Proof for Eq. (15)

Here, we prove that a mutant on the cycle with dB updating has lower fixation probability than in the well-mixed population for general $N$. We have to show that $\phi_{dB}^M - \phi_{dB}^o > 0$ for $r > 0, r \neq 1$. Under dB updating, the fixation probability in the well-mixed population is given by

$$\phi_{dB}^M = \frac{N - 1}{N} \frac{1 - \frac{1}{r}}{1 - \frac{1}{r^N}}.$$  \hfill (1)

On the cycle, the respective fixation probability is given by (Eq. (5.3) in [1])

$$\phi_{dB}^o = \frac{2(r - 1)}{3r - 1 + (r - 3)r^{2-N}}.$$  \hfill (2)

Then the difference is given by

$$\phi_{dB}^M - \phi_{dB}^o = \frac{(r - 1)r^{N-2}}{N} \frac{(N - 3)r^{N+1} - (N - 1)r^{N} + (N - 1)r^{3} - (N - 3)r^{2}}{(r^{N-1} - 1)(3r^{N+1} - r^{N} + r^{3} - 3r^{2})}.$$  \hfill (3)

This expression can be written in the form of

$$\frac{(r - 1)^2r^{N-2}}{N} \cdot \frac{\sum_{k=0}^{N-4} r^k((N - 2)(k + 1) - (k + 1)^2)}{\left(\sum_{k=0}^{N-2} r^k\right)^3 + \sum_{k=1}^{N-3} 2r^k + 3r^{N-2}}.$$  \hfill (4)

As Eq. (4) contains only positive coefficients in $r$, the difference is always positive for $r > 0$ and $r \neq 1$. For $r = 1$, it is zero. Thus Eq. (15) is fulfilled for all $r > 0, r \neq 1$.

References