Oikos

OIK-04937

Smith, A. N. and Edwards, K. F. 2019. Effects of multiple timescales of resource supply on the maintenance of species and functional diversity. – Oikos doi: 10.1111/oik.04937

Appendix 1

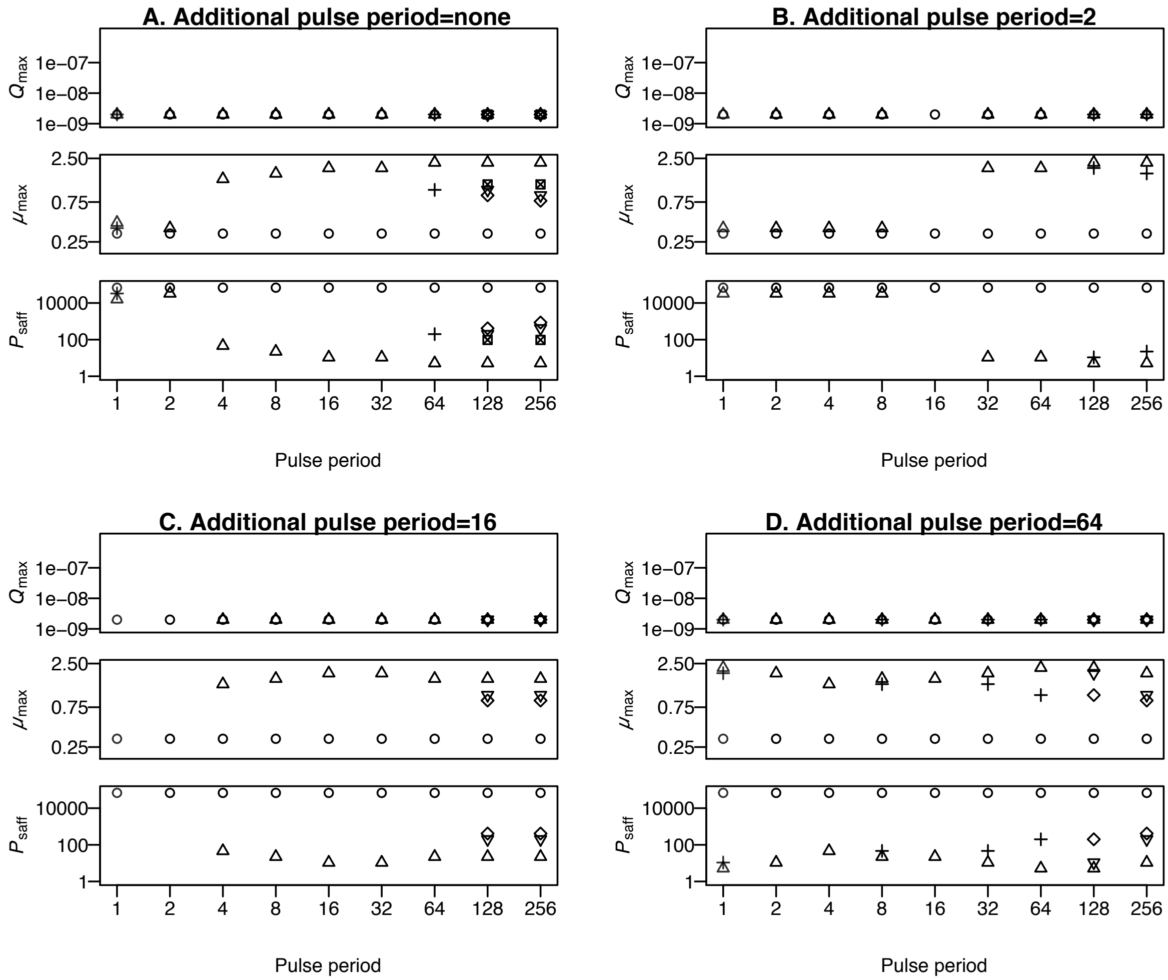

Figure A1. Two-way tradeoff between μ_{max} and P_{saff}. Q_{max} is held constant across species, resulting in a two-way tradeoff between maximum growth rate and phosphate affinity. Each point represents the trait value for a single species that persisted during that trial. For each pulse period on the x-axis, the values for each trait of all coexisting species are plotted. The units for the axes are: Q_{max}, µmol P cell^{-1}; μ_{max}, d^{-1}; P_{saff}, L µmol P^{-1} day^{-1}. (A) Community structure under a single pulse frequency, with pulse period ranging from 1 to 256 days. (B) Community structure under two simultaneous pulse frequencies. All communities experience a 'background' pulse every 2 days, and a second pulse with period ranging from 1 to 256 days. (C) As in (B), but with a background pulse every 16 days. (D) As in (B), but with a background pulse every 64 days.

