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(i) $Z(t,x) \rightarrow \xi(t)$ as $D \rightarrow \infty$

Kondo and M.(2015)

$$\begin{cases} P_t = P\left(1 - \frac{P+aX}{K} - Z\right) + P_{xx} \\ X_t = X\left(1 - \frac{X+bP}{K} - d(\mu)Z\right) + X_{xx} & t>0,\ 0<x<L \\ Z_t = RZ(P - \mu X - 1) + DZ_{xx}, \\ P_x = X_x = Z_x = 0, \quad t>0,\ x=0,\ L \end{cases}$$

(ii) $$\xi_t = R\xi\left(\frac{1}{L}\int_0^L P dx - \frac{\mu}{L}\int_0^L X dx - 1\right)$$

(SS) $$\begin{cases} P_t = P\left(1 - \frac{P+aX}{K} - \xi\right) + P_{xx} \\ X_t = X\left(1 - \frac{X+bP}{K} - d(\mu)\xi\right) + X_{xx}, & t>0,\ 0<x<L \\ \xi_t = R\xi\left(\frac{1}{L}\int_0^L P dx - \frac{\mu}{L}\int_0^L X dx - 1\right) \\ (P_x, X_x)(t,0) = (0,0) = (P_x, X_x)(t,L), & t>0. \\ (P(0,x), X(0,x), \xi(0)) = (P_0(x), X_0(x), \langle Z_0 \rangle) \end{cases}$$

spatial average of Z_0