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SUPPORTING INFORMATION

Ecological opportunity and predator-prey interactions: linking eco-evolutionary processes and diversification in adaptive radiations

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Appendix 1

Robustness

All the results presented in the main paper are based on radiations with low prey niche width (σ_α = 0.1) but quantitatively robust also for wider prey niche width (Appendix 1, figures. S1-S12) and longer running (5000 evolutionary steps, see examples in figure S13-S15) simulations. As an additional robustness check, we also simulated radiations with 25% increase in both parameters *r* and *d*, a 25 % decrease in *r* and *d*, and a 25% increase in *r* and a 25 % decrease in *d* (figures S13-S15). We also inspected the ecological dynamics throughout the radiations and we see no sign of unstable ecological dynamics throughout our simulations. Our conclusions presented in the main paper thus remain the same.

The simulations are largely deterministic (with some stochastic elements included by random mutations). We see low variation in prey diversity across 10 replicates, standard deviation < 2 for all σ_α. Variation increases slightly, plausibly due to fewer (5) replicates and increased community complexity, in the predator-prey simulations. Standard deviation (std) in prey diversity across replicates in predator-prey simulations is low (std < 3) when bmax = 0.0001 and then increases when bmax is increased to 0.0003 (std < 6) and 0.0005 (std < 9). This increase in variation is however mainly due to increased variation in simulations with low predator niche width (σ_a =0.1), due to predator extinctions in some simulations. Std in predator diversity were >3 for simulations where σ_a =0.3-0.7.

Figure legends

Figure S1-S4

Predator-prey community adaptive radiation data. Prey diversity as a function of time and predator niche width (range 0.1(black) – 0.7 (light gray)) for a range of predator mutation probability and efficiency. Dashed line represent a prey reference community and solid lines denotes predator-prey community data. See panel titles for predator parameter settings. Prey niche width (denoted as sig_a) range 0.1 (figure S1); 0.3 (figure S2); 0.5 (figure S3) 0.7 (figure S4).

Figure S5-S8

Predator-prey community adaptive radiation data. Predator diversity as a function of time and predator niche width (range 0.1(black) – 0.7 (light gray)) for a range of predator mutation probability and efficiency. See panel titles for predator parameter settings. Prey niche width (denoted as sig_a) range 0.1 (figure S5); 0.3 (figure S6); 0.5 (figure S7) 0.7 (figure S8).

Figure S9-S12

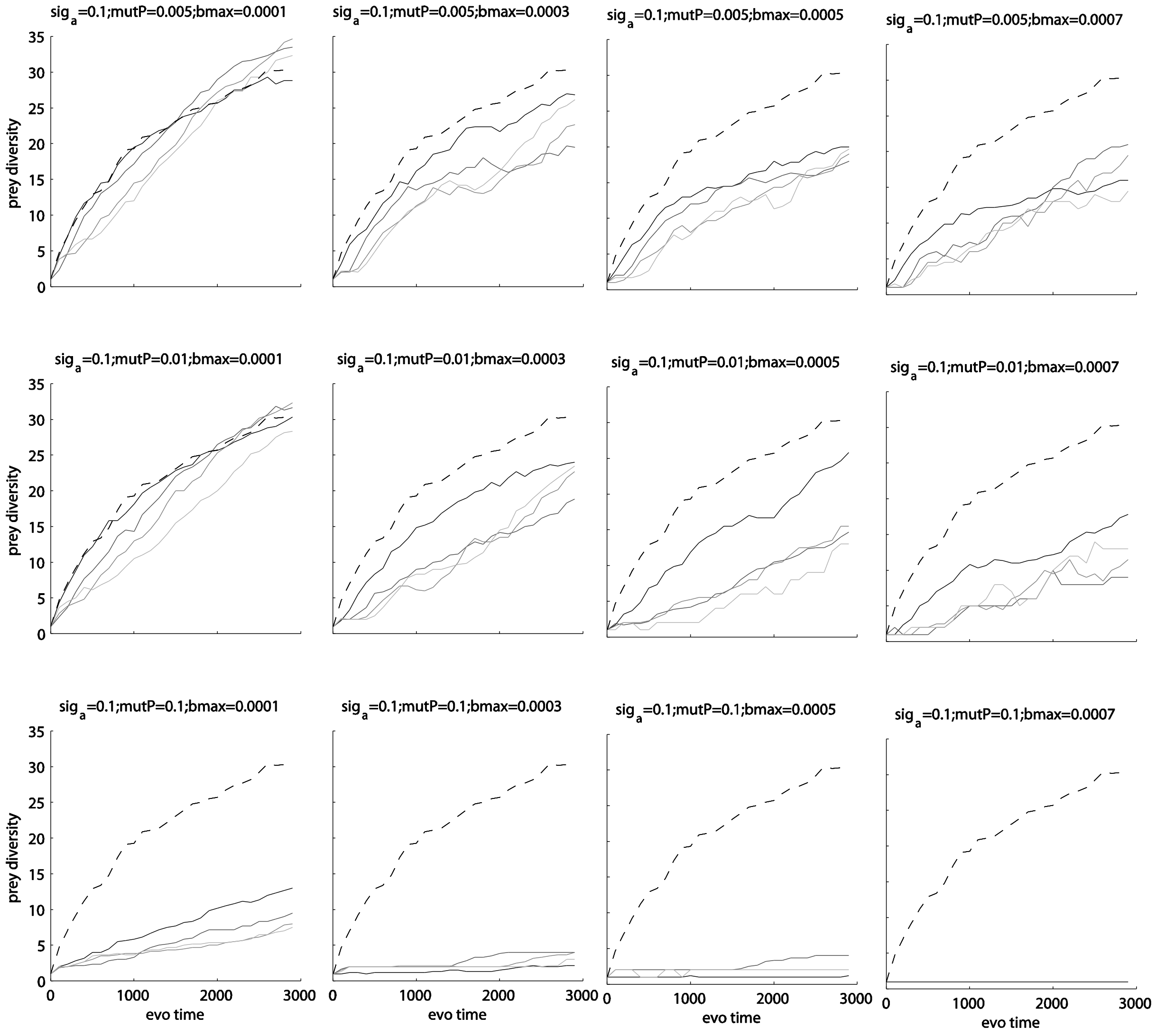
Predator-prey community adaptive radiation data. Mean prey abundance as a function of time and predator niche width (range 0.1(black) – 0.7 (light gray)) for a range of predator mutation probability and efficiency. Dashed line represent a prey reference community and solid lines denotes predator-prey community data. See panel titles for predator parameter settings. Prey niche width (denoted as sig_a) range 0.1 (figure S9); 0.3 (figure S10); 0.5 (figure S11) 0.7 (figure S12).

Figure S13-S15

Predator-prey adaptive radiations across parameter space for different prey growth (*r*) and (*d*) values. Fig. S13 shows results where r = 0.75 and d = 0.15. Fig. S14 shows results where r = 1.25 and d = 0.25. Fig. S15 shows results where r = 1.25 and d = 0.15. The general patterns are similar among these parameter combinations. Co-radiation at intermediate predator niche width (σ_a = 0.3), low predator mutation probability (μ_{pred} = 0.005) and low (a) and high (b) predator efficiency (b_{max} = 0.0001 (a) and 0.0005 (b)). Predators excluding the prey from parts of trait space when the predator's efficiency is large (b_{max} = 0.0007), niche width is low (e.g. $\sigma_a < 0.1$) and mutation probability is low (μ_{pred} = 0.005) (c). Note that the prey can escape the excluding affect induced by the predator if a prey mutant invades on the opposite side of the predator trait (panel c in Fig S13) or if the predator goes extinct (panel c in Fig. S15). High values of predator mutation probability (μ_{pred} = 0.1), in combination with high predator efficiency (b_{max} = 0.0007) interrupts the branching all together, only one predator and one prey population co-evolve in trait space with the predator trait (red) completely overlapping the prey (gray, barely seen) (d). All the results presented is based on radiations with low prey niche width (σ_α = 0.1) and other model parameters were set to: u_{opt}=0; K_0=10000; σ_K =1; c = 0.3; μ_{prey} = 0.01.

