Supplementary Information for Emergence of stable polymorphism driven by evolutionary games between mutants

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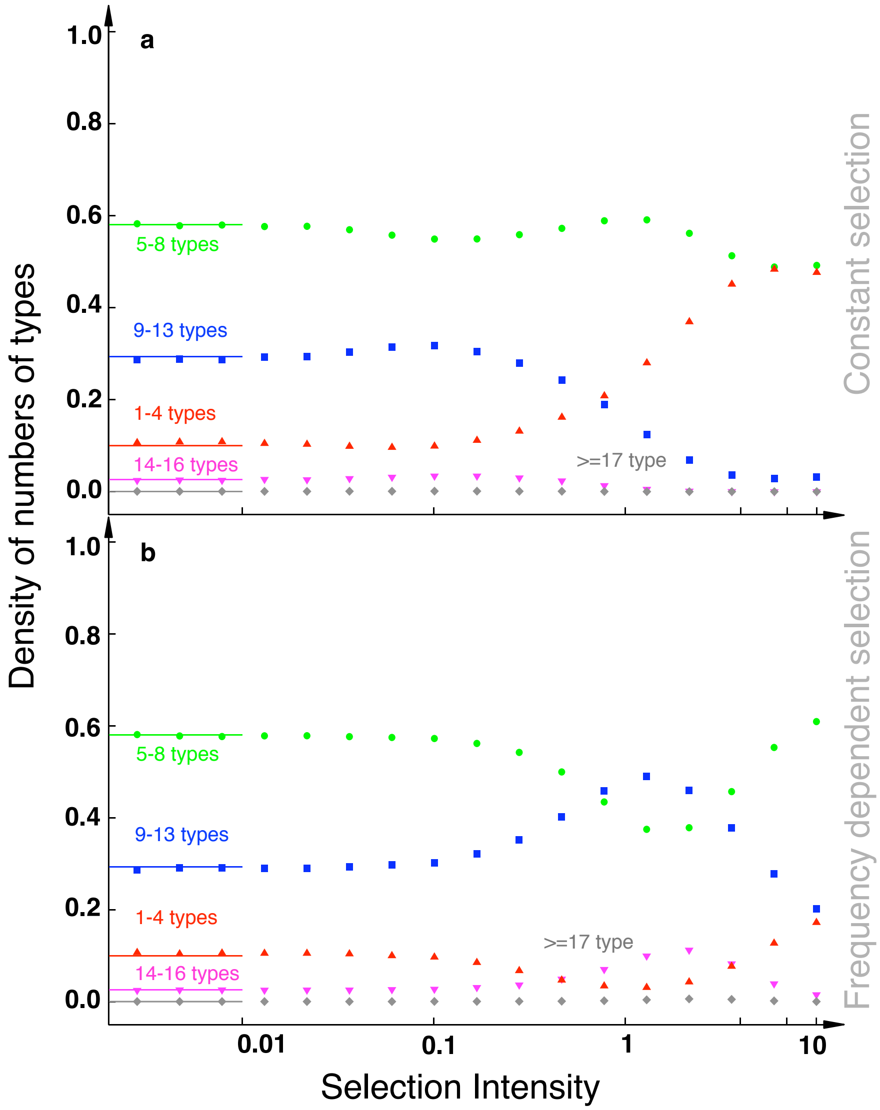
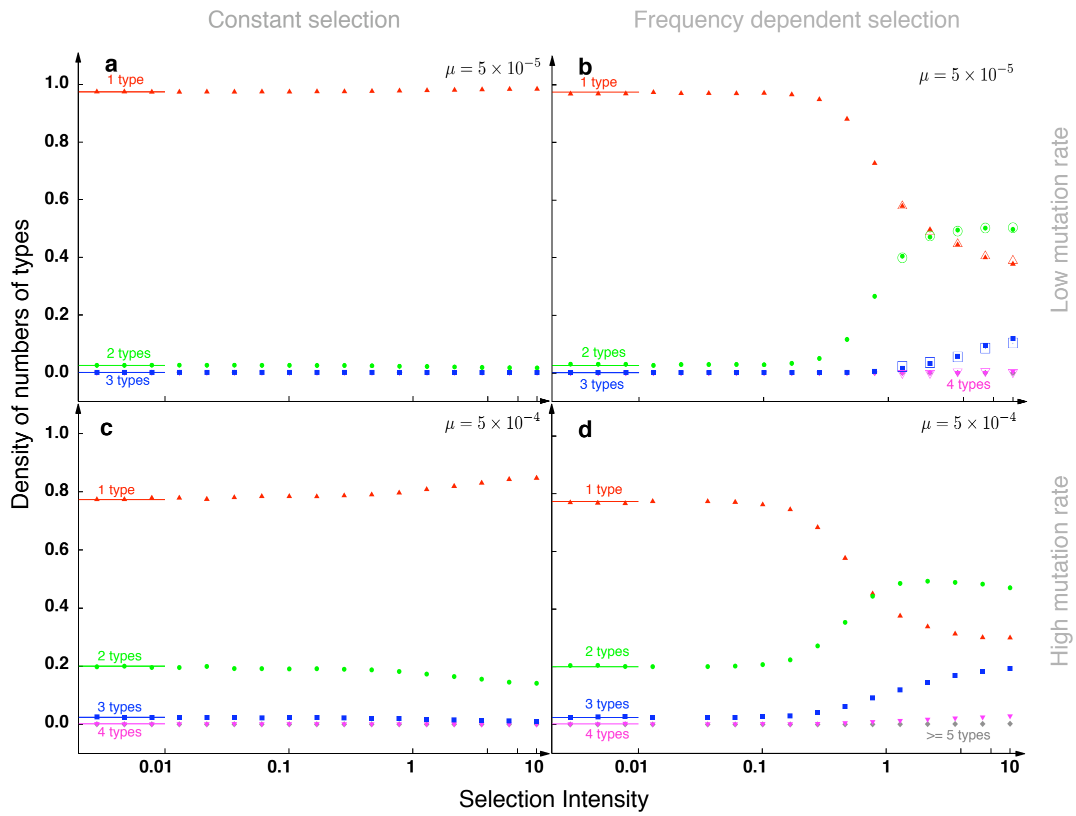
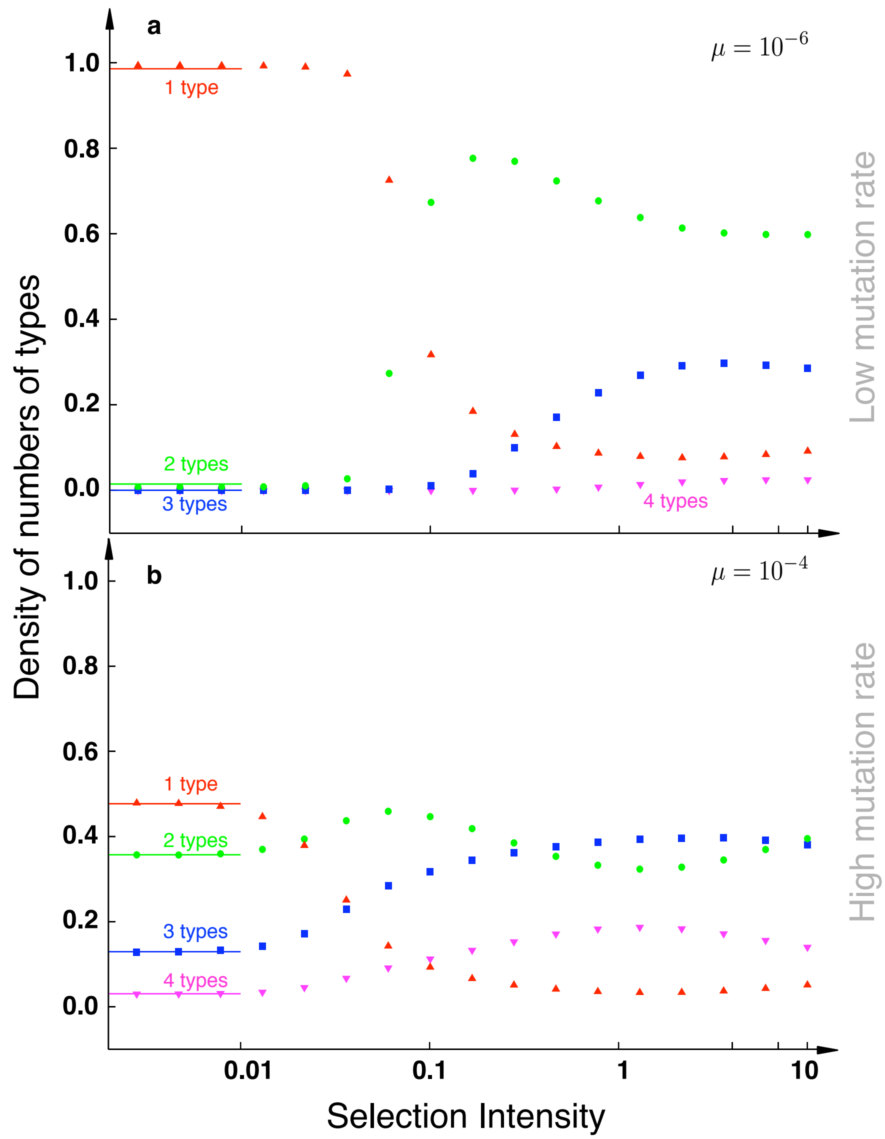