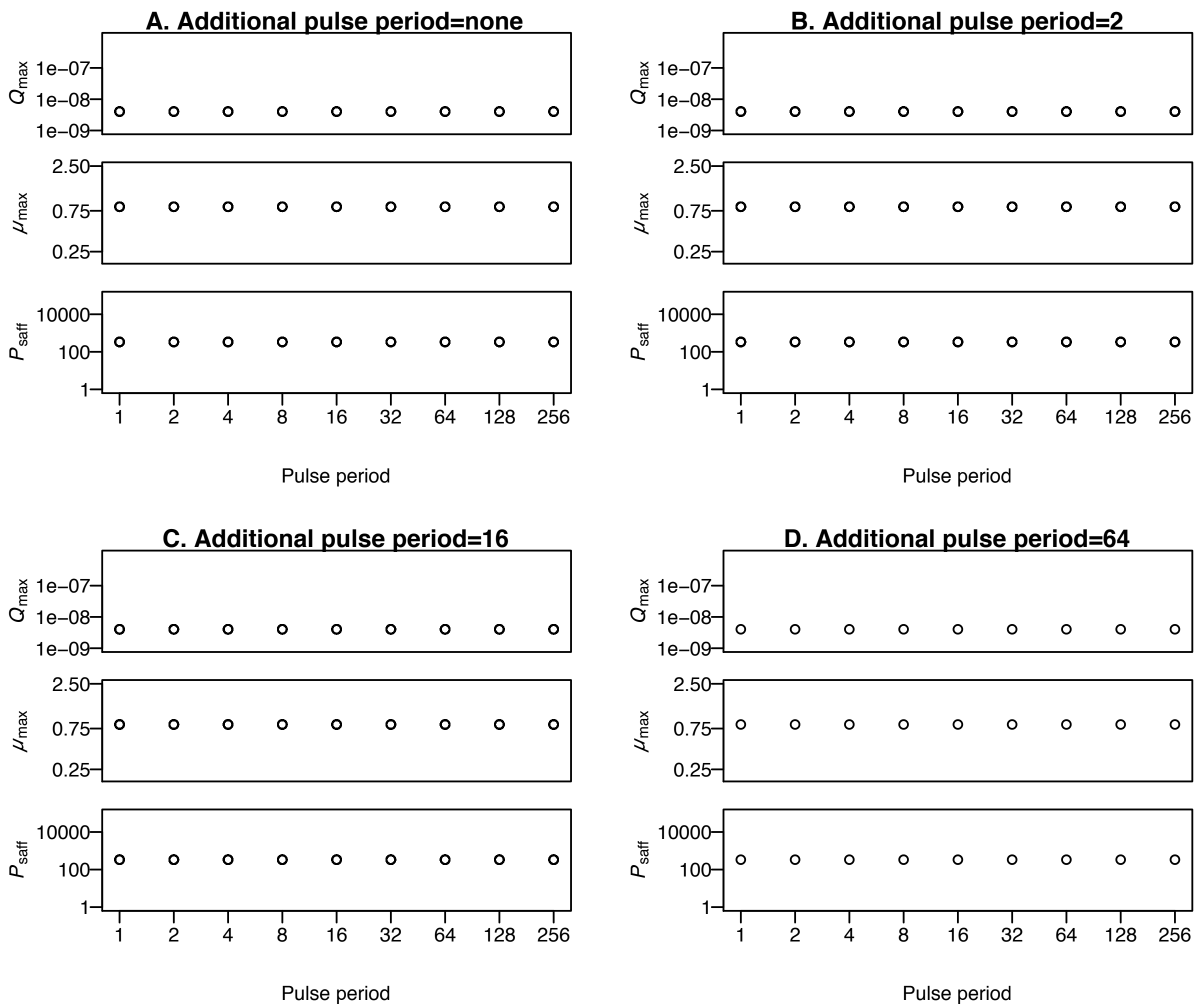

Figure A2. Two-way tradeoff between P_{saff} and Q_{max}. μ_{max} is held constant across species (0.88 day^{-1}), resulting in a two-way tradeoff between phosphate affinity and storage capacity. Each point represents the trait value for a single species that persisted during that trial. For each pulse period on the x-axis, the values for each trait of all coexisting species are plotted. The units for the axes are: Q_{max}, µmol P cell^{-1}; μ_{max}, d^{-1}; P_{saff}, L µmol P^{-1} day^{-1}. (A) Community structure under a single pulse frequency, with pulse period ranging from 1 to 256 days. (B) Community structure under two simultaneous pulse frequencies. All communities experience a 'background' pulse every 2 days, and a second pulse with period ranging from 1 to 256 days. (C) As in (B), but with a background pulse every 16 days. (D) As in (B), but with a background pulse every 64 days.