Figures

Figure S1



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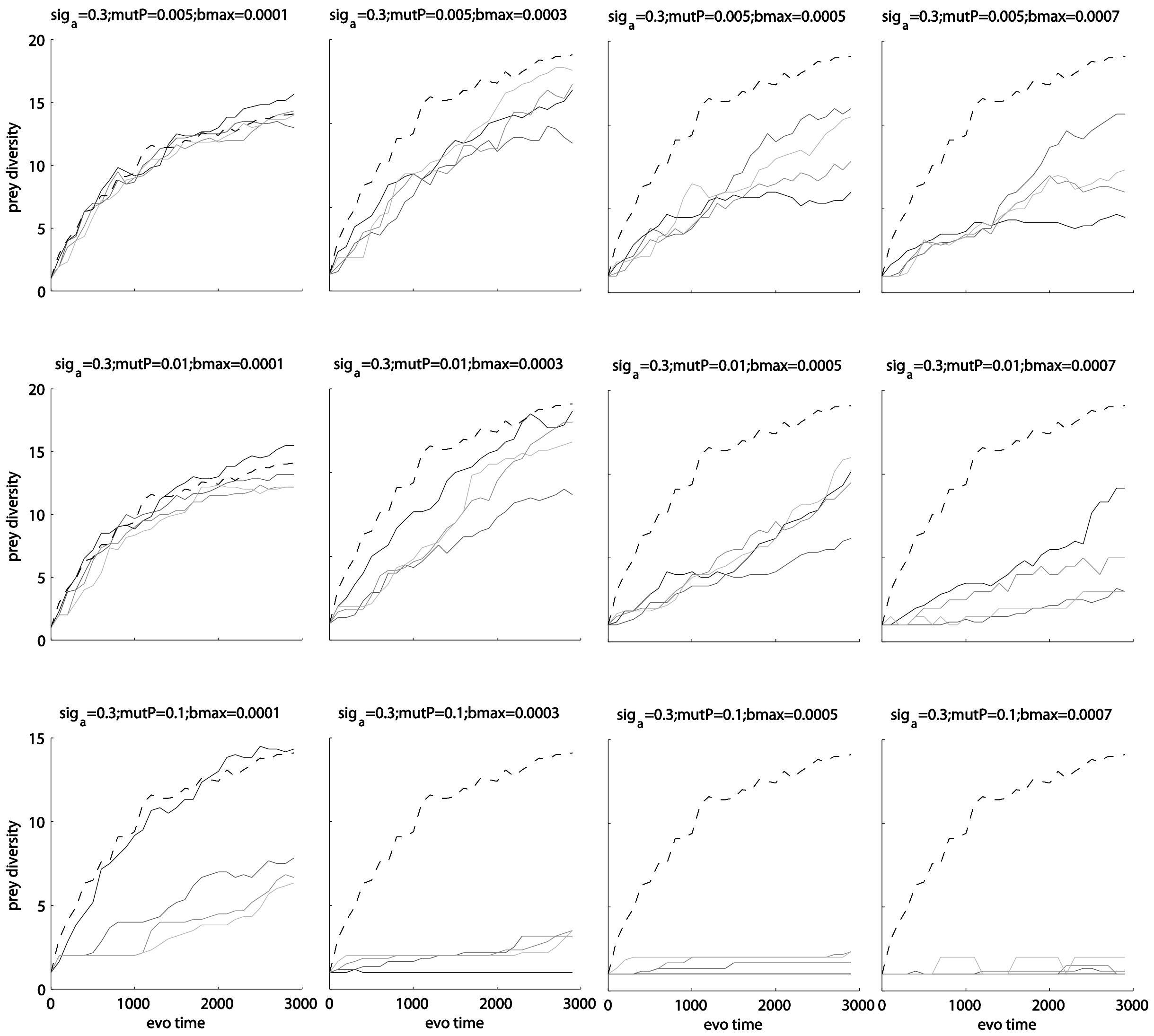

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evo time
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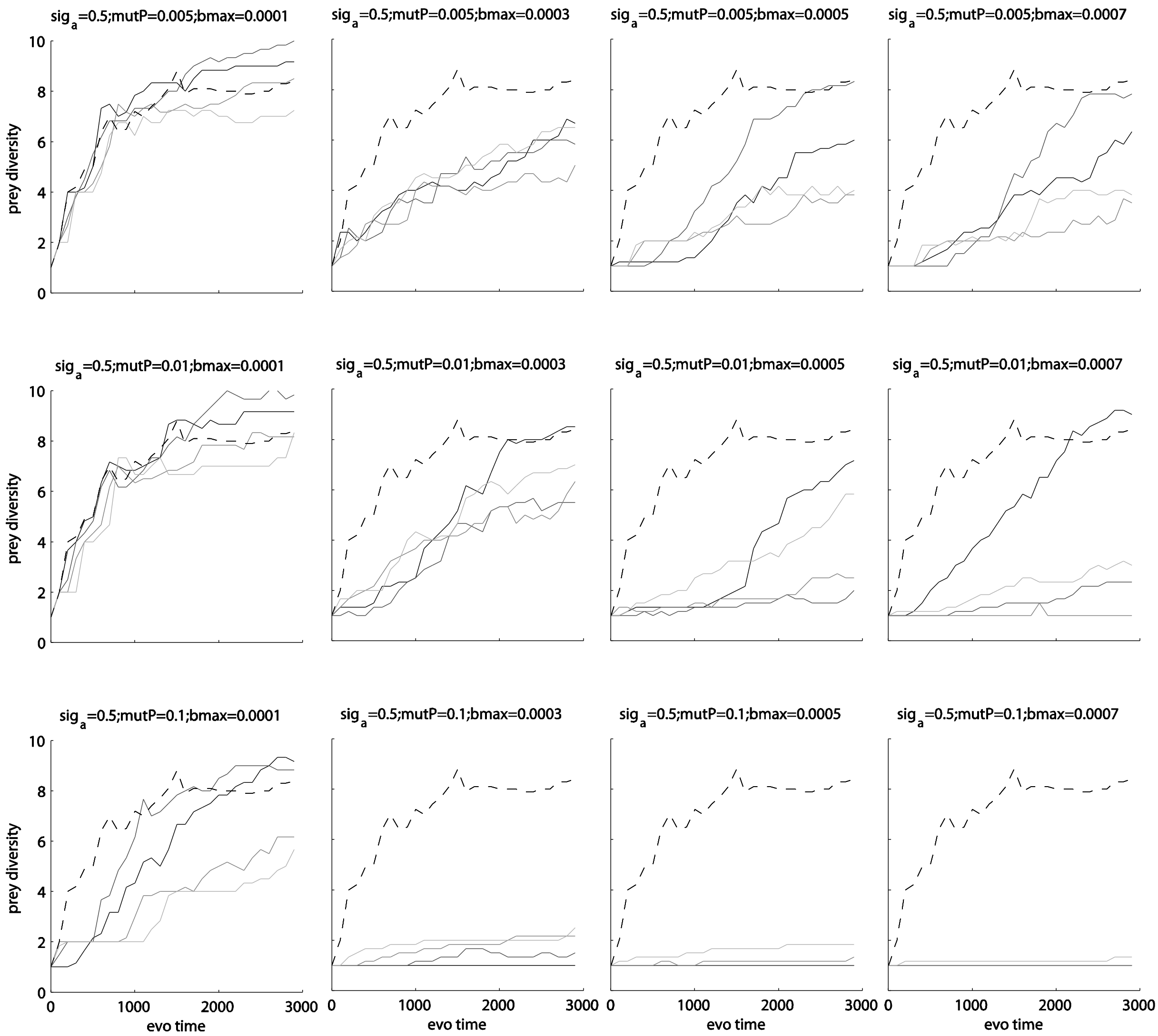
3000
0
5
10
15
20

