

### 3 **A Supplementary information on distributions**

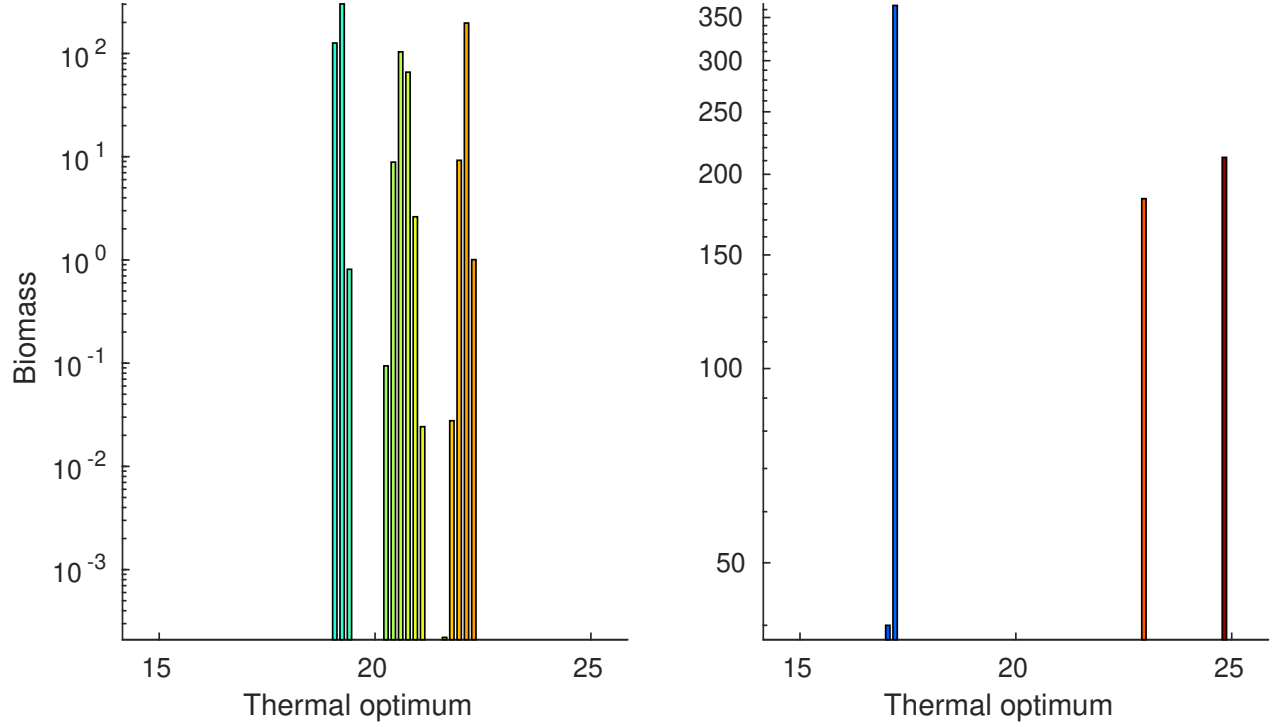


Figure A.1: Temporal mean of biomass as a function of the thermal optimum defining each species. The temporal means are computed over the last 200 years of a simulation spanning 5000 years. We considered both a random (left) or a seasonal noise (right). The coexistence mechanism implemented is the storage effect, and the intra and interspecific competition coefficients are equal. This simulation is the one described in Fig. 1 in main text. 99 other simulations have been performed to produce the main text results in Figs. 2-4.