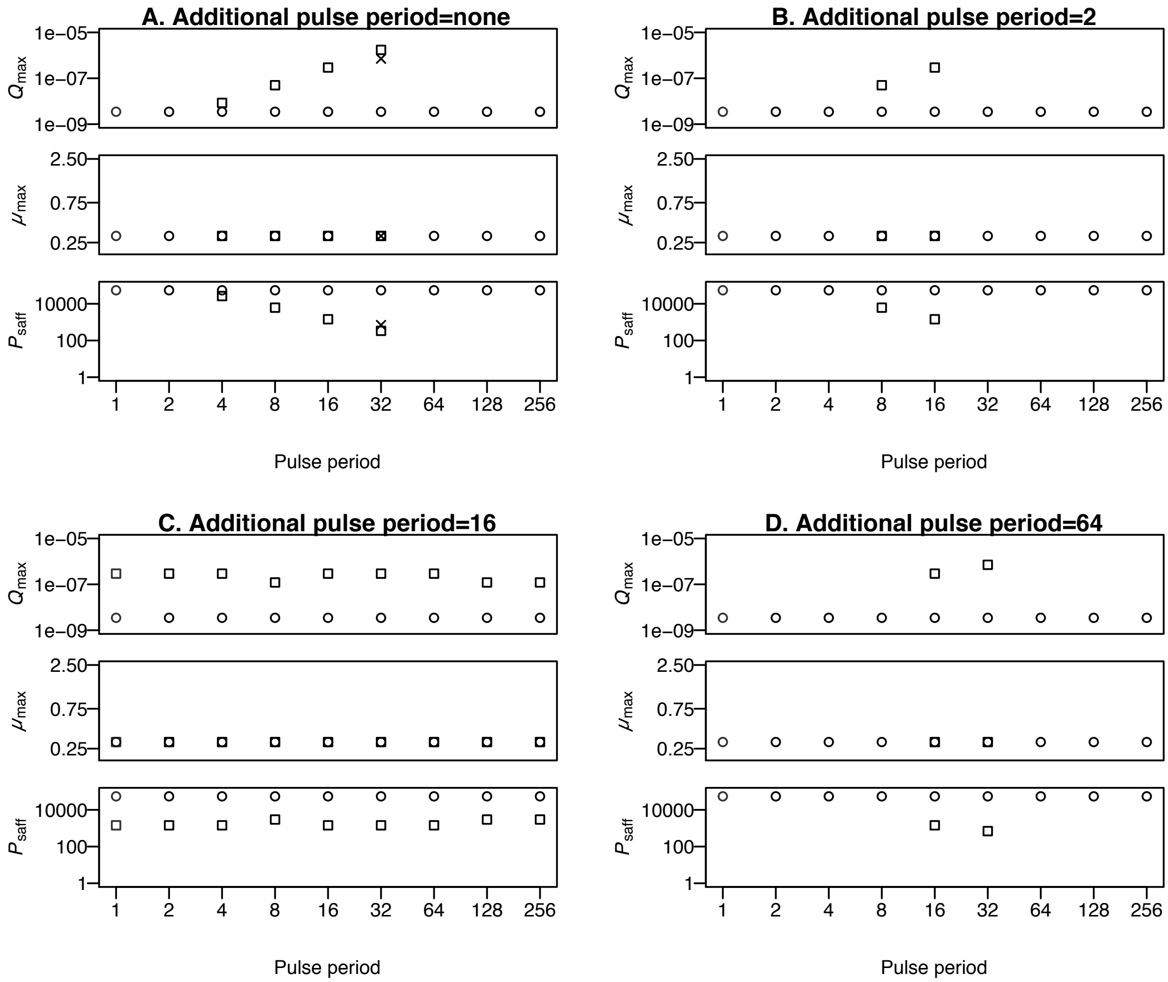

Figure A3. Two-way tradeoff between P_{saff} and Q_{max}. μ_{max} is held constant across species (0.3 day^{-1}), resulting in a two-way tradeoff between phosphate affinity and storage capacity. Each point represents the trait value for a single species that persisted during that trial. For each pulse period on the x-axis, the values for each trait of all coexisting species are plotted. The units for the axes are: Q_{max}, µmol P cell^{-1}; μ_{max}, d^{-1}; P_{saff}, L µmol P^{-1} day^{-1}. (A) Community structure under a single pulse frequency, with pulse period ranging from 1 to 256 days. (B) Community structure under two simultaneous pulse frequencies. All communities experience a 'background' pulse every 2 days, and a second pulse with period ranging from 1 to 256 days. (C) As in (B), but with a background pulse every 16 days. (D) As in (B), but with a background pulse every 64 days.

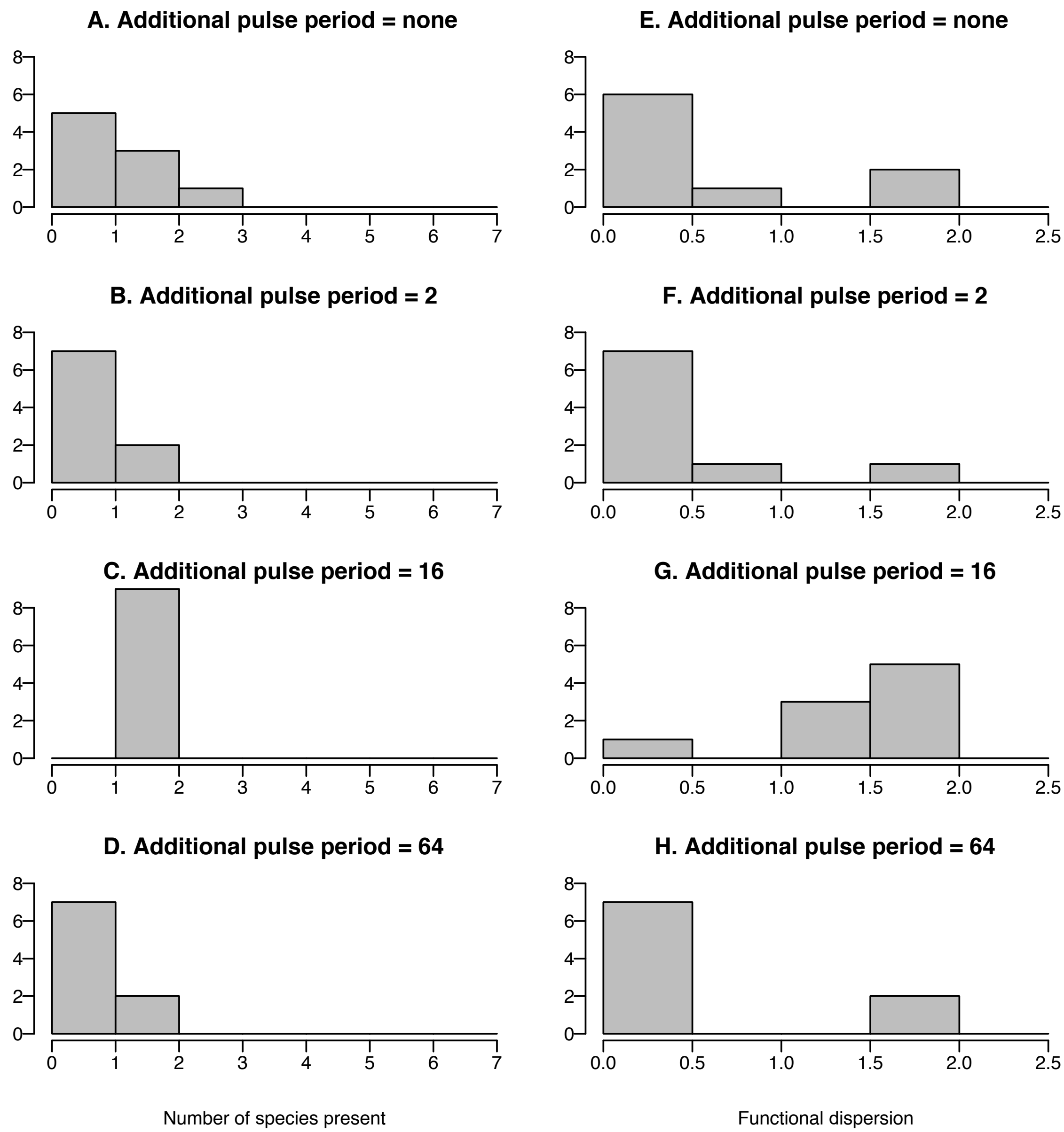

Figure A4. Two-way tradeoff between P_{saff} and $Q_{\max}$, with $\mu_{\max}$ held constant at 0.3 day^{-1}. Effects of one versus two pulse frequencies on species and functional diversity, under a two-way tradeoff between phosphate affinity and storage capacity. (A-D) show the distribution of species richness across all model runs displayed in Fig. A3, for (A-D) respectively. (E-H) show the distribution of functional dispersion across all model runs in Fig. A3, for (A-D) respectively.

