

BauchModel_DefaultParamsHighMovement

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Table 1: Parameter values used in this analysis

Parameter	Population_1	Population_2	Def
r	0.16	0.16	Fish net growth
s	0.8	0.8	Supply and demand
h	0.5	0.5	Harvesting efficiency
k	0.17	0.17	Social learning rate
w	1.44	1.44	Conservation cost
c	0.6	0.6	Rarity valuation
d	0.3	0.3	Social norm strength (within pop)
i	0	0	Fish immigration (from opposite patch)
rho	0	0	Social norm strength (opposite pop)

Table 2: Starting values used in this analysis

Parameter	Population_1	Population_2
F	0.406	0.406
X	0.240	0.240

SCENARIO: OSCILLATIONS

Function:

$$\frac{dP_1}{dt} = r_1 P_1 (1 - P_1) - \frac{h_1 * P_1 (1 - X_1)}{P_1 + s_1} - e_1 P_1 + i_1 P_2$$

$$\frac{dP_2}{dt} = r_2 P_2 (1 - P_2) - \frac{h_2 * P_2 (1 - X_2)}{P_2 + s_2} - e_2 P_2 + i_2 P_1$$

$$\frac{dX_1}{dt} = k_1 X_1 (1 - X_1) \left[\frac{1}{P_1 + c_1} - w_1 + d_1 (2X_1 - 1) + prop_1 (2X_2 - 1) \right]$$

$$\frac{dX_2}{dt} = k_2 X_2 (1 - X_2) \left[\frac{1}{P_2 + c_2} - w_2 + d_2 (2X_2 - 1) + prop_2 (2X_1 - 1) \right]$$

