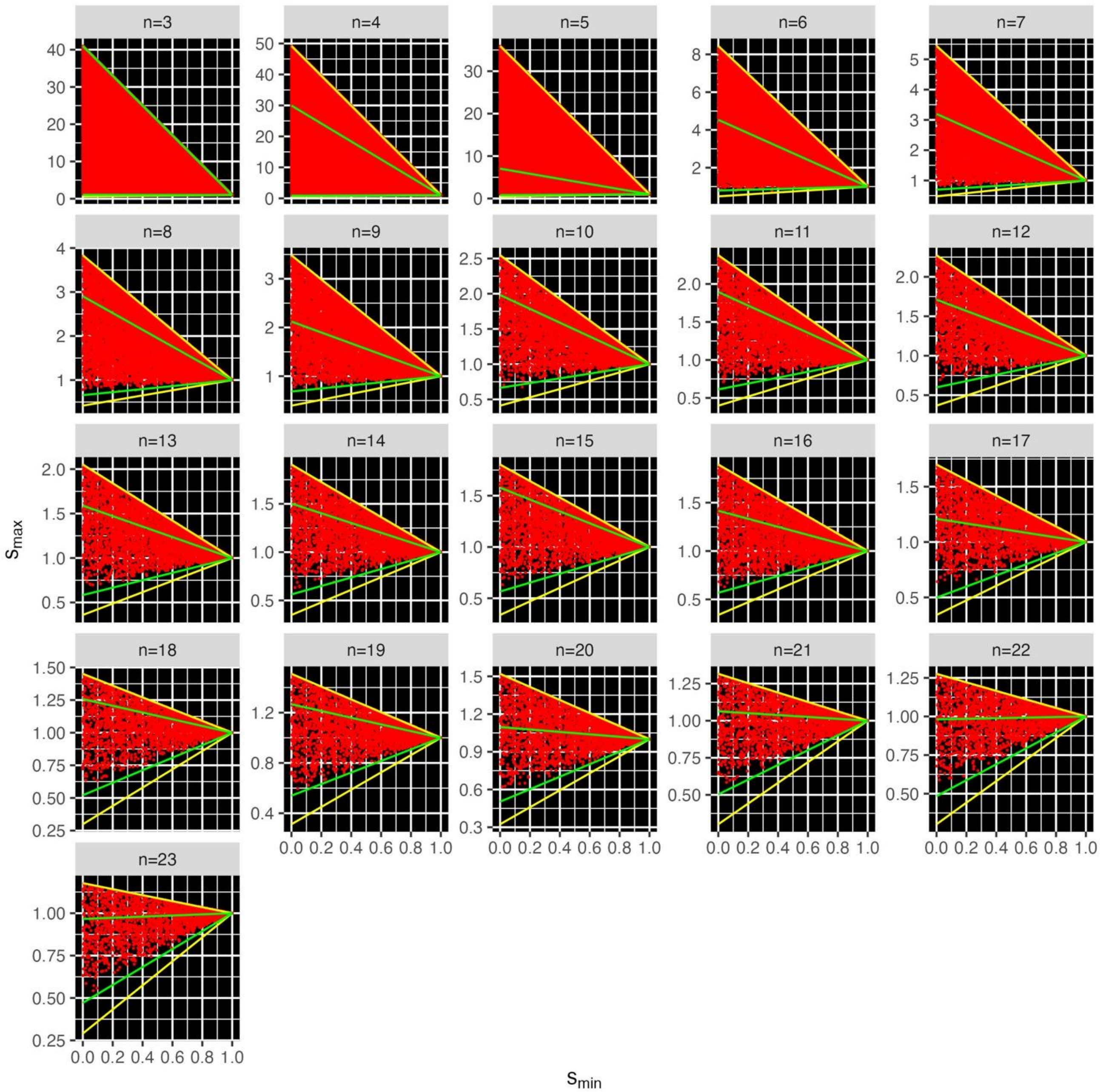
Supplementary Figure S1. Probability $p_{f,s}$ to find a feasible matrices S of a point $s = (s_{min}, s_{max})$ for $n \leq 17$ by a Bernoulli experiment (Methods). The chosen simulation region is the interesting part of the (s_{min}, s_{max})-space for stability considerations of the LVC model. Each experiment was conducted with 30,000 points. The Bernoulli experiment shows that with 10^6 trials of random S matrices per point $s = (s_{\min}, s_{\max})$, a matrix was found with the probability $10^6 \le p_{f,x}$ for feasibility.