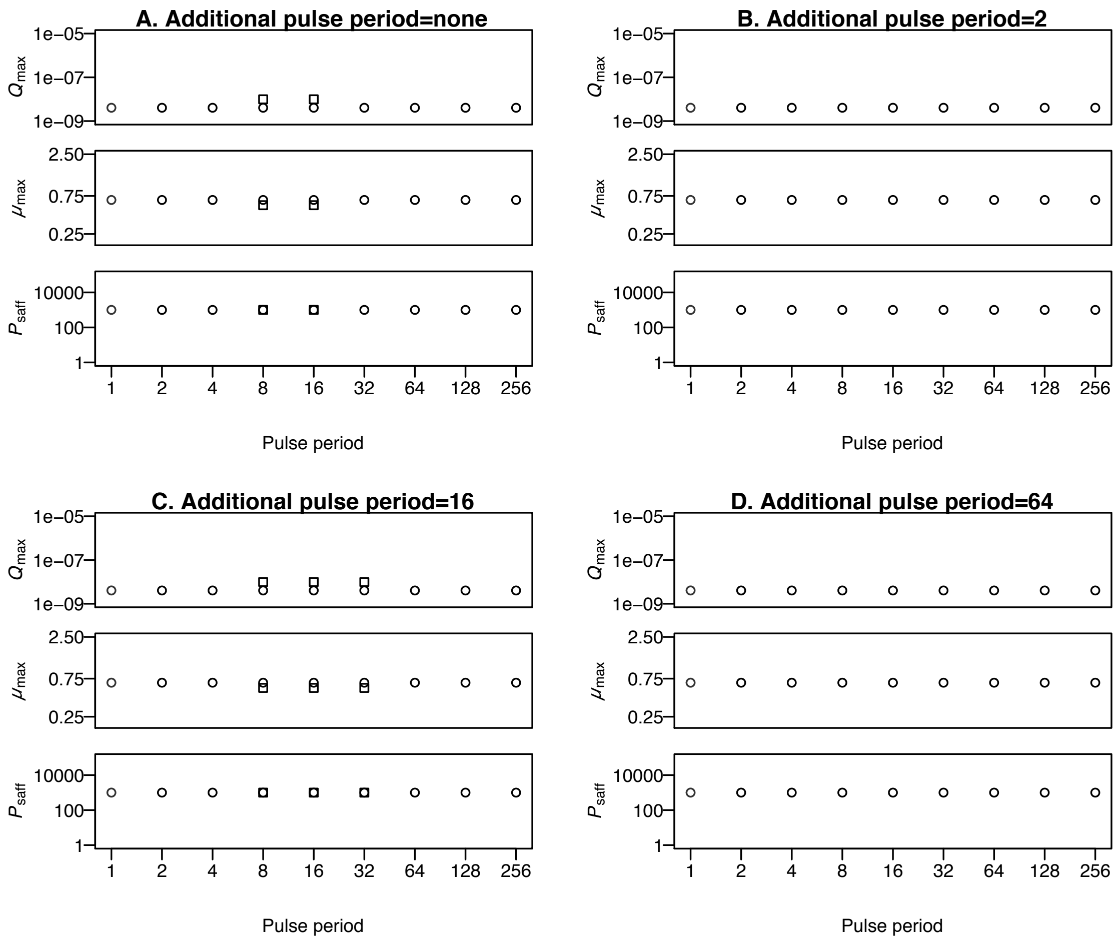

Figure A5. Two-way tradeoff between μ_{max} and Q_{max}. P_{saff} is held constant across species (1000 L µmol P^{-1} day^{-1}), resulting in a two-way trade-off between maximum growth rate and storage capacity. Each point represents the trait value for a single species that persisted during that trial. For each pulse period on the x-axis, the values for each trait of all coexisting species are plotted. The units for the axes are: Q_{max}, µmol P $cell^{-1}$; μ_{max}, day^{-1}; P_{saff}, L µmol P^{-1} day^{-1}. (A) Community structure under a single pulse frequency, with pulse period ranging from 1 to 256 days. (B) Community structure under two simultaneous pulse frequencies. All communities experience a 'background' pulse every 2 days, and a second pulse with period ranging from 1 to 256 days. (C) As in (B), but with a background pulse every 16 days. (D) As in (B), but with a background pulse every 64 days.