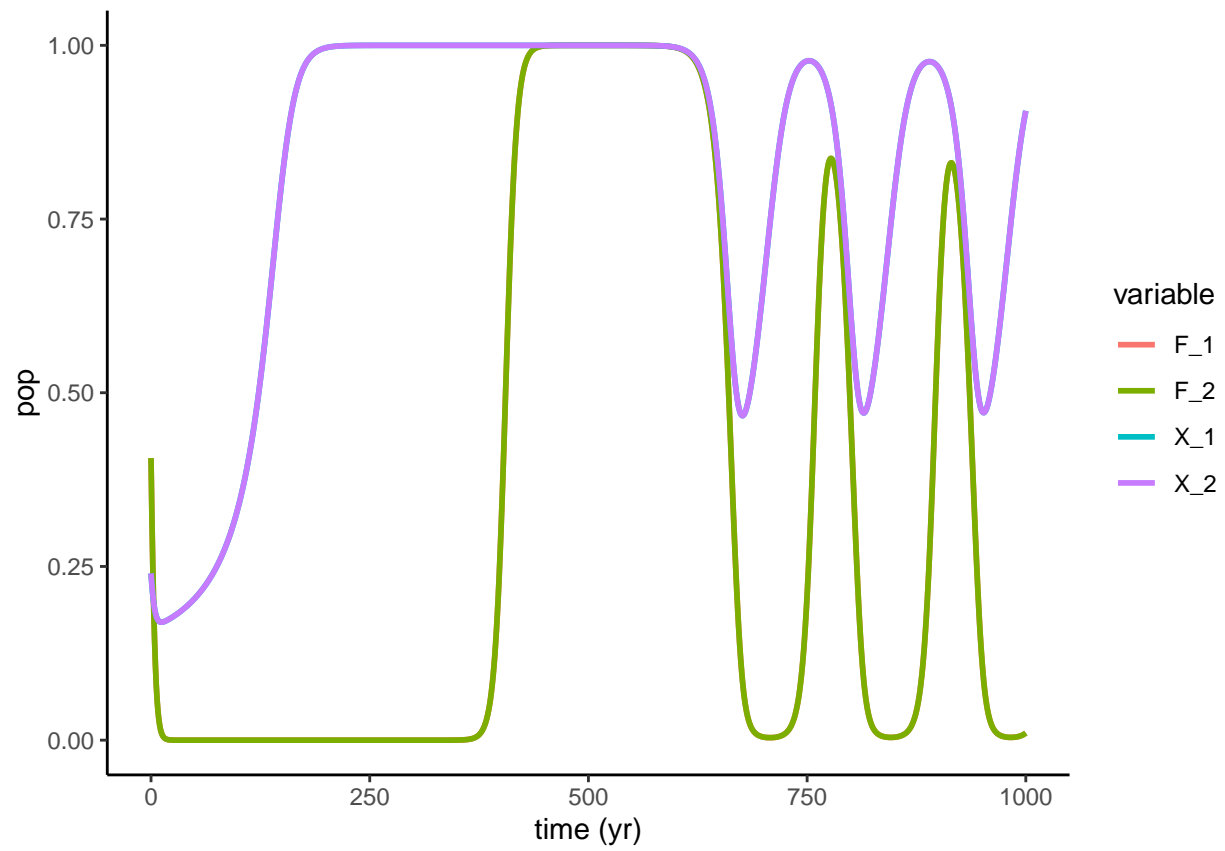


Figure 1: New Model with default paramters

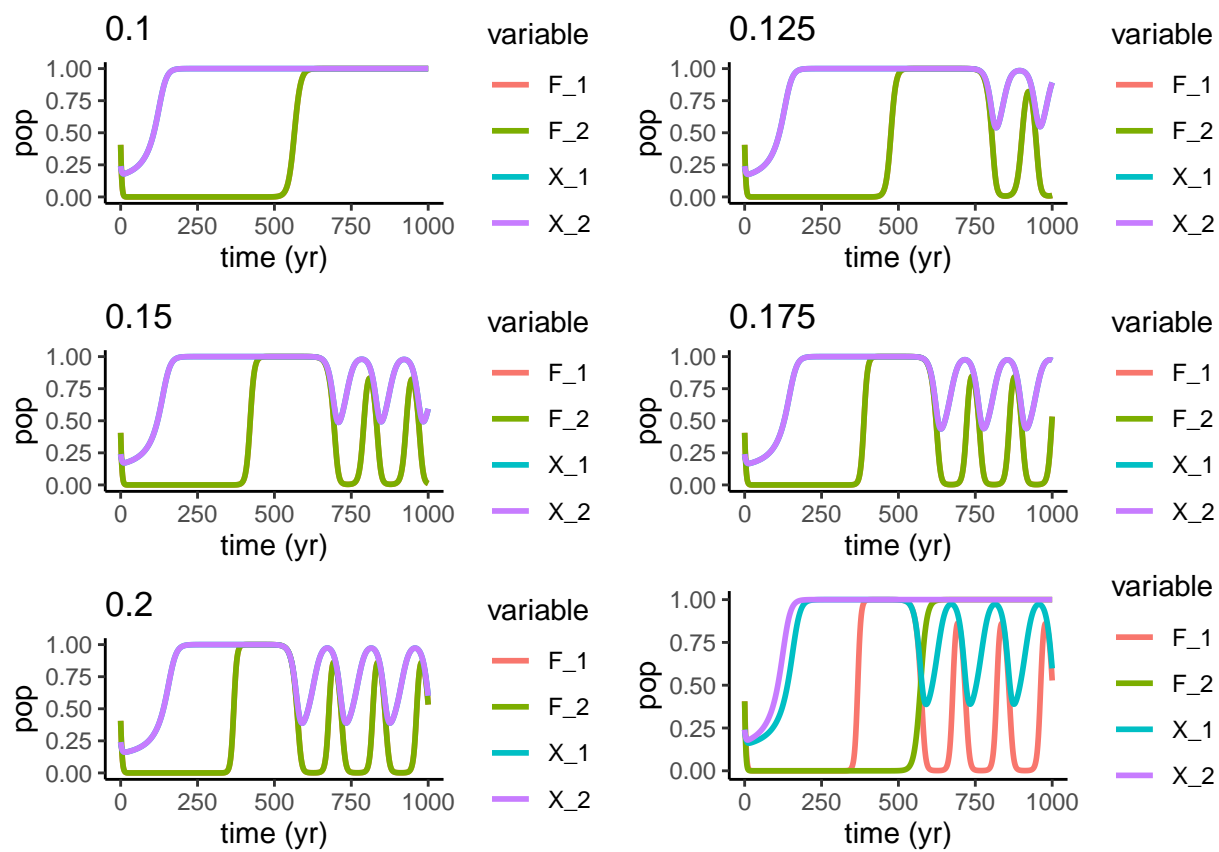


Figure 2: r - Net growth/fecundity, range 0.1 to .2

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## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 2.35693e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 2.35693e-14
##
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##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 2.35693e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 1.92887e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 1.92887e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 1.92887e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 1.57856e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 1.57856e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 1.57856e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 1.57856e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 268.869, R2 = 1.29187e-14
##
## DLSODA- Above warning has been issued I1 times.
##      It will not be issued again for this problem.
## In above message, I1 = 10
##

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## In above message, R1 = 231.59, R2 = 6.48562e-15
##
## DLSODA- Above warning has been issued I1 times.
## It will not be issued again for this problem.
## In above message, I1 = 10
##
## DLSODA- At current T (=R1), MXSTEP (=I1) steps
## taken on this call before reaching TOUT
## In above message, I1 = 5000
##
## In above message, R1 = 231.59
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step
## (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 2.81674e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step
## (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 2.81674e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step
## (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 2.33321e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step
## (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 2.33321e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step
## (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 2.33321e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step
## (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 1.86517e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step
## (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 1.86517e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step
## (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 1.54499e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
## such that in the machine,  $T + H = T$  on the next step

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##      (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 1.54499e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine, T + H = T on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 273.892, R2 = 1.54499e-14
##
## DLSODA- Above warning has been issued I1 times.
##      It will not be issued again for this problem.
## In above message, I1 = 10
##
## DLSODA- At current T (=R1), MXSTEP (=I1) steps
##      taken on this call before reaching TOUT
## In above message, I1 = 5000
##
## In above message, R1 = 273.892
##