Figure S3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evo time
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1000
2000
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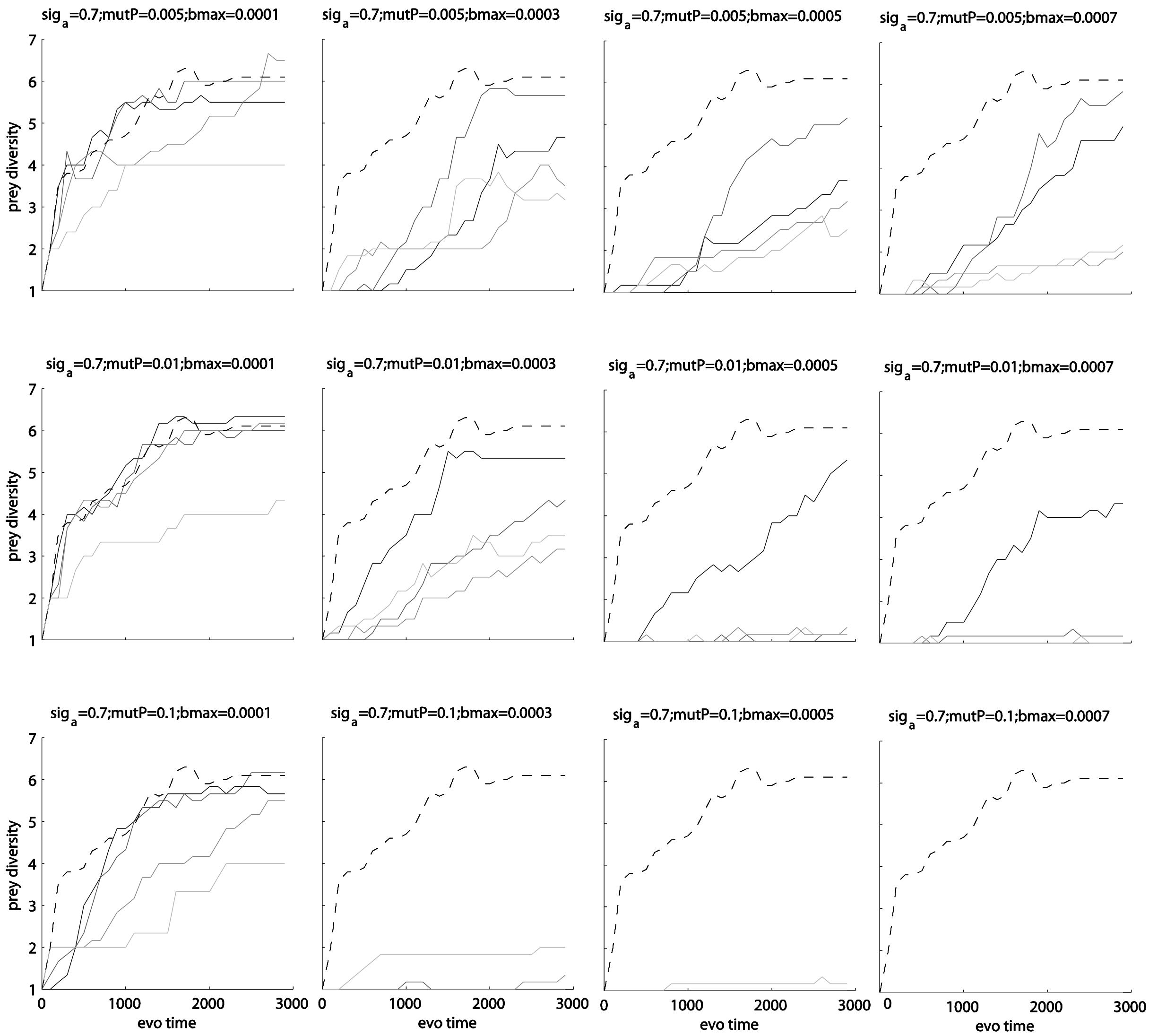
Figure S4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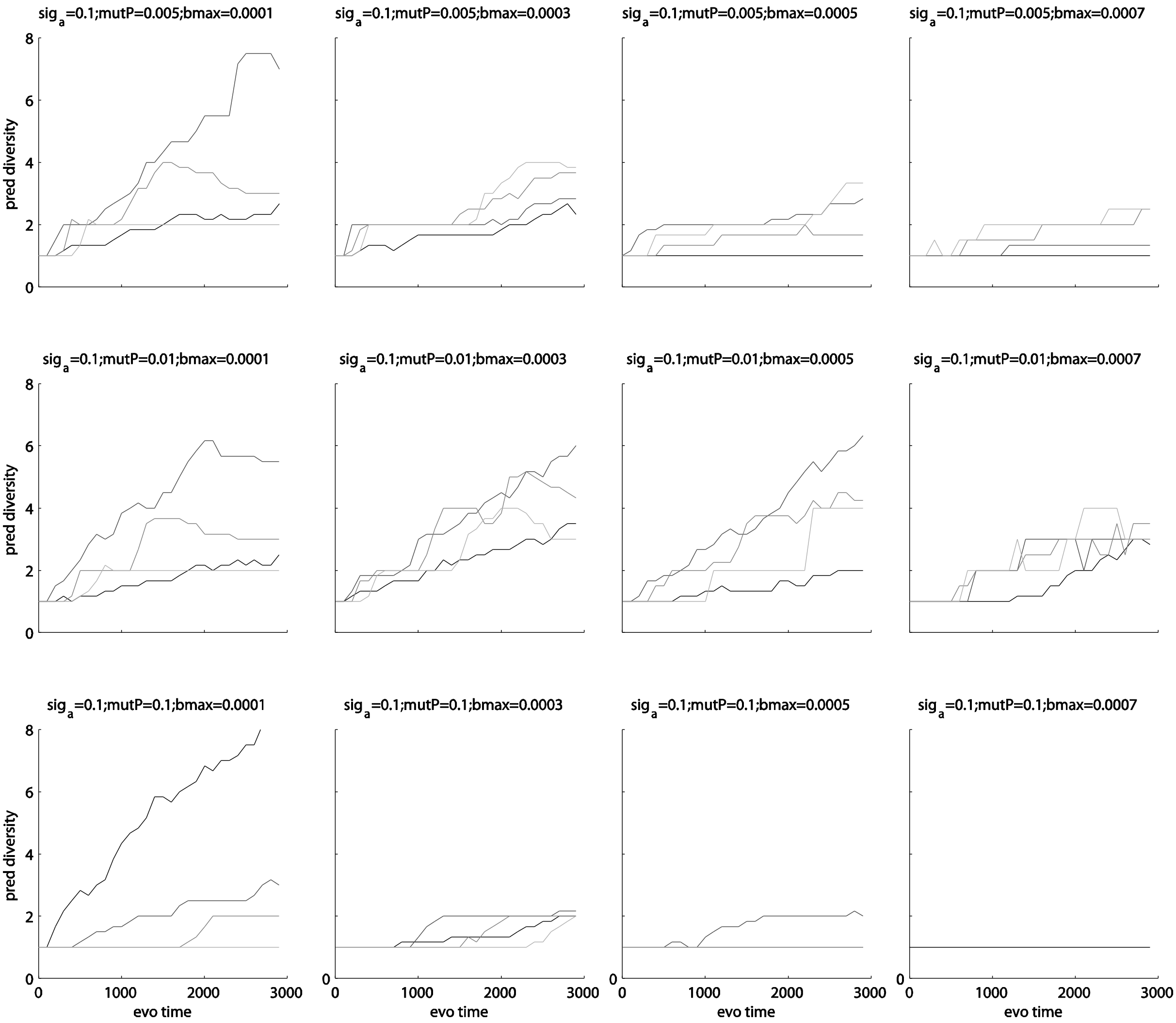
prey diversity
evo time