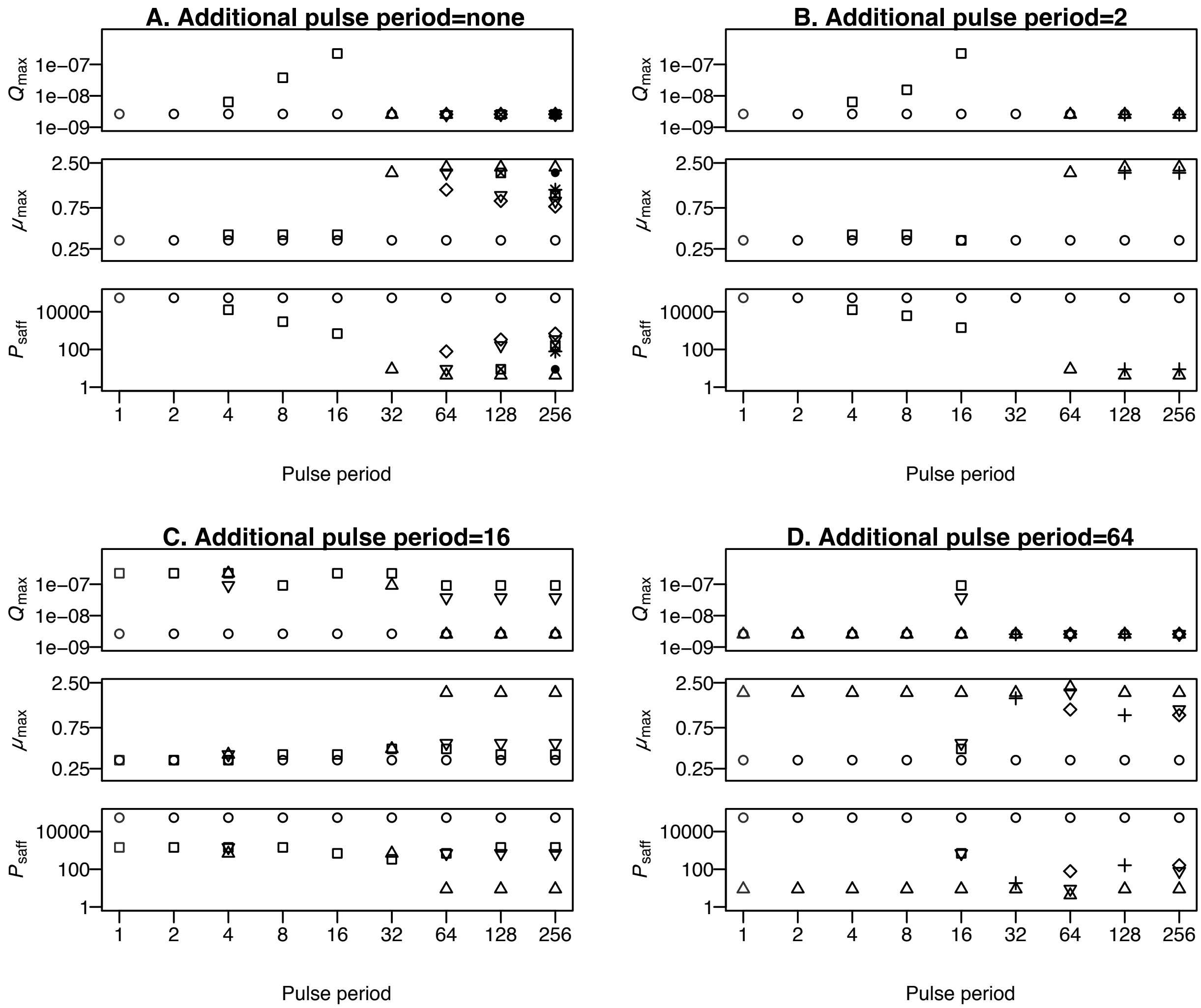

Figure A6. Effects of reducing the magnitude of pulse mixing events (*d*) by 25%. Each point represents the trait value for a single species that persisted during that trial. For each pulse period on the x-axis, the values for each trait of all coexisting species are plotted. The units for the axes are: Q_{max}, μmol P cell^{-1}; μ_{max}, d^{-1}; P_{saff}, L μmol P^{-1} day^{-1}. (A) Community structure under a single pulse frequency, with pulse period ranging from 1 to 256 days. (B) Community structure under two simultaneous pulse frequencies. All communities experience a ‘background’ pulse every 2 days, and a second pulse with period ranging from 1 to 256 days. (C) As in (B), but with a background pulse every 16 days. (D) As in (B), but with a background pulse every 64 days.

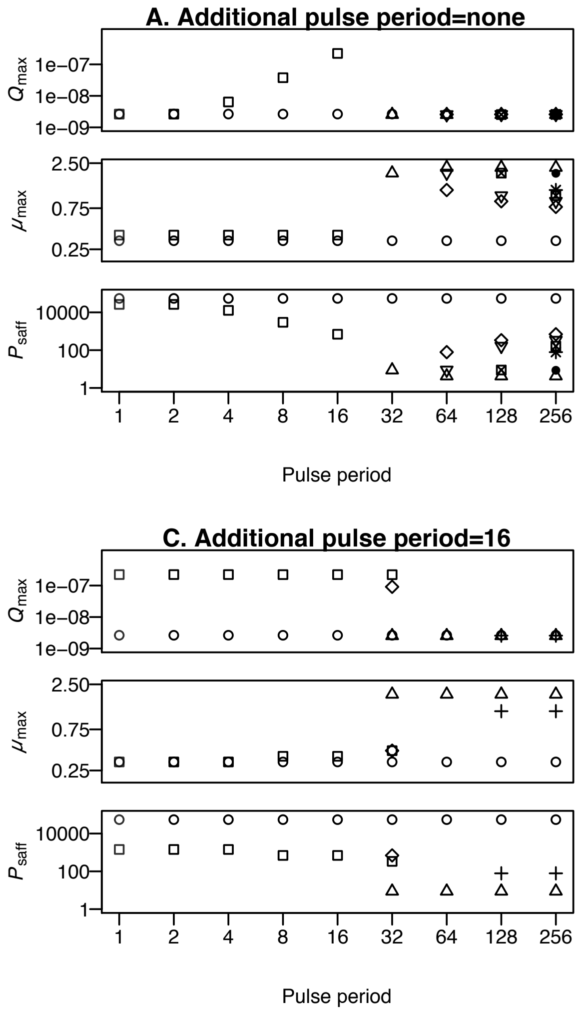

Figure A7. Effects of reducing the magnitude of pulse mixing events (*d*) by 50%. Each point represents the trait value for a single species that persisted during that trial. For each pulse period on the x-axis, the values for each trait of all coexisting species are plotted. The units for the axes are: Q_{max}, μmol P cell^{-1}; μ_{max}, day^{-1}; P_{saff}, L μmol P^{-1} day^{-1}. (A) Community structure under a single pulse frequency, with pulse period ranging from 1 to 256 days. (B) Community structure under two simultaneous pulse frequencies. All communities experience a 'background' pulse every 2 days, and a second pulse with period ranging from 1 to 256 days. (C) As in (B), but with a background pulse every 16 days. (D) As in (B), but with a background pulse every 64 days.