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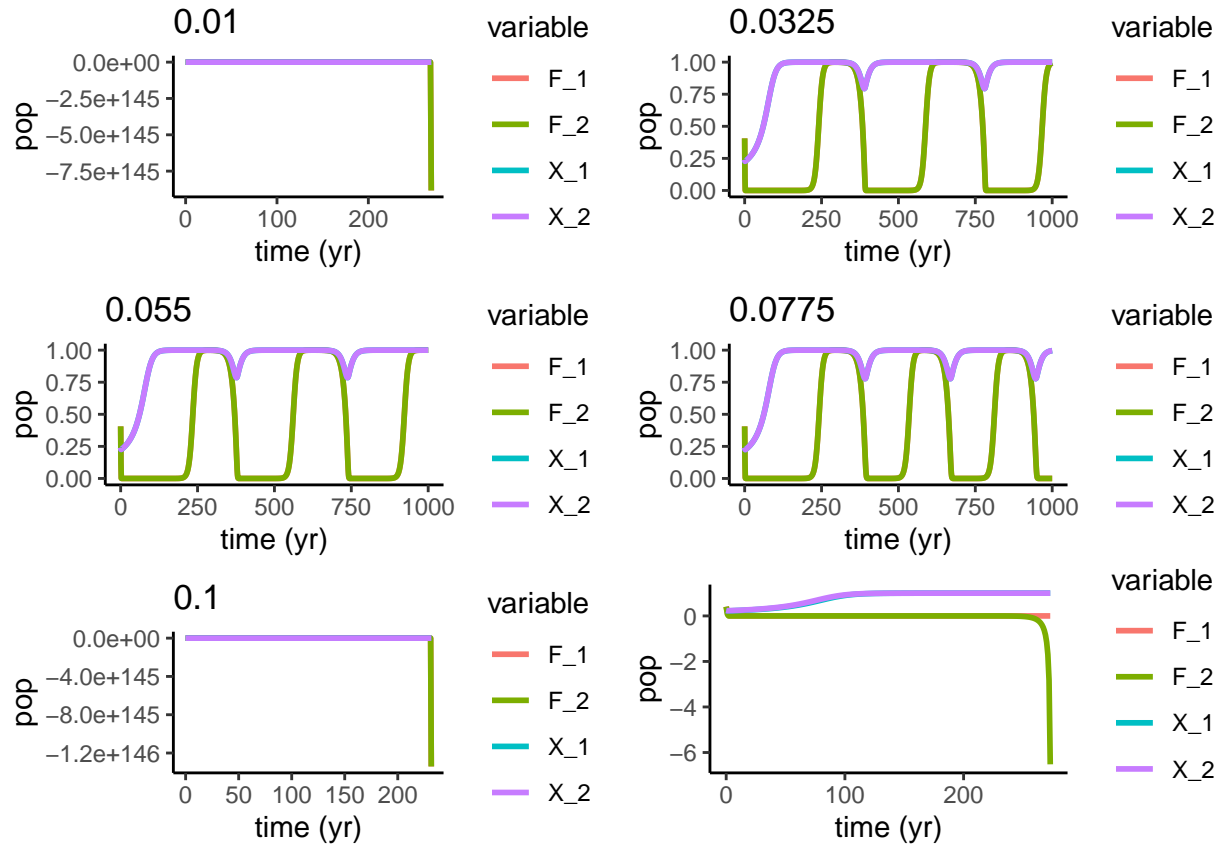


Figure 3: s - supply and demand, range 0.1 to 1


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## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 2.70569e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 2.70569e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 2.70569e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 2.16293e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 2.16293e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 1.79163e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 1.79163e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 1.79163e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 1.43223e-14
##
## DLSODA- Warning..Internal T (=R1) and H (=R2) are
##      such that in the machine,  $T + H = T$  on the next step
##      (H = step size). Solver will continue anyway.
## In above message, R1 = 371.091, R2 = 1.43223e-14
##
## DLSODA- Above warning has been issued I1 times.
##      It will not be issued again for this problem.
## In above message, I1 = 10
##

```

```

## DLSODA- At current T (=R1), MXSTEP (=I1) steps
##         taken on this call before reaching TOUT
## In above message, I1 = 5000
##
## In above message, R1 = 371.091
##

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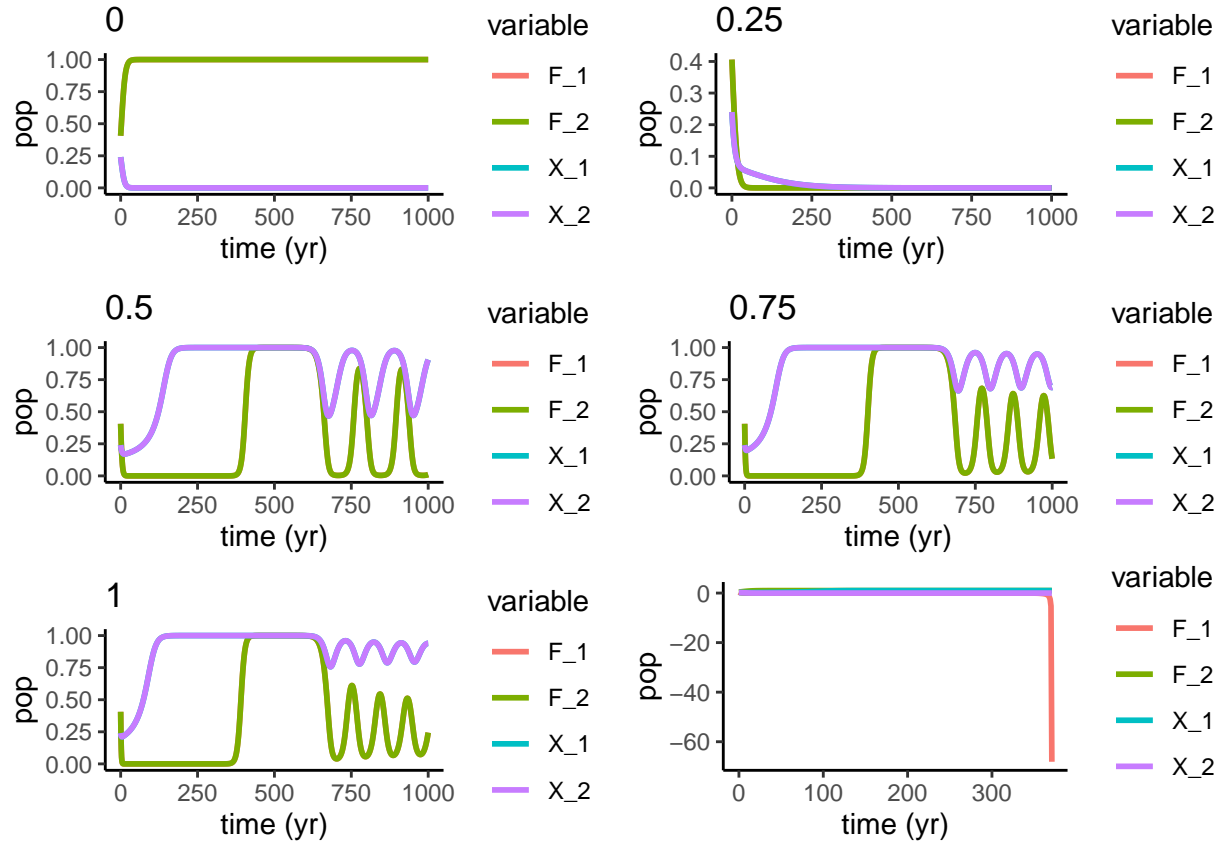