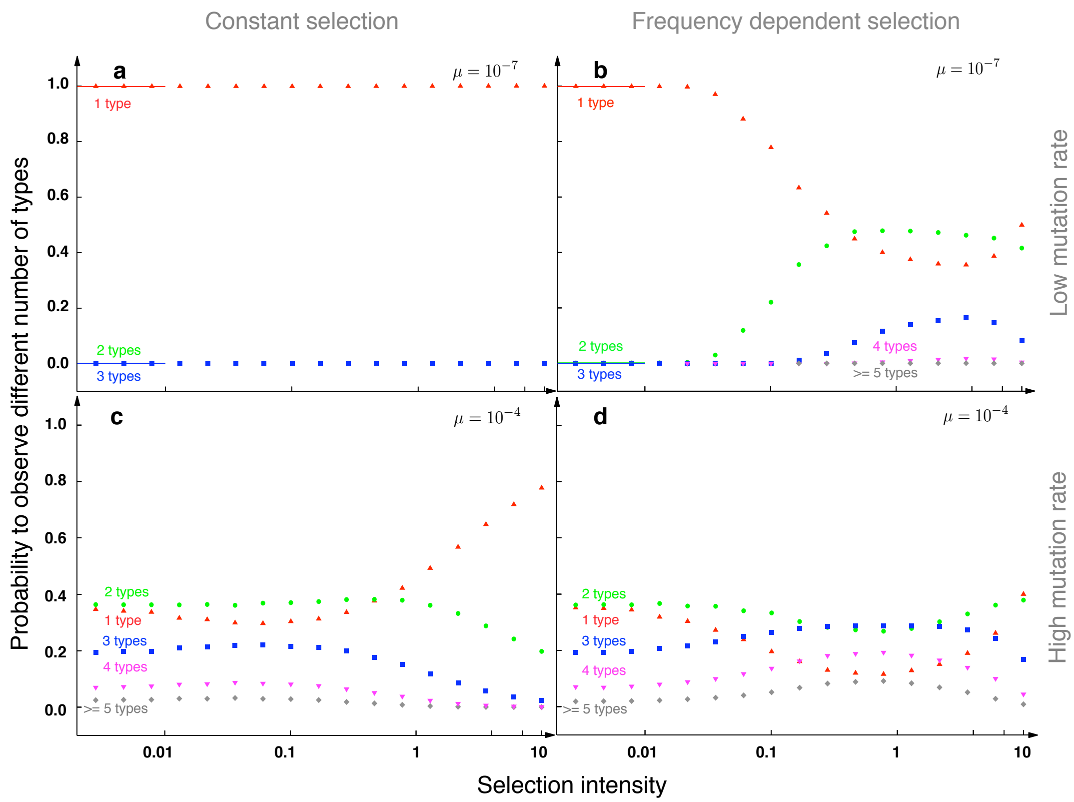
Supplementary Figure S1: **Distribution of the number of types under high mutation rates.** The expected number of types for different selection intensities is shown in a Moran process with a high mutation rate, $\mu = 1/N$. The symbols are simulation results, and the lines are Ewens' sampling formula under neutral selection. Under neutral or weak selection, the diversity is much higher than for smaller mutation rates, both for constant selection (top) and frequency-dependent selection (bottom). It is unlikely that any type occurs with a high frequency, and it is most likely to observe a comparatively large number of low-frequency types. For strong selection, the diversity under frequency-dependent selection is much higher compared with constant selection (population size $N = 1000$, mutation rate $\mu = 10^{-3}$ per time step, average over 500 independent realizations, and 10^7 time steps, after an initial period of 25000 time steps).