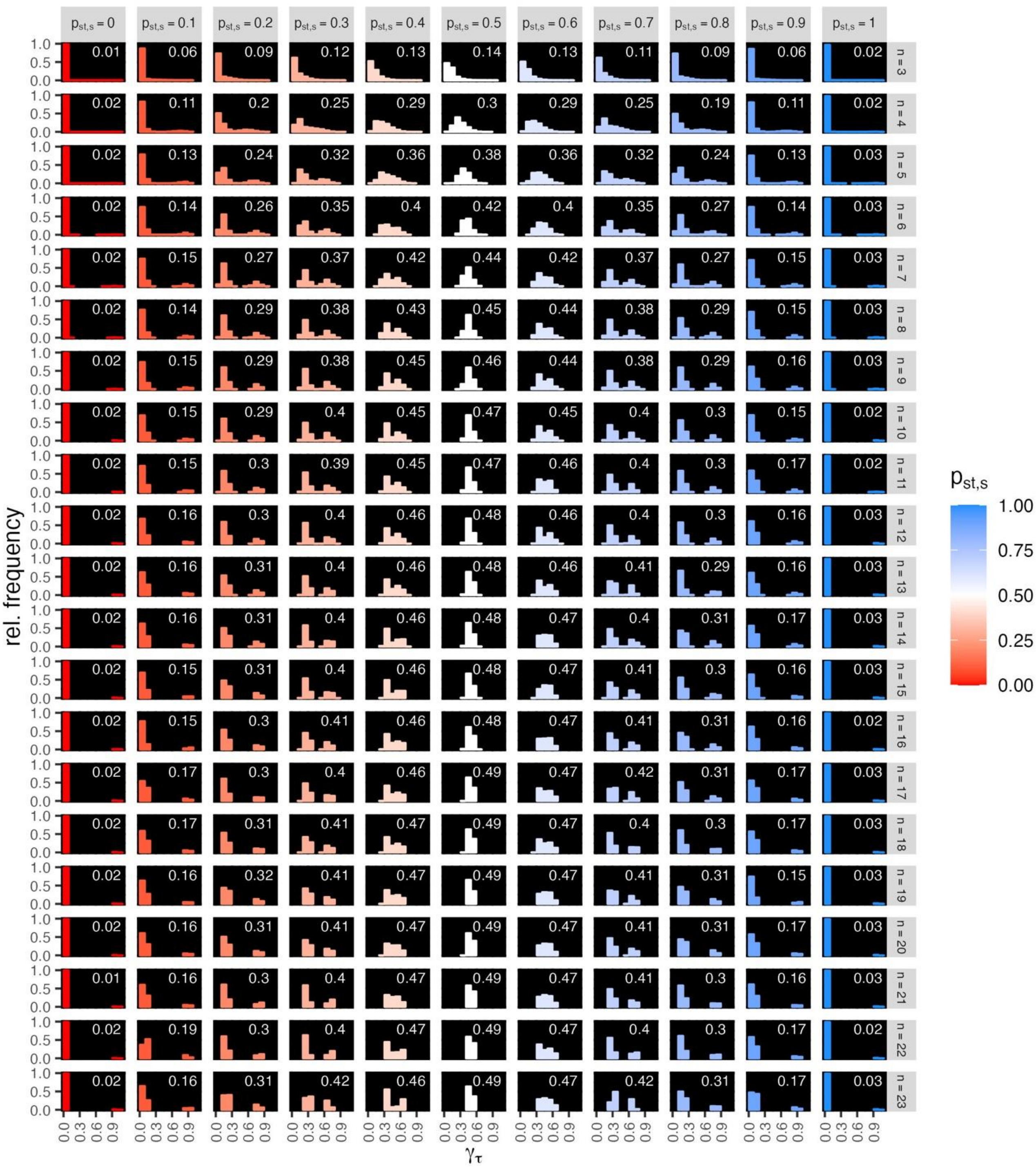
Supplementary Figure S2. Points $s = (s_{\min}, s_{\max})$ with changeable stability for $3 \le n \le 23$, with the stability probability $p_{st,s}$ over 1000 different relative intrinsic growth rate vectors r_k. All points with changeable stability were in the triangles T_n which are delimited by the green lines through the point $s = (1, 1)$ and the points with the maximum and minimum slope (two larger dots per panel). The simulation range (yellow delimited triangle) was chosen heuristically slightly larger than the triangle T_{n-1} to ensure that points with changeable stability were not overlooked. For $n = 3$, the simulation range was chosen heuristically large. Note, the scale for $s_{\max}$ differs in the panels.