Figure 4: h - Harvesting efficiency, range 0 to 0.1. Note, default is .075

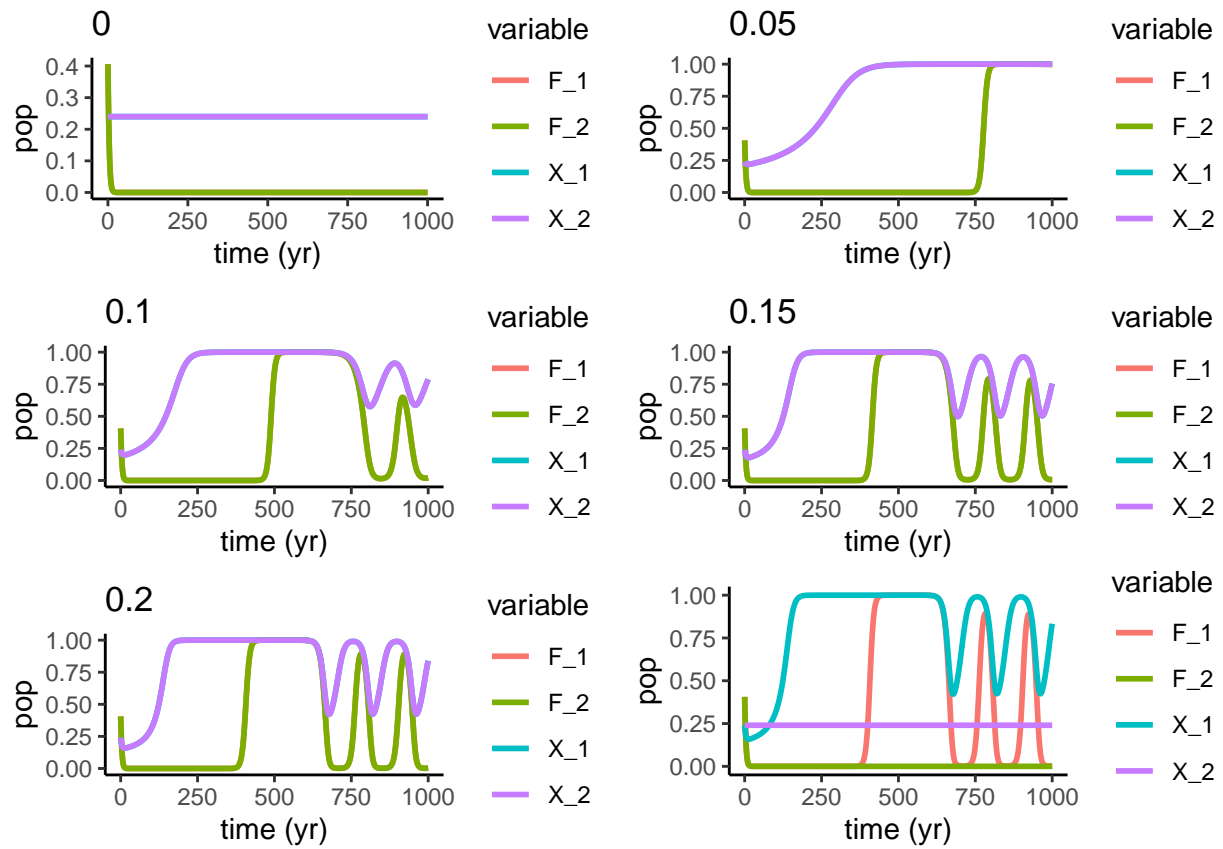


Figure 5: K - Social learning rate 0 to 1

