

BauchModel_3

Sophie Wulfinf

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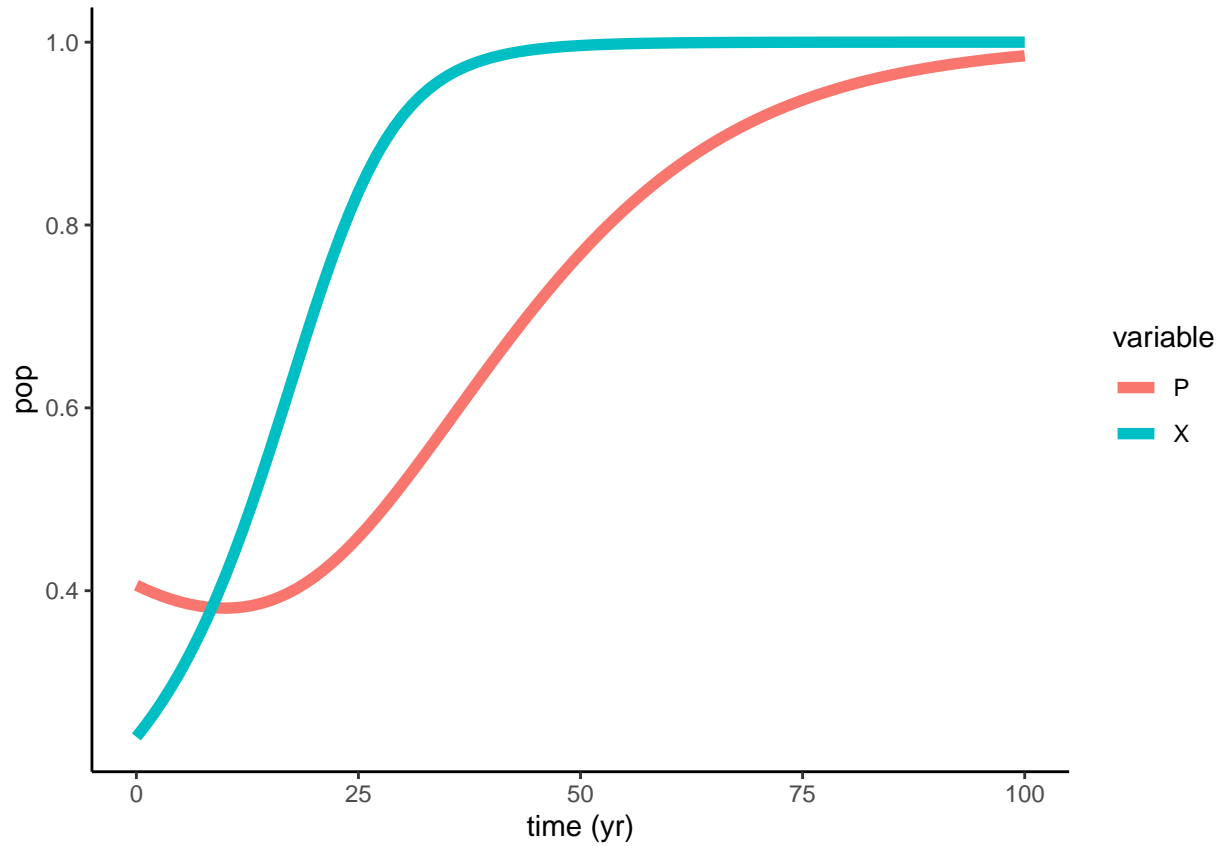