Supplementary Figure S2: **Distribution of number of types for a small population.** The expected number of different types for different selection intensity is shown under a Moran process for $N = 100$, the case of $N = 1000$ is shown in the main text. As for $N = 1000$, our simulations (filled symbols) agree with Ewens' sampling formula under weak selection (lines). The top panels show a low mutation rate, $\mu = 5 \times 10^{-5}$ per time step. The bottom panels show a higher mutation rate, $\mu = 5 \times 10^{-4}$ per time step. For constant selection (left), diversity decreases when selection becomes stronger. For frequency dependent selection (right), from nearly neutral selection to extremely strong selection, the number of types coexisting in the population for most of the time increases. (population size $N = 100$, averages obtained over 500 independent realizations and 10^6 generations per realization, where the data of first $25N$ generations are excluded).



Supplementary Figure S3: **Distribution of number of types in a diploid population under a Moran process.** The symbols are simulation results, and the lines represent Ewens' sampling formula. The top panel shows a low mutation rate, $\mu = 10^{-6}$ per time step. The bottom panel shows a higher mutation rate, $\mu = 10^{-4}$ per time step. From nearly neutral selection to extremely strong selection, the number of types which stably coexist in the population increases (population size $N = 1000$, averages obtained over 500 independent realizations and 10^7 generations per realization, where the data of first 25000 generations are excluded).



Supplementary Figure S4: **Distribution of number of types under a Wright-Fisher process.** The expected number of different types for different selection intensities is shown here. The symbols are simulation results, and the lines are Ewens' sampling formula derived for neutral selection. For constant selection (left), diversity decreases when selection becomes strong. For frequency dependent selection (right), from nearly neutral selection to extremely strong selection, the number of types coexisting in the population for most of the time increases. The decrease of diversity for very high selection intensity is due to the effect that even minimal fluctuations can quickly destroy stable coexistence under strong selection in the Wright-Fisher process (population size $N = 1000$, average over 500 independent realizations, and 10^7 generations per realization, where the data of first 25000 generations are excluded).