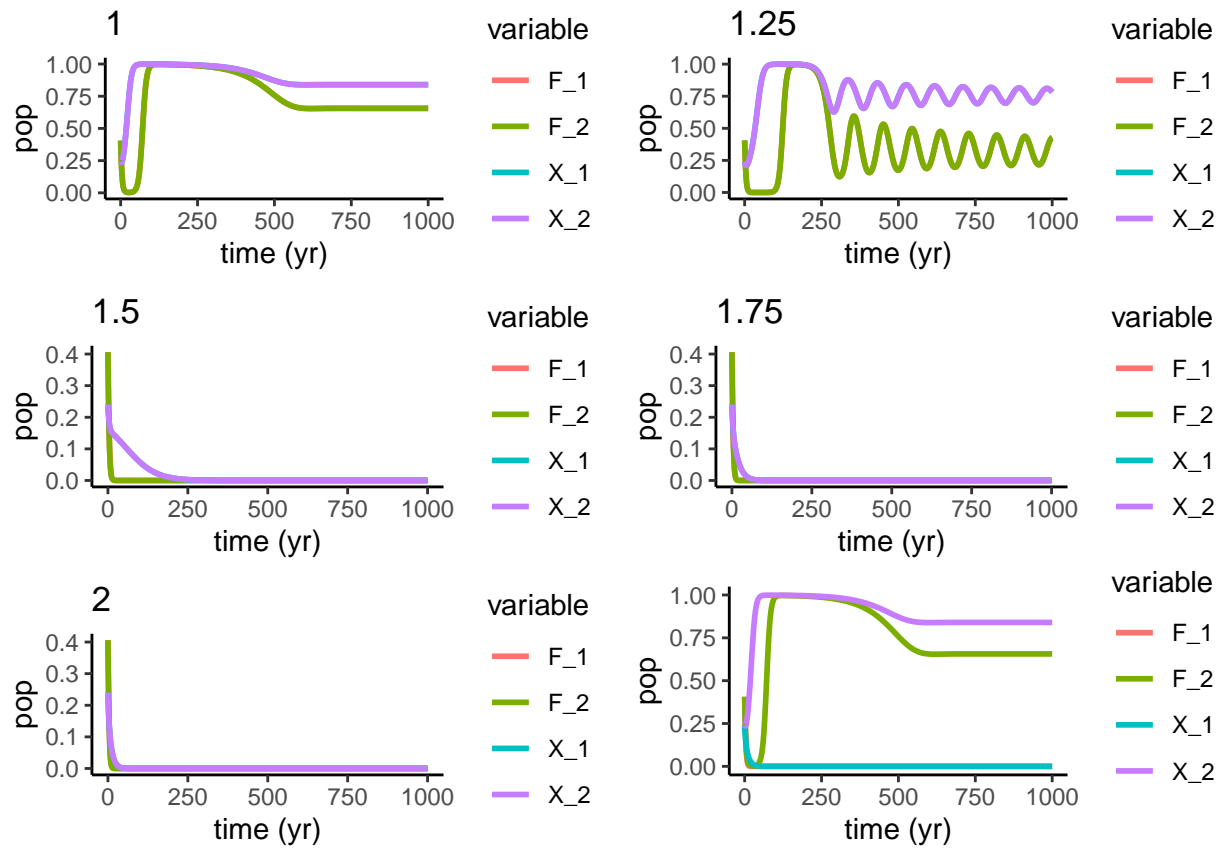


Figure 6: w - conservation costs

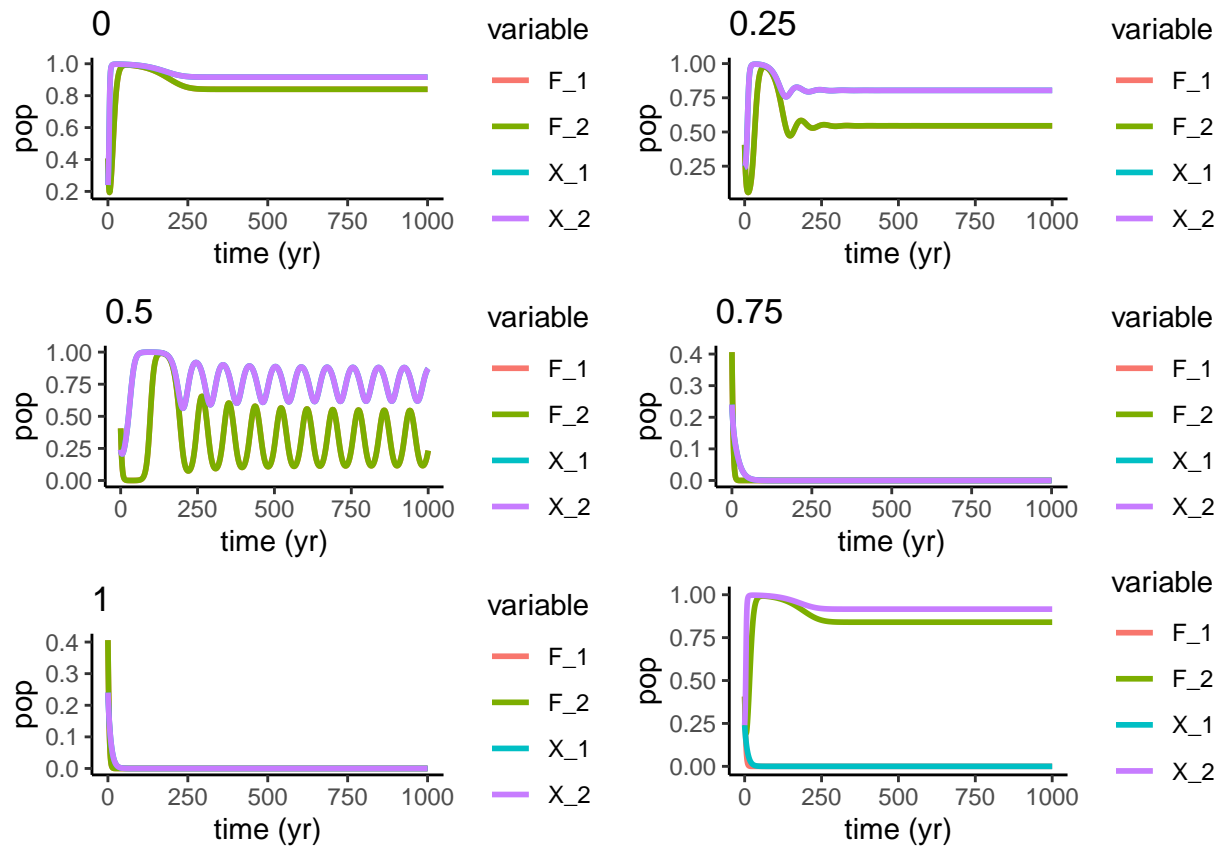