Figure S5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pred diversity
evo time
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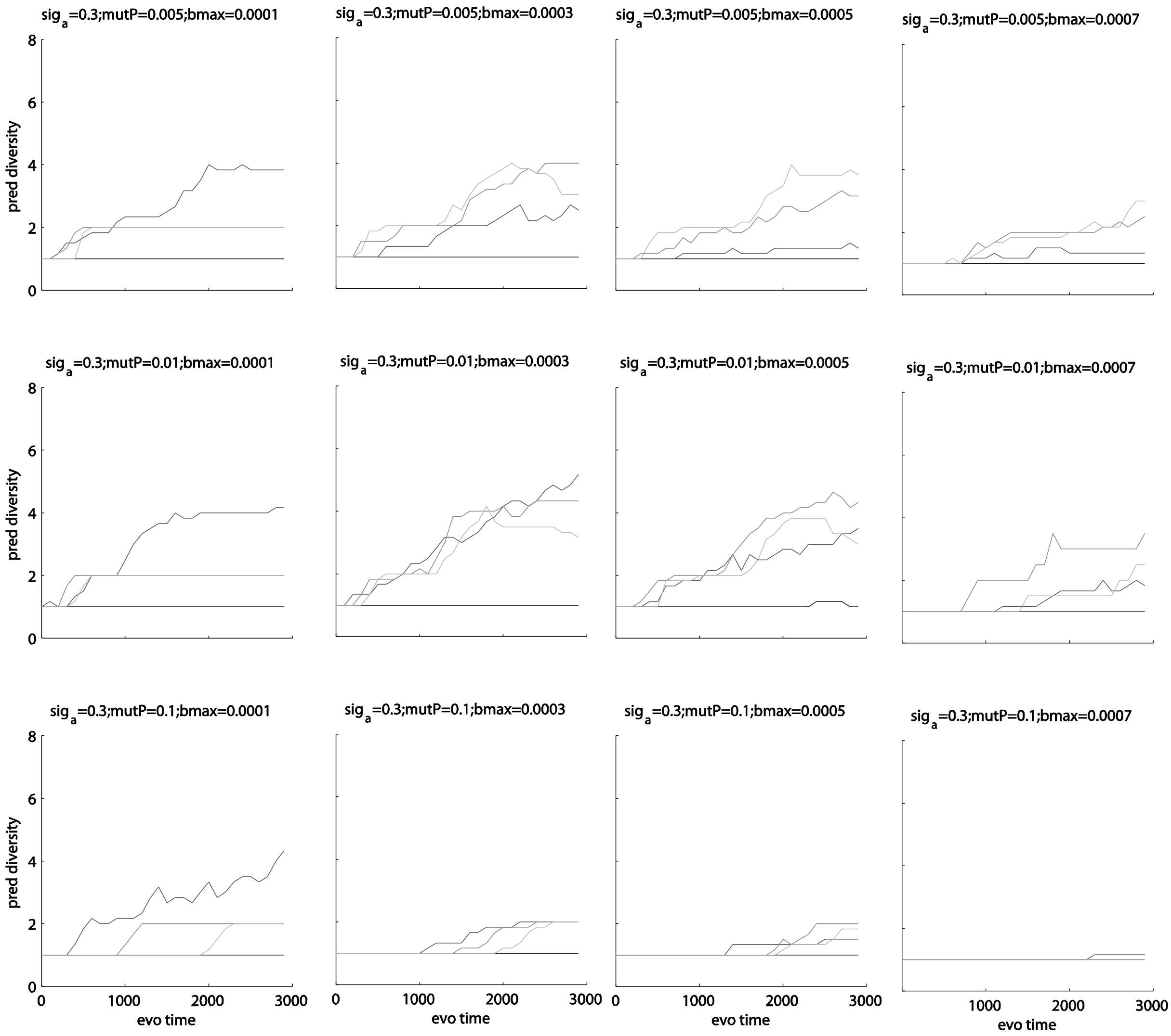
Figure S6



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pred diversity
evo time
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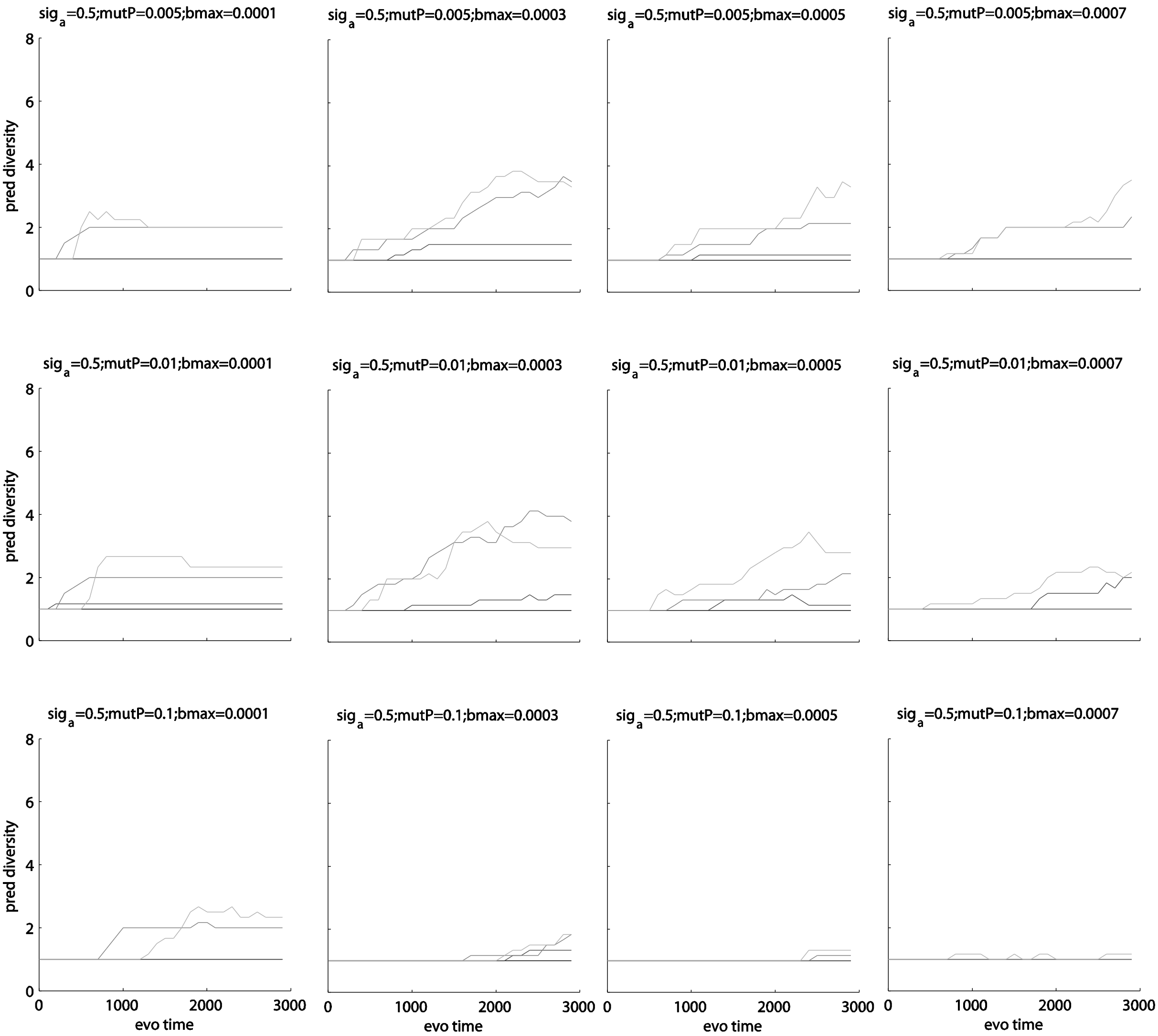
Figure S7