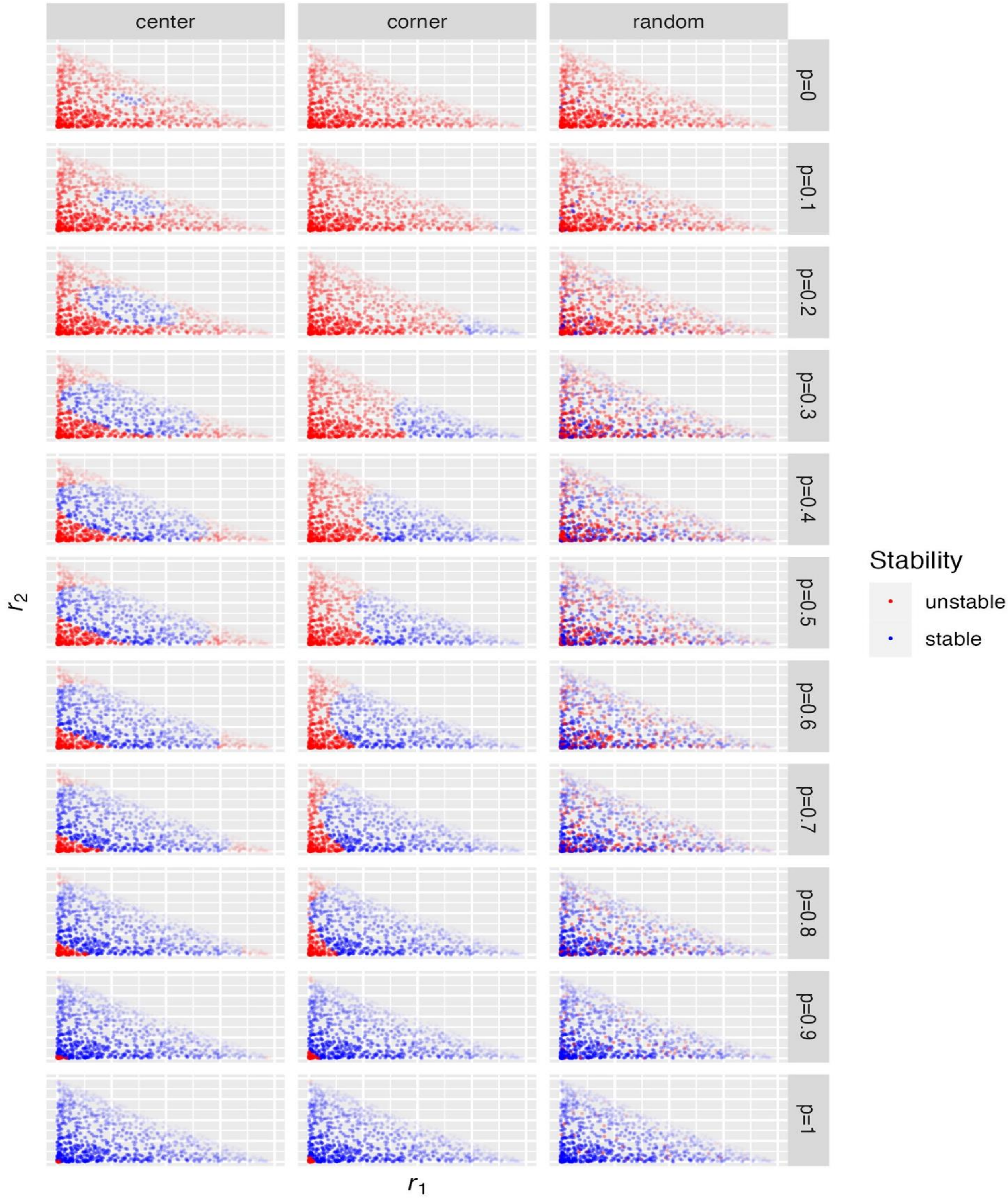
Supplementary Figure S3. Points $s = (s_{min}, s_{max})$ with only stable matrices S. For details, cf. Supplementary Figure 2.