Figure 7: c - rarity valuation param

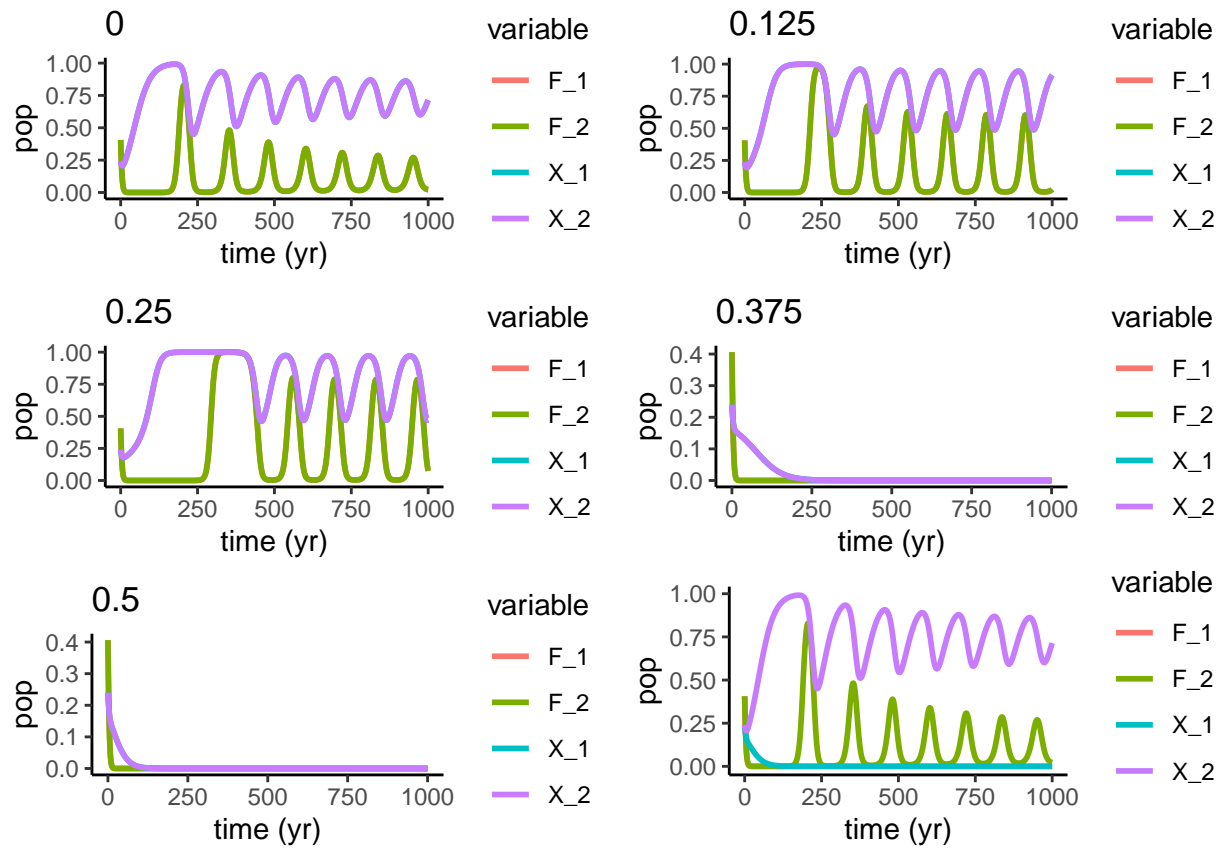


Figure 8: d - social norm strength

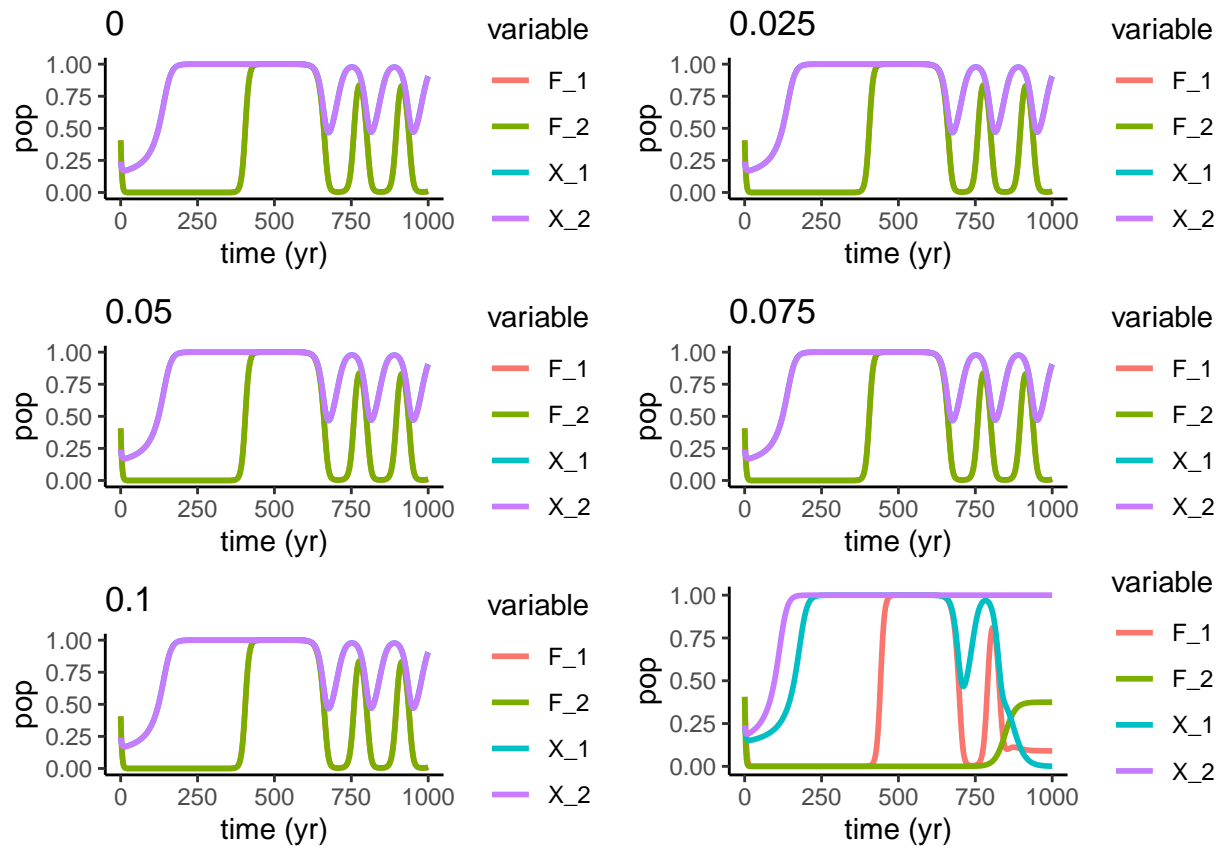