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evo time
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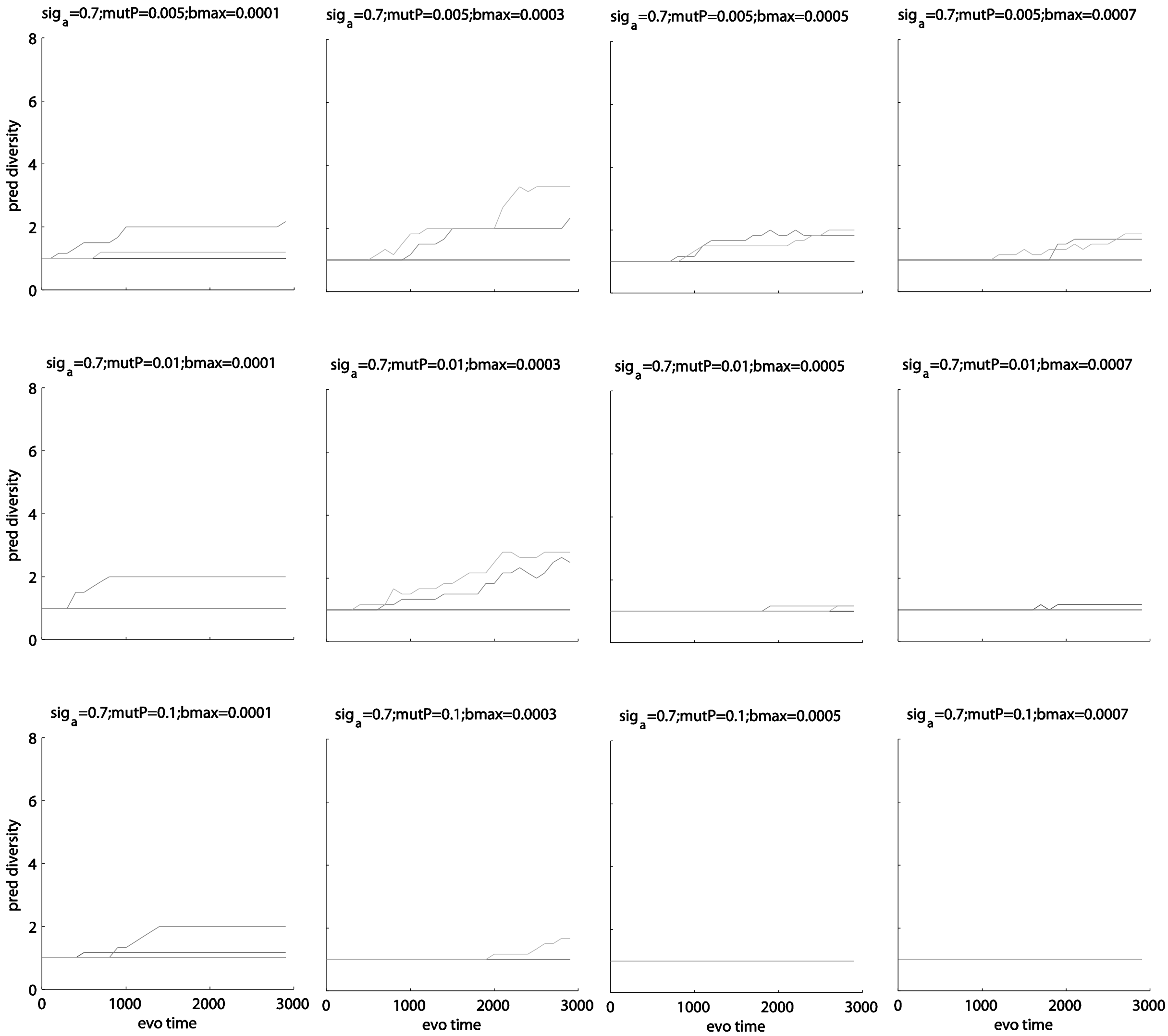
Figure S8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pred diversity
evo time
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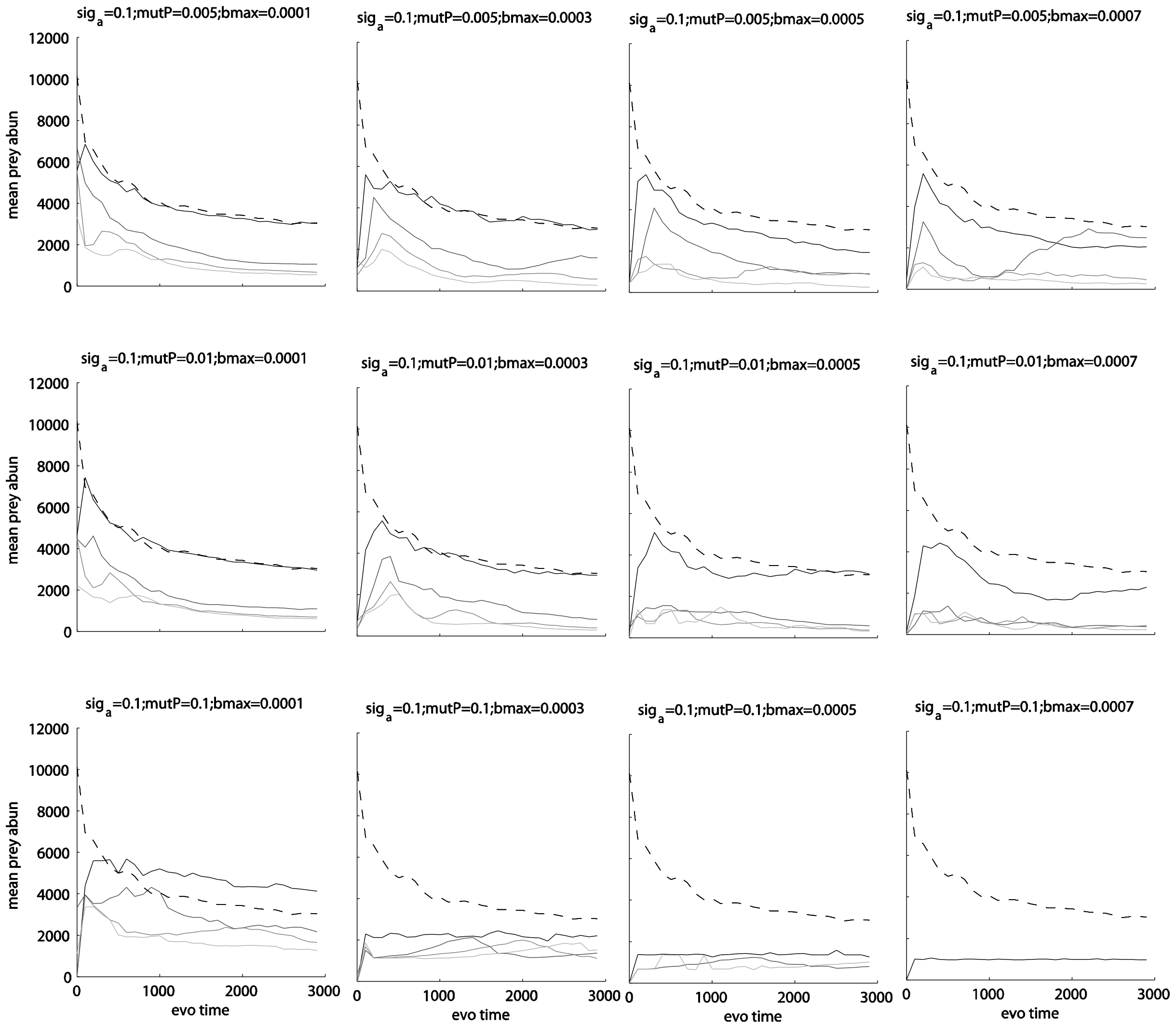
Figure S9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mean prey abun
evo time
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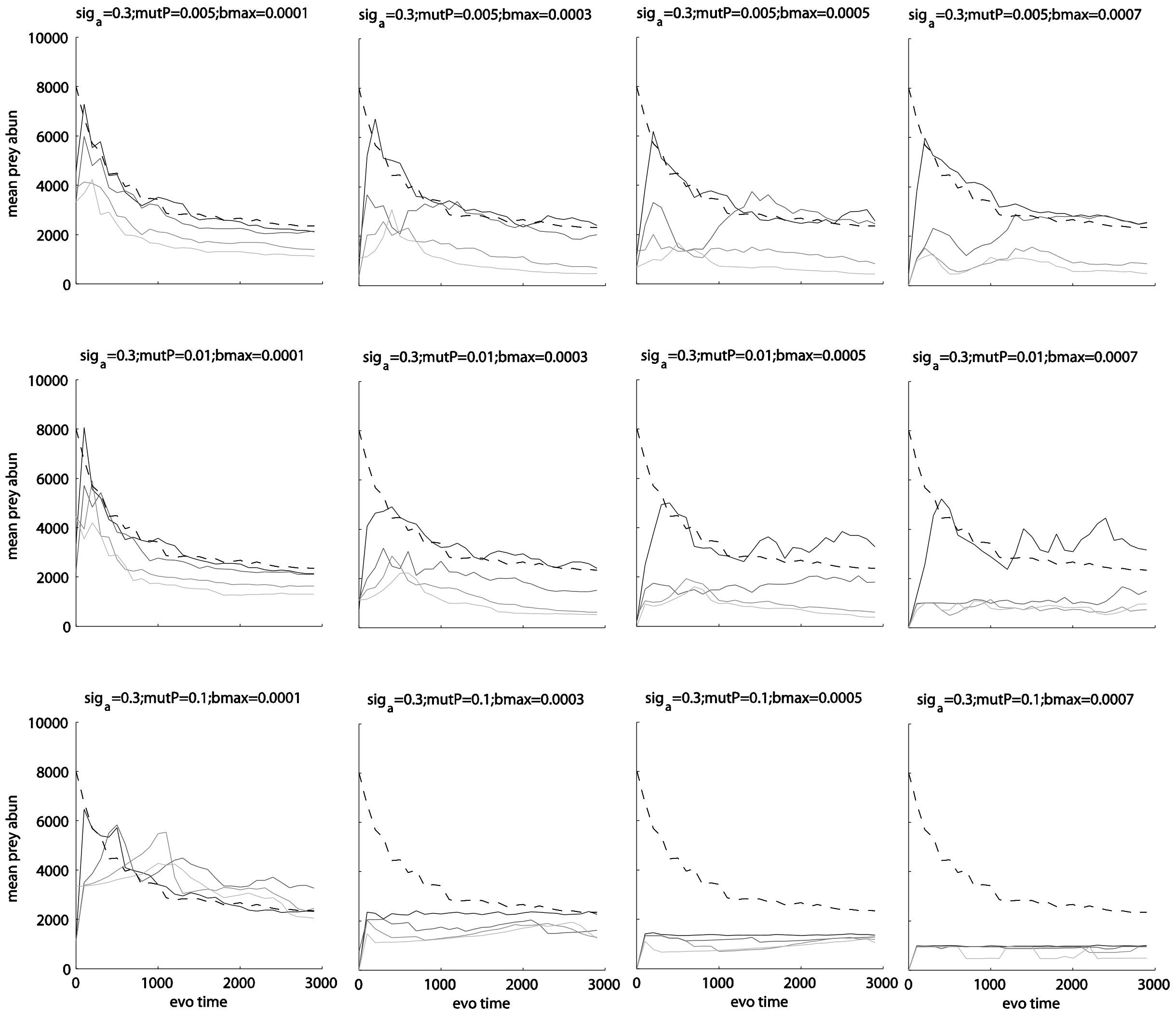
106 Figure S10