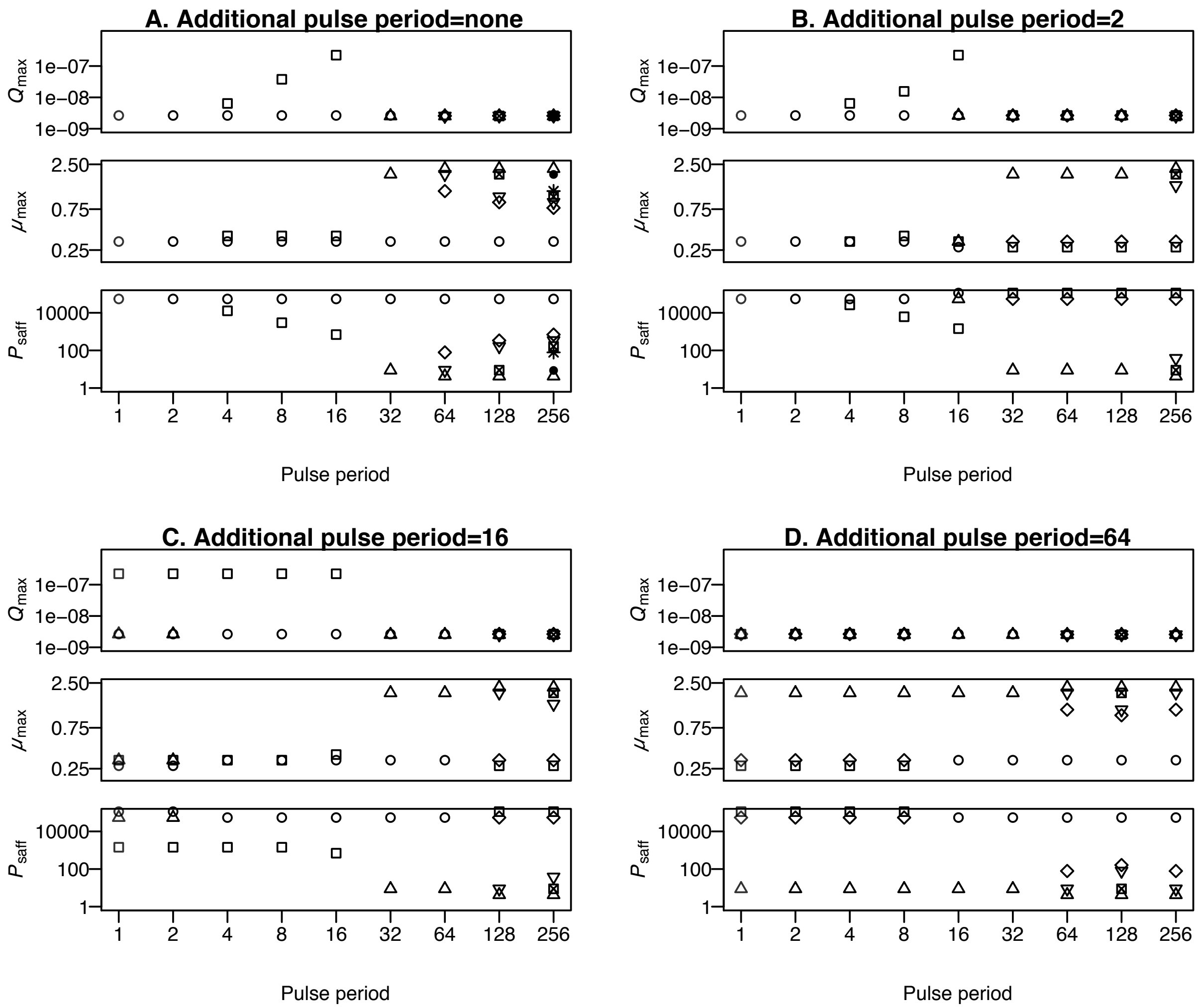

Figure A8. Effects of reducing the magnitude of pulse mixing events (*d*) by 75%. Each point represents the trait value for a single species that persisted during that trial. For each pulse period on the x-axis, the values for each trait of all coexisting species are plotted. The units for the axes are: $Q_{\max}$, µmol P cell^{-1}; $\mu_{\max}$, day^{-1}; P_{saff}, L µmol P^{-1} day^{-1}. (A) Community structure under a single pulse frequency, with pulse period ranging from 1 to 256 days. (B) Community structure under two simultaneous pulse frequencies. All communities experience a 'background' pulse every 2 days, and a second pulse with period ranging from 1 to 256 days. (C) As in (B), but with a background pulse every 16 days. (D) As in (B), but with a background pulse every 64 days.