Figure 9: i - fish immigration

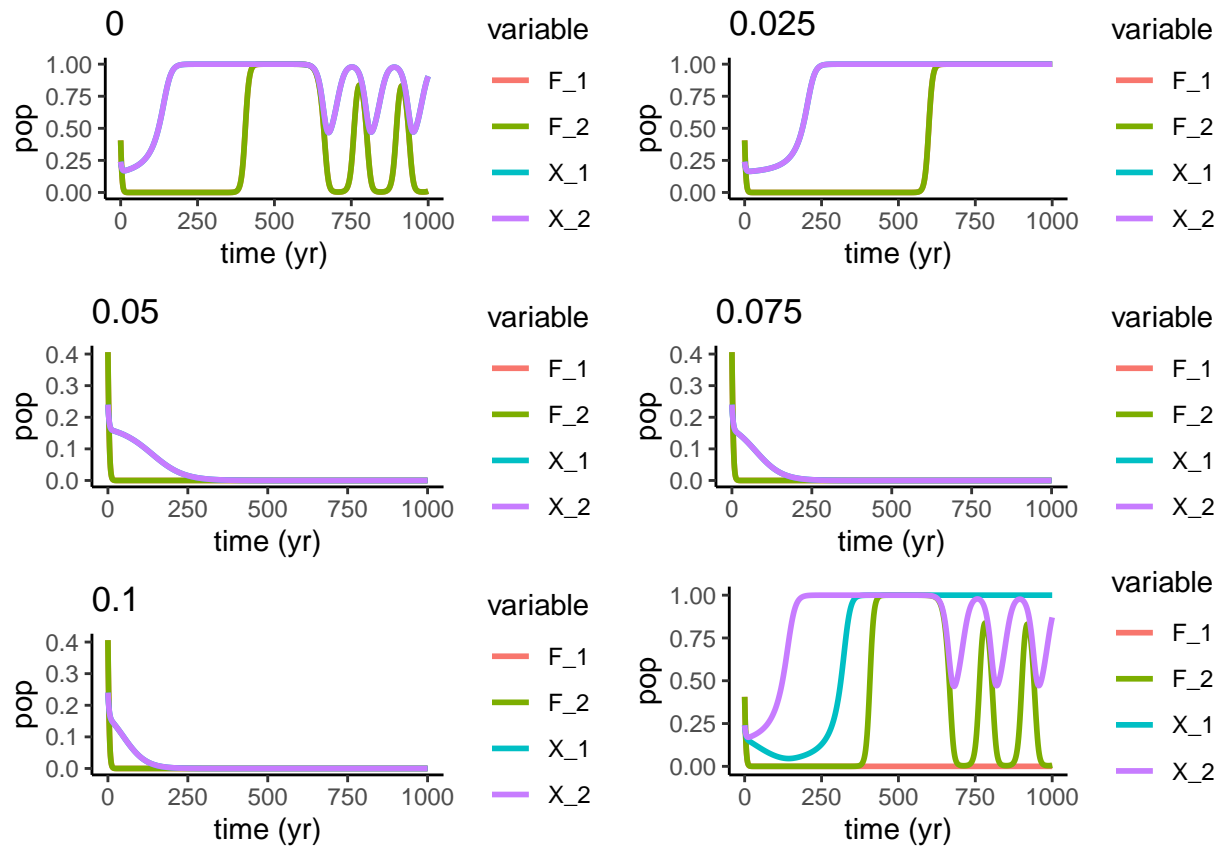


Figure 10: ρ - Population influence on the other

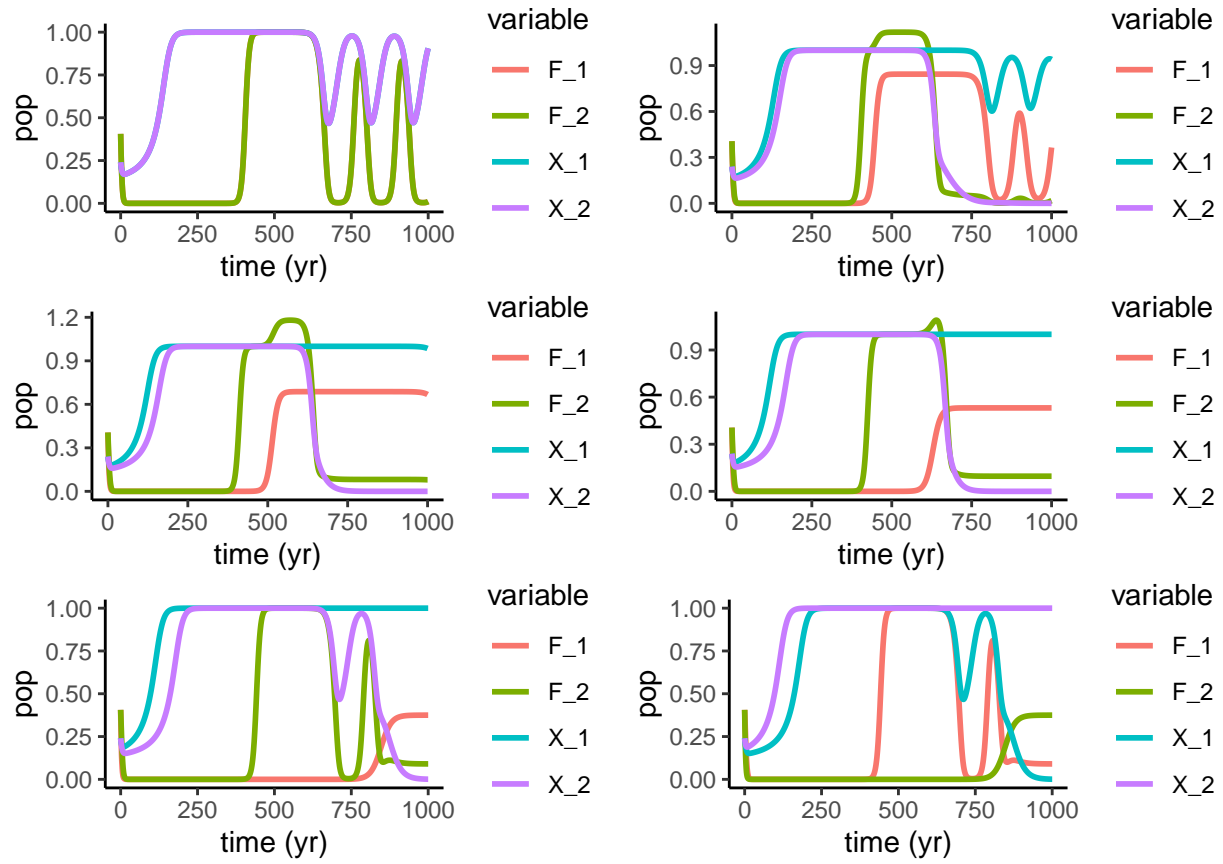