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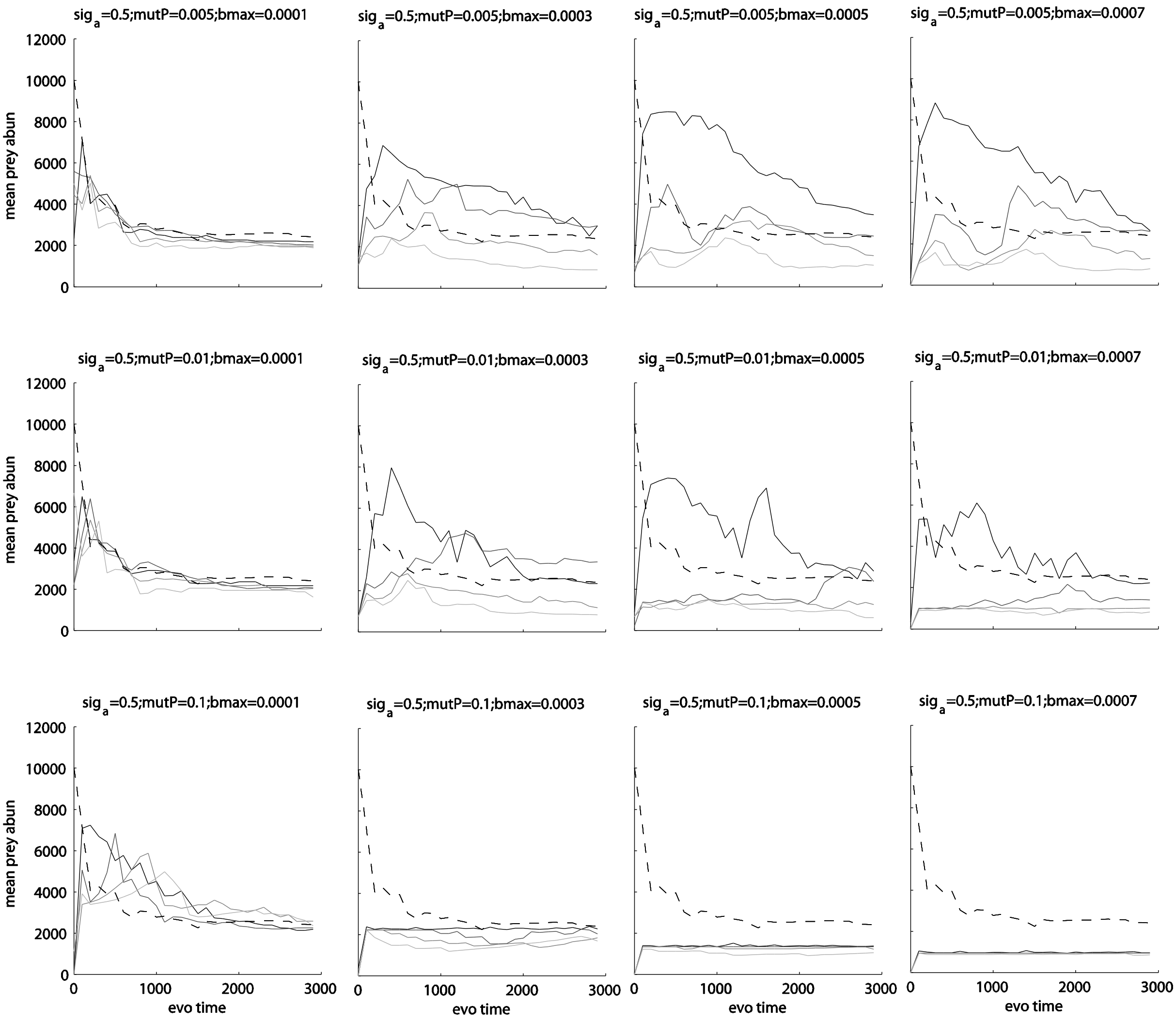
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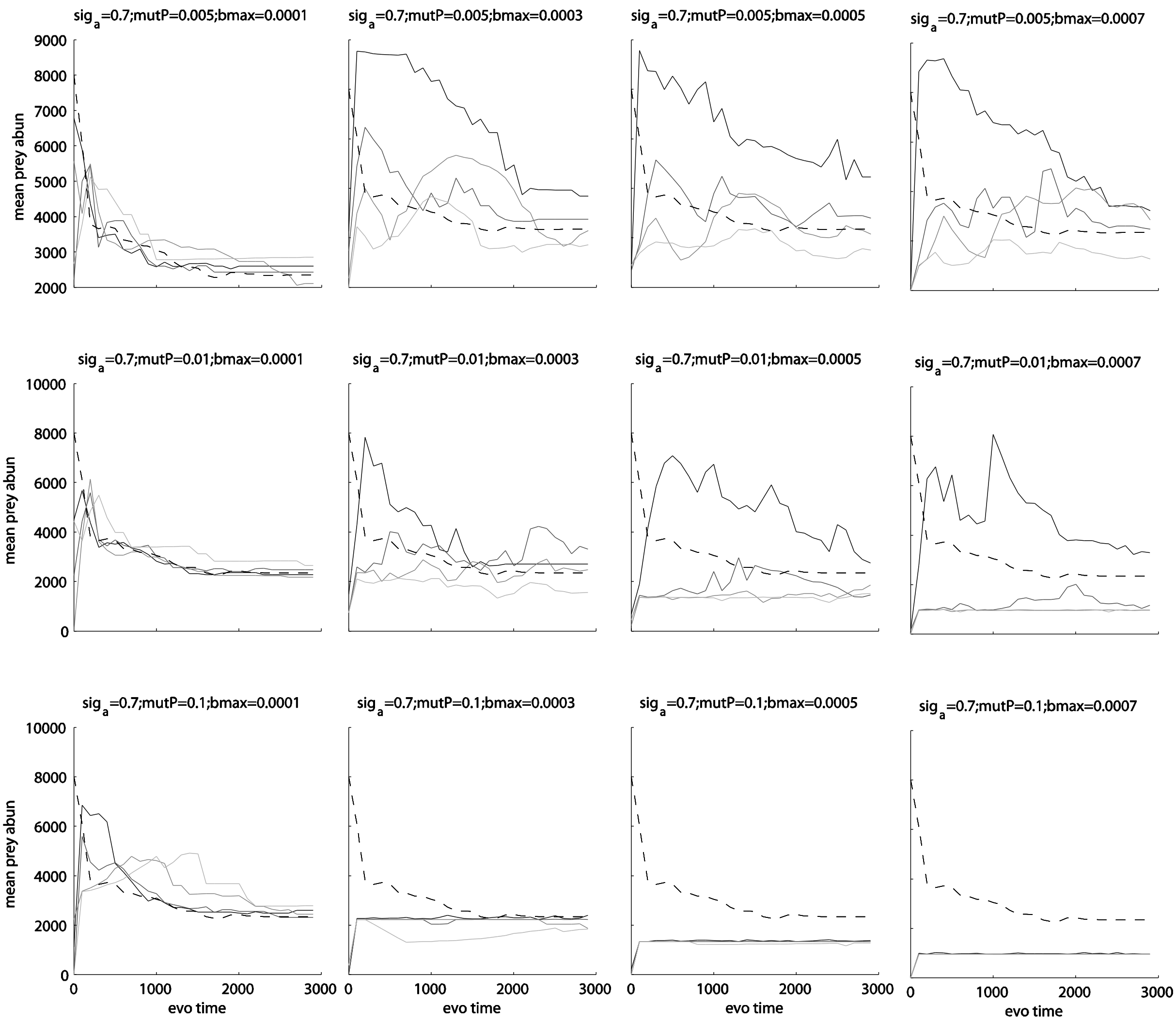
evo time