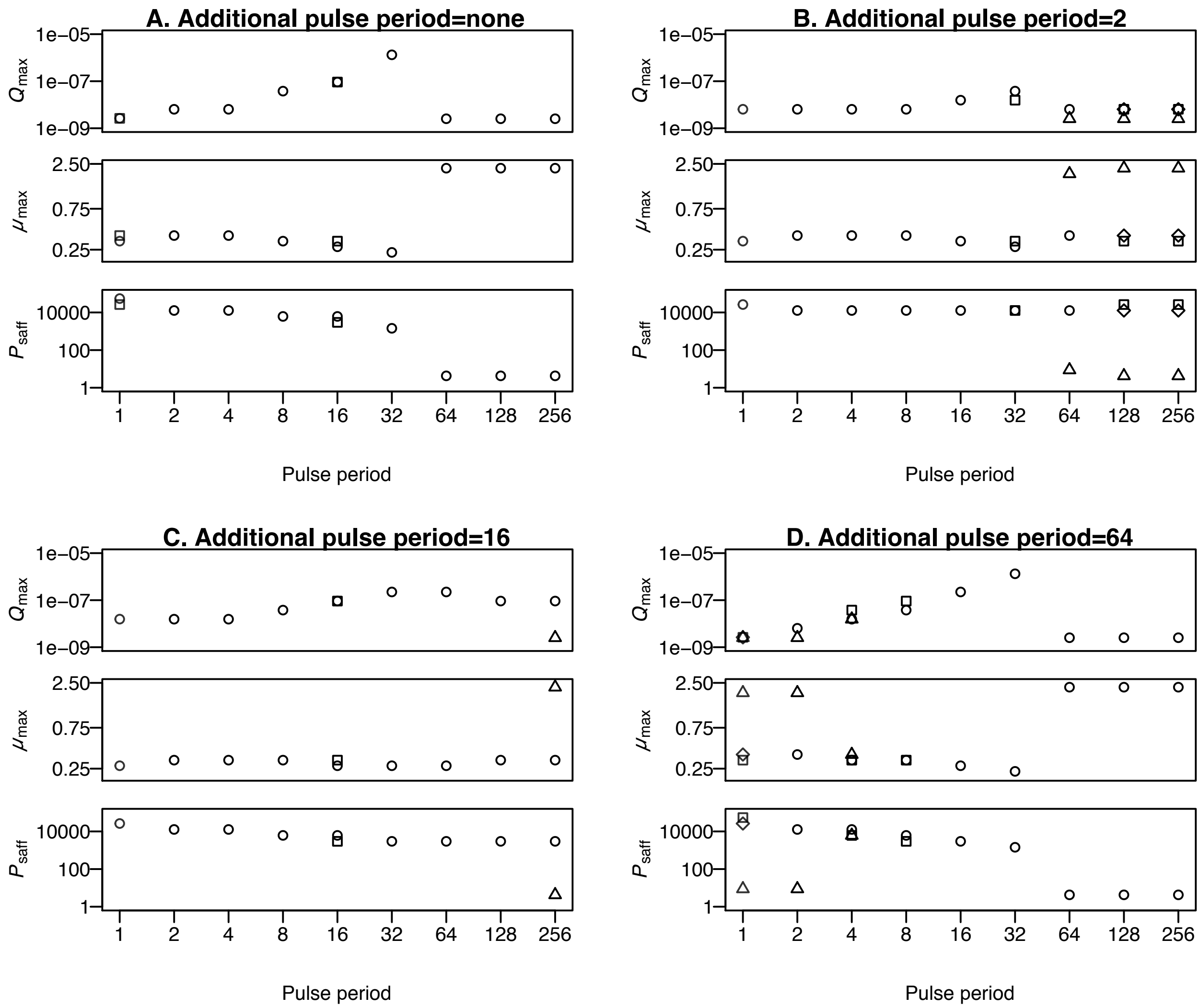

Figure A9. Effect of removing nutrient supply through mixing and recycling (a = 0, f = 0). Each point represents the trait value for a single species that persisted during that trial. For each pulse period on the x-axis, the values for each trait of all coexisting species are plotted. The units for the axes are: Q_{max}, μmol P cell^{-1}; μ_{max}, day^{-1}; P_{saff}, L μmol P^{-1} day^{-1}. (A) Community structure under a single pulse frequency, with pulse period ranging from 1 to 256 days. (B) Community structure under two simultaneous pulse frequencies. All communities experience a 'background' pulse every 2 days, and a second pulse with period ranging from 1 to 256 days. (C) As in (B), but with a background pulse every 16 days. (D) As in (B), but with a background pulse every 64 days.