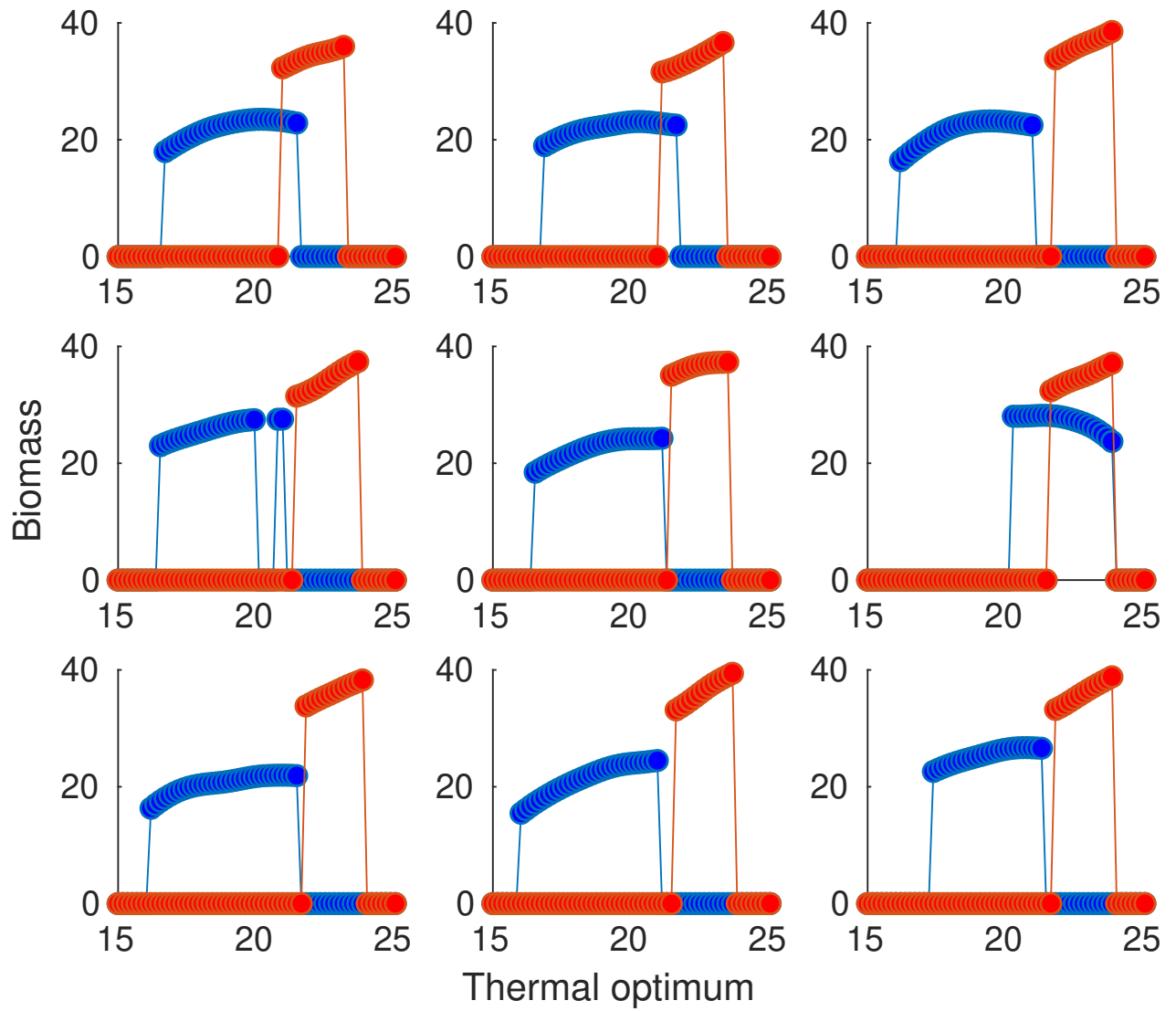


Figure A.2: Temporal mean biomass distribution, computed over the last 200 years, for 9 representative simulations, as a function of the thermal optimum of the species. These simulations are done without storage effect but with strong self-regulation. Temperature is either a seasonal signal (red) or a random noise (blue). The distribution induced by a random noise overlaps the one obtained with a seasonal noise in only 2 simulations out of 100, hence the two signals lead in general to very different biomass distributions on the trait axis.

## B Variable mortality

To test the robustness of our conclusions, we conducted the same set of analyses with a species-specific mortality. For each set of simulations, covering 4 different coexistence scenarios and 2 types of environmental forcing, mortality was drawn from a uniform distribution between 14.9 and 15.1  $\text{year}^{-1}$  so that we only changed the variability, but not the mean, of this parameter.

The main results of our analysis were not altered by this modification.

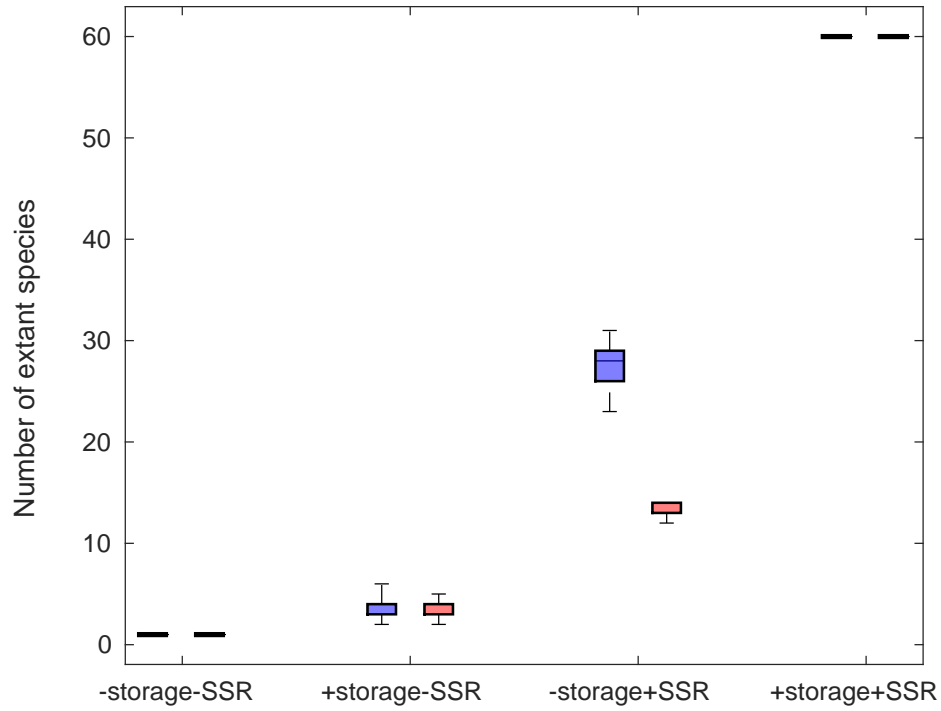


Figure B.3: Number of species still present at the end of 100 simulations (5000 years each) with a variable mortality, initialized with 60 species, with a random forcing signal (blue) or a seasonal noise (red). The signs + or -storage refer to presence or absence of the storage effect, respectively; + / - SSR, presence or absence of Strong Self-Regulation, respectively. Community compositions are stable in the cases -storage-SSR and +storage+SSR, for which 1 or 60 species are still present at the end of all simulations, respectively. Due to low variance, the whiskers here represent min and max rather than 1.5 interquartile range.