Figure S12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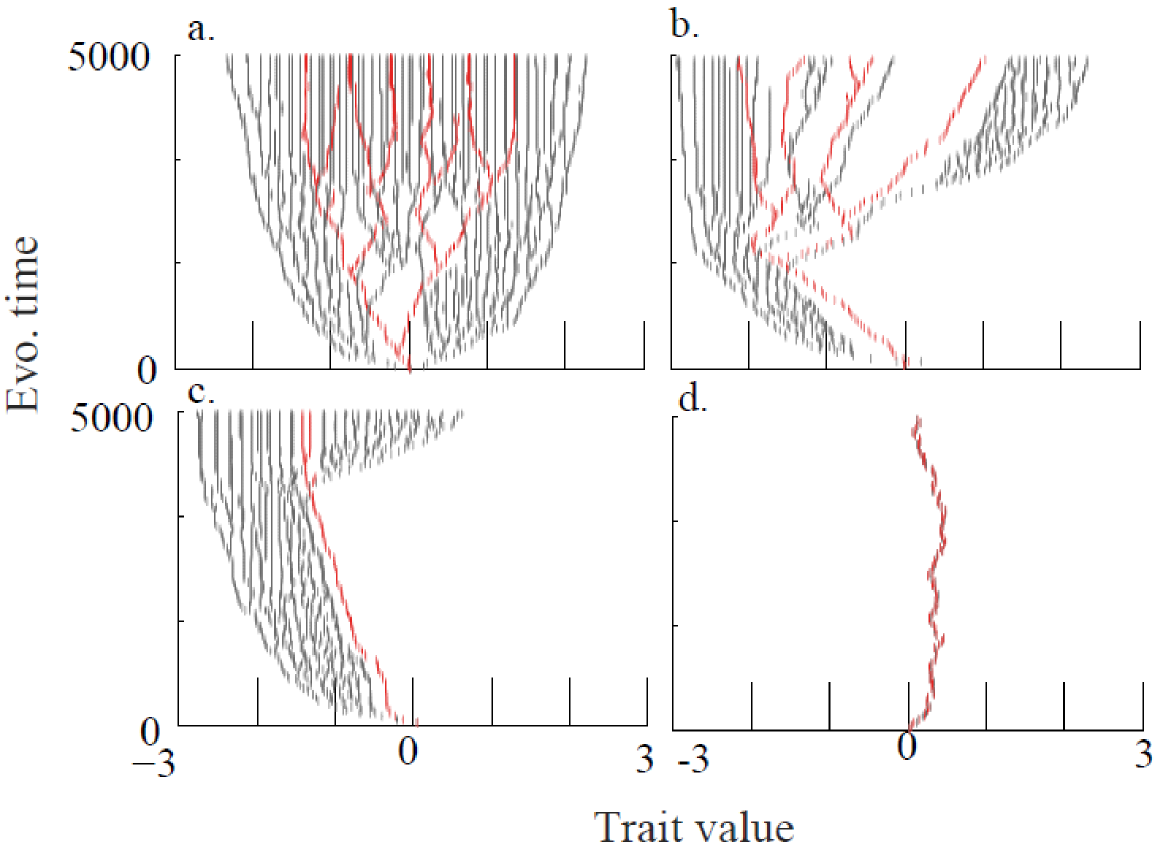
mean prey abun
evo time