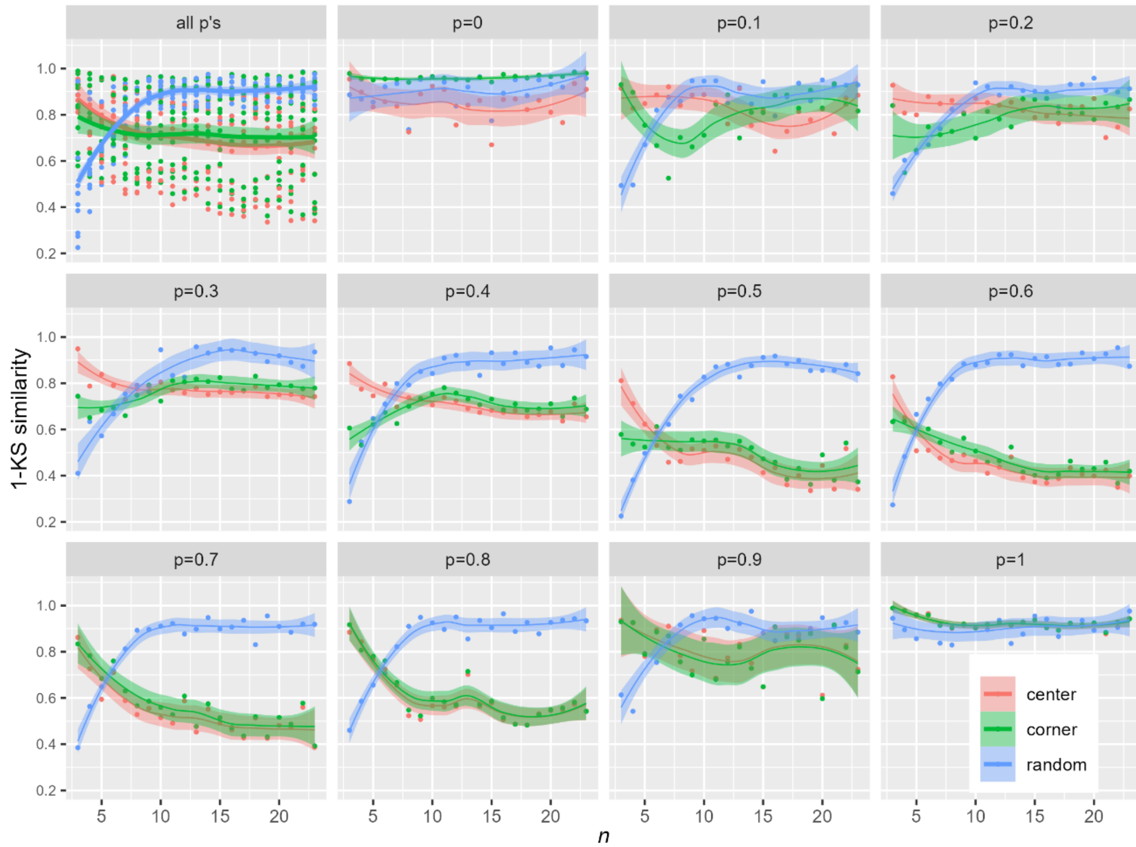
Supplementary Figure S4. Points $s = (s_{min}, s_{max})$ with only unstable matrices S. For details, cf. Supplementary Figure 2.



Supplementary Figure S5. Relative frequency distribution of local sensitivities γ_τ for all intrinsic growth rate r_τ vectors pooled over all changeable stability s = ($s_{\min}$, $s_{\max}$) points, for all species numbers n (right columns) and stability probabilities $p_{st,s}$ are given in the middle of the classes with width 0.1. The white numbers are the means of the sensitivities γ_τ.



Supplementary Figure S6. Example for random, centre- and corner-clustered spatial arrangements of 1000 blue and red points representing stable and unstable ones for different probabilities p of blue points (rows of panels) on the unit simplex Δ_2 for $n = 3$. The view goes along the axis r_3 with depth indicated by paler colours.



Supplementary Figure S7. Comparison between distributions of sensitivity measure γ_τ applied to stability in *r*-space (fig. E5) and prescribed spatial arrangements of 1000 stable and unstable points (cf. example in fig. E6), in unit simplexes Δ_{n-1}, $n = 3,\ldots,23$. The probability (of stability) *p* classes have class width 0.1 (panels). Panel **all p's**: all probabilities together. Points: single similarity values, lines: LOESS smoothing, **center**: all stable points clustered around the centre, **corner**: all stable points clustered around one corner, **random**: random arrangement. The similarity was calculated by 1 – KS, the test statistic of the Kolmogorov Smirnov test, i.e., the maximum distance of the cumulative distributions.