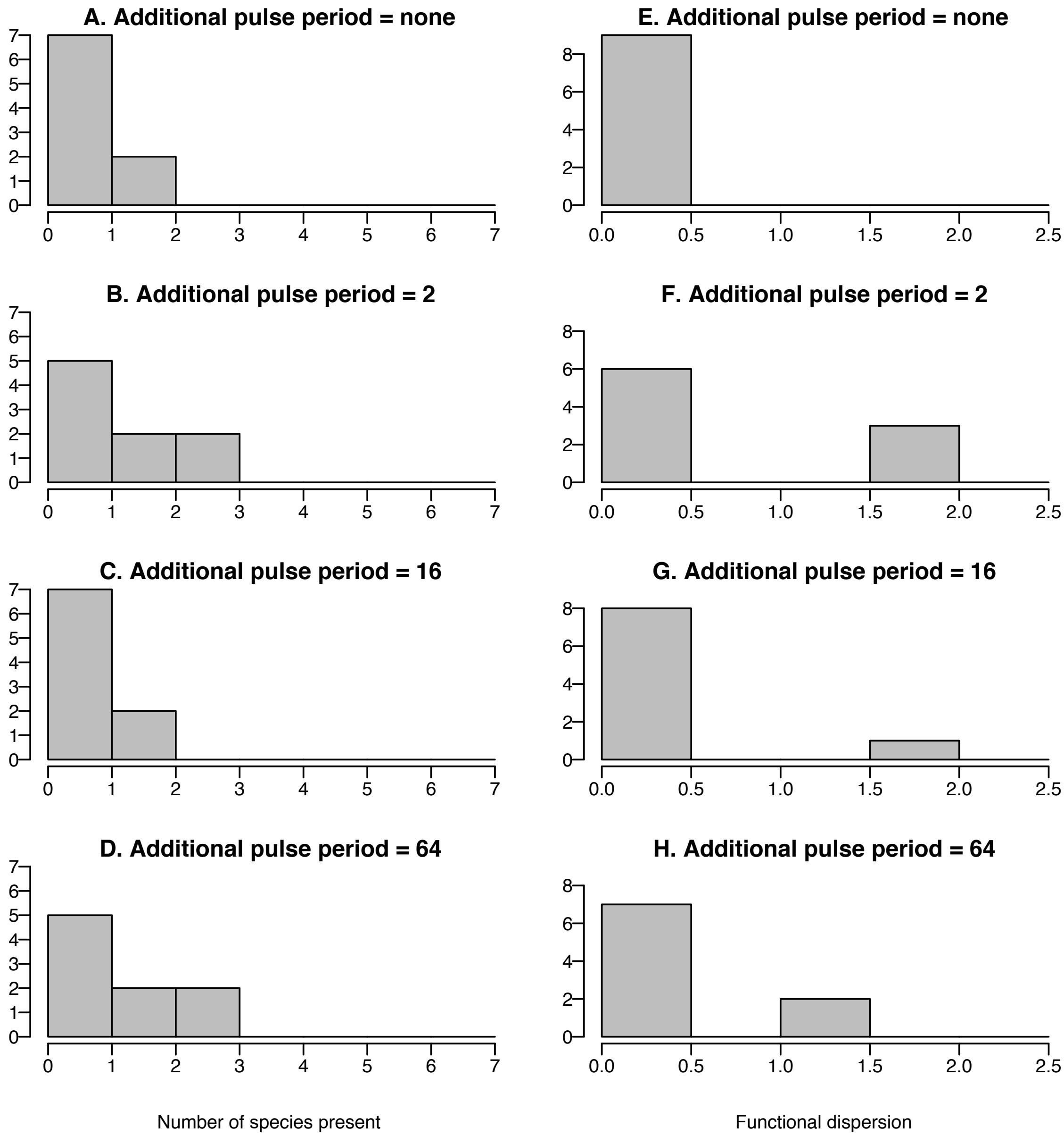

Figure A10. Effect of removing nutrient supply through mixing and recycling (a = 0, f = 0). Effects of one vs. two pulse frequencies on species and functional diversity, under a two-way tradeoff between phosphate affinity and storage capacity. (A-D) show the distribution of species richness across all model runs displayed in Fig. A9, for (A-D) respectively. (E-H) show the distribution of functional dispersion across all model runs in Fig. A9, for (A-D) respectively.

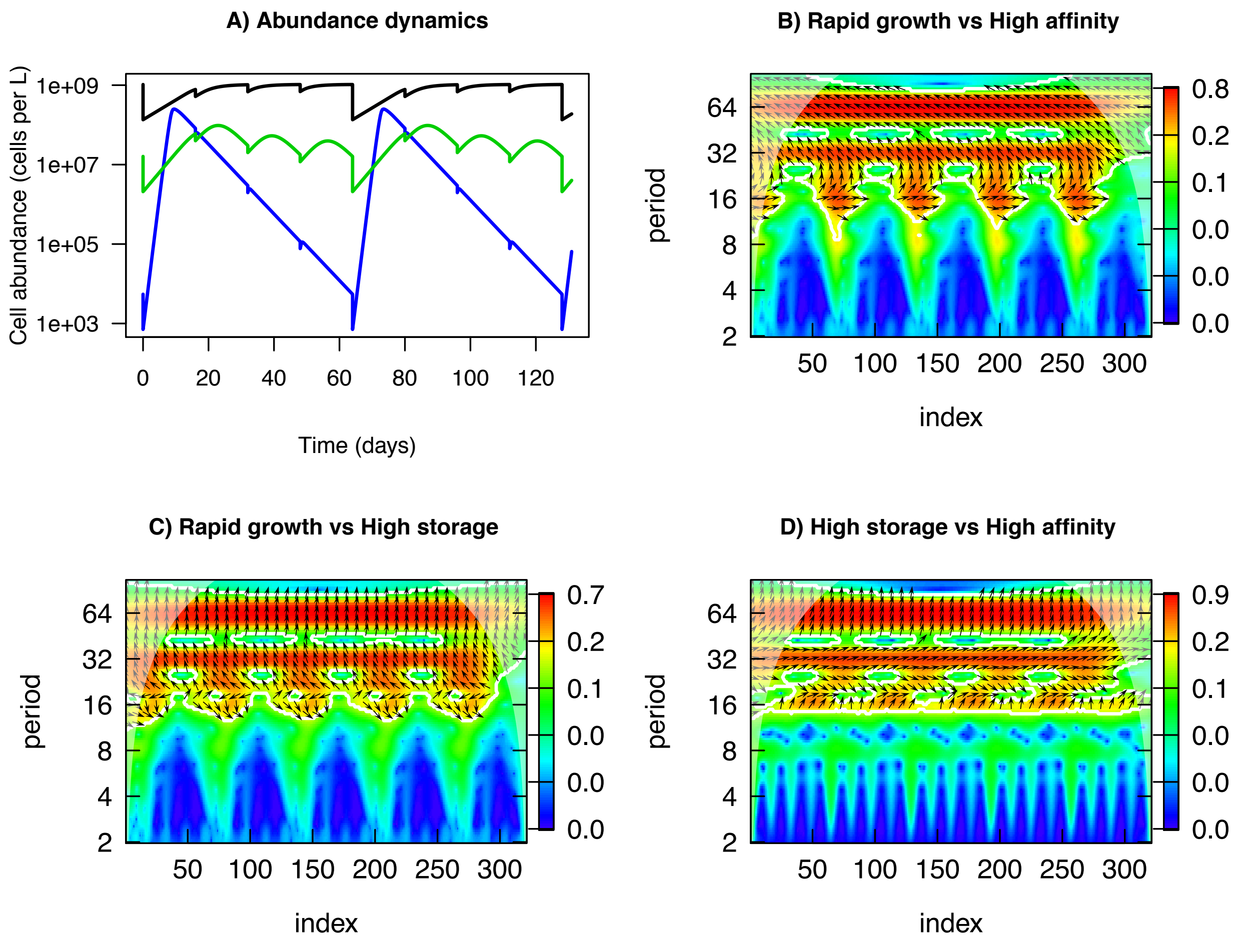

Figure A11. Example wavelet analysis for the dynamics of multiple coexisting strategies. (A) abundance dynamics corresponding to the case in Fig. 2C where pulses are added at frequencies of 16 and 64 days. The species labeled 'Affinity' has the highest value of P_{saff}, the species labeled 'Storage' has the highest value of $Q_{\max}$, and the species labeled 'Velocity' has the highest value of $\mu_{\max}$. (B) Cross-wavelet power image for the velocity and storage strategies, at lags from -64 to 64. (C) Cross-wavelet power image for the velocity and affinity strategies, at lags from -64 to 64. (D) Cross-wavelet power image for the storage and affinity strategies, at lags from -64 to 64. Wavelet analyses performed with the R package 'WaveletComp'.