Figure 11: increasing only the i_2 parameter

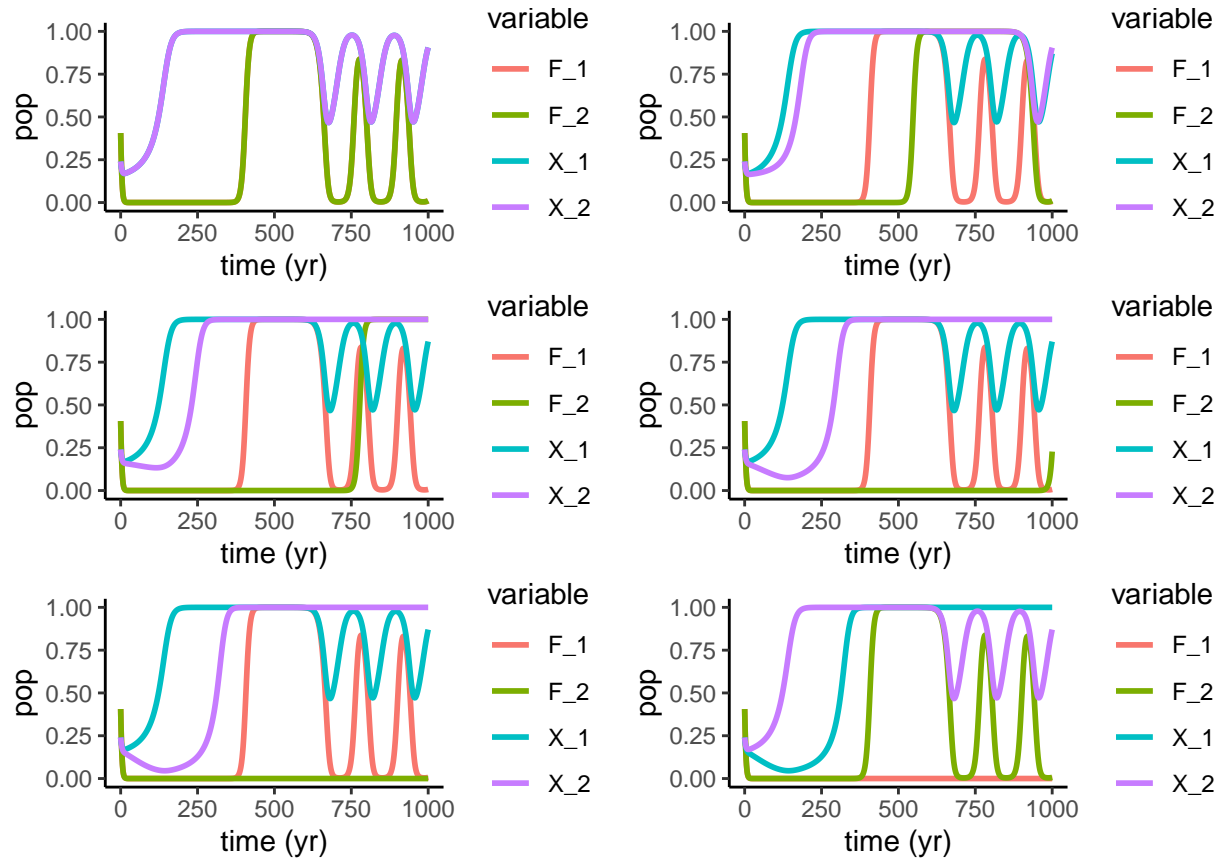


Figure 12: increasing only the rho2 parameter