Figure S13



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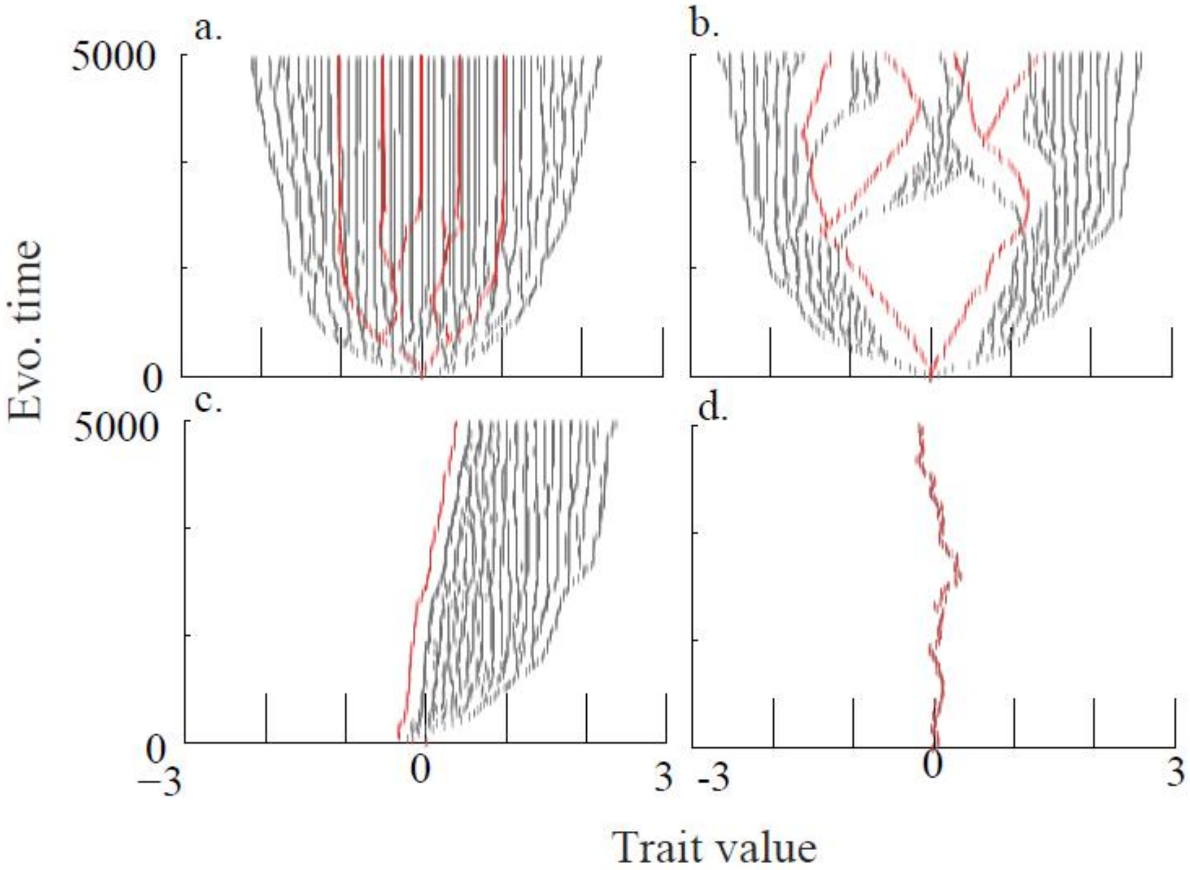

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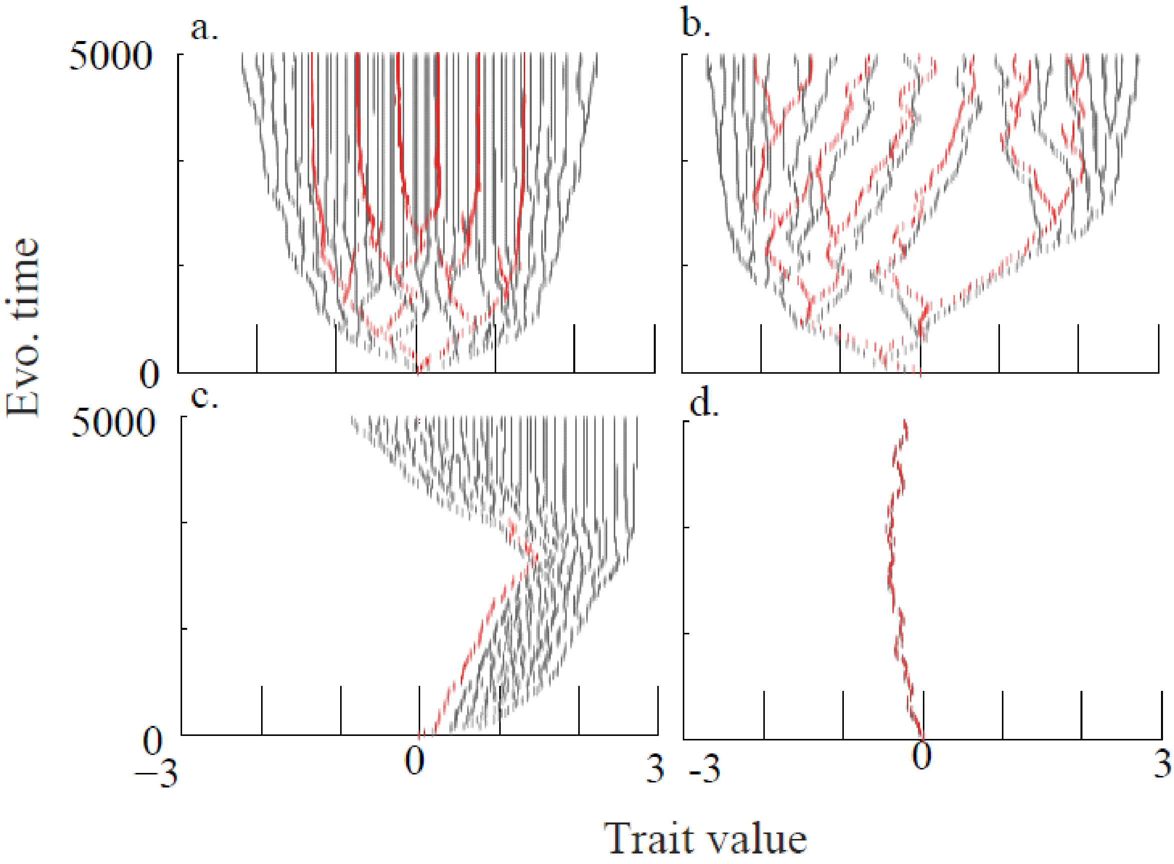

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