Figure 1: Original Bauch Model

See derivation in notes but this is the new equations (still unsure about interaction terms):

$$\frac{dP_1}{dt} = r_1 P_1 (1 - P_1) - \frac{h_1 * P_1 (1 - X_1)}{P_1 + s_1} + \rho_1 * \frac{P_2 - P_1}{2}$$

$$\frac{dX_1}{dt} = k_1 X_1 (1 - X_1) \left[\frac{1}{P_1 + c_1} - w_1 + d_1 (2X_1 - 1) \right] + k_2 X_1 (1 - X_2) \left[\frac{1}{P_1 + c_1} - w_1 + d_2 (2X_2 - 1) \right]$$

$$\frac{dP_2}{dt} = r_2 P_2 (1 - P_2) - \frac{h_2 * P_2 (1 - X_2)}{P_2 + s_2} + \rho_2 * \frac{P_1 - P_2}{2}$$

$$\frac{dX_2}{dt} = k_2 X_2 (1 - X_2) \left[\frac{1}{P_2 + c_2} - w_2 + d_2 (2X_2 - 1) \right] + k_1 X_2 (1 - X_1) \left[\frac{1}{P_2 + c_2} - w_2 + d_1 (2X_1 - 1) \right]$$

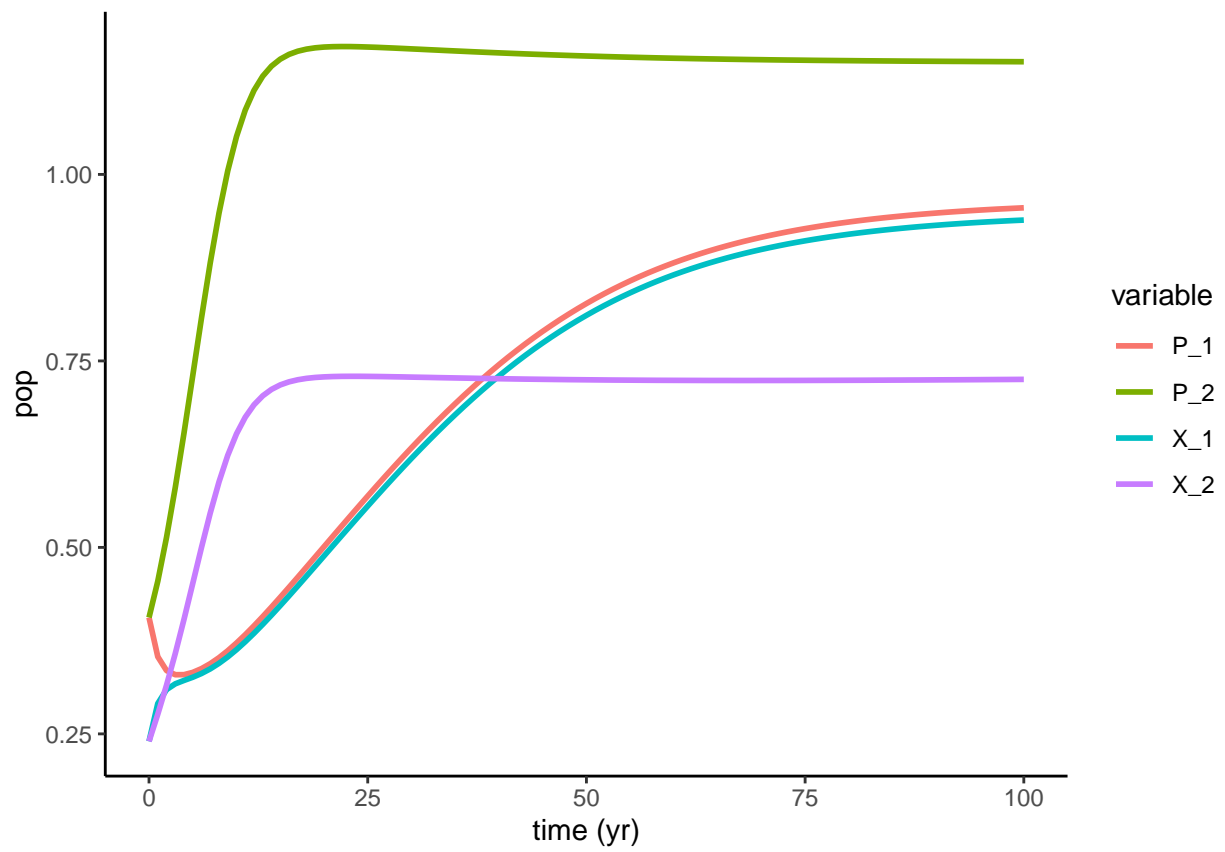


Figure 2: New Model with default paramters

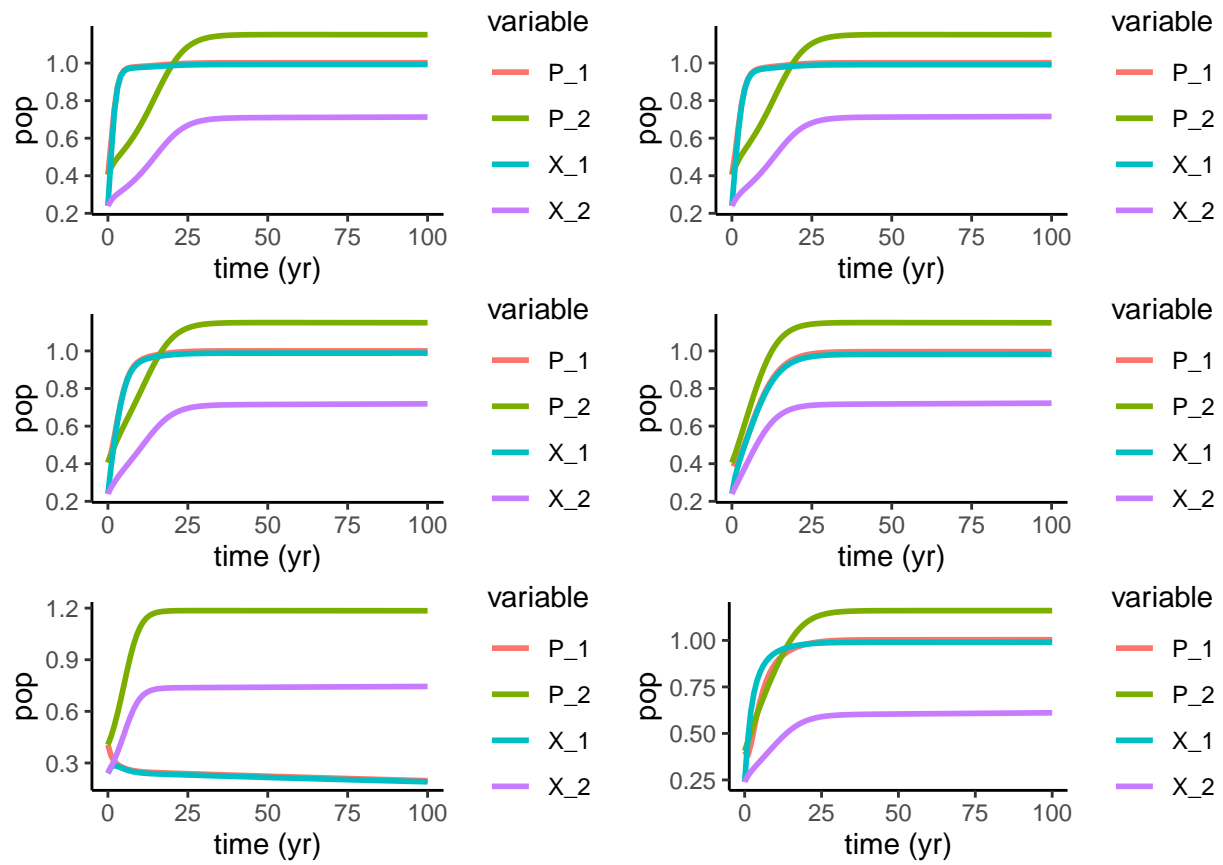


Figure 3: R - Net growth/fecundity, range 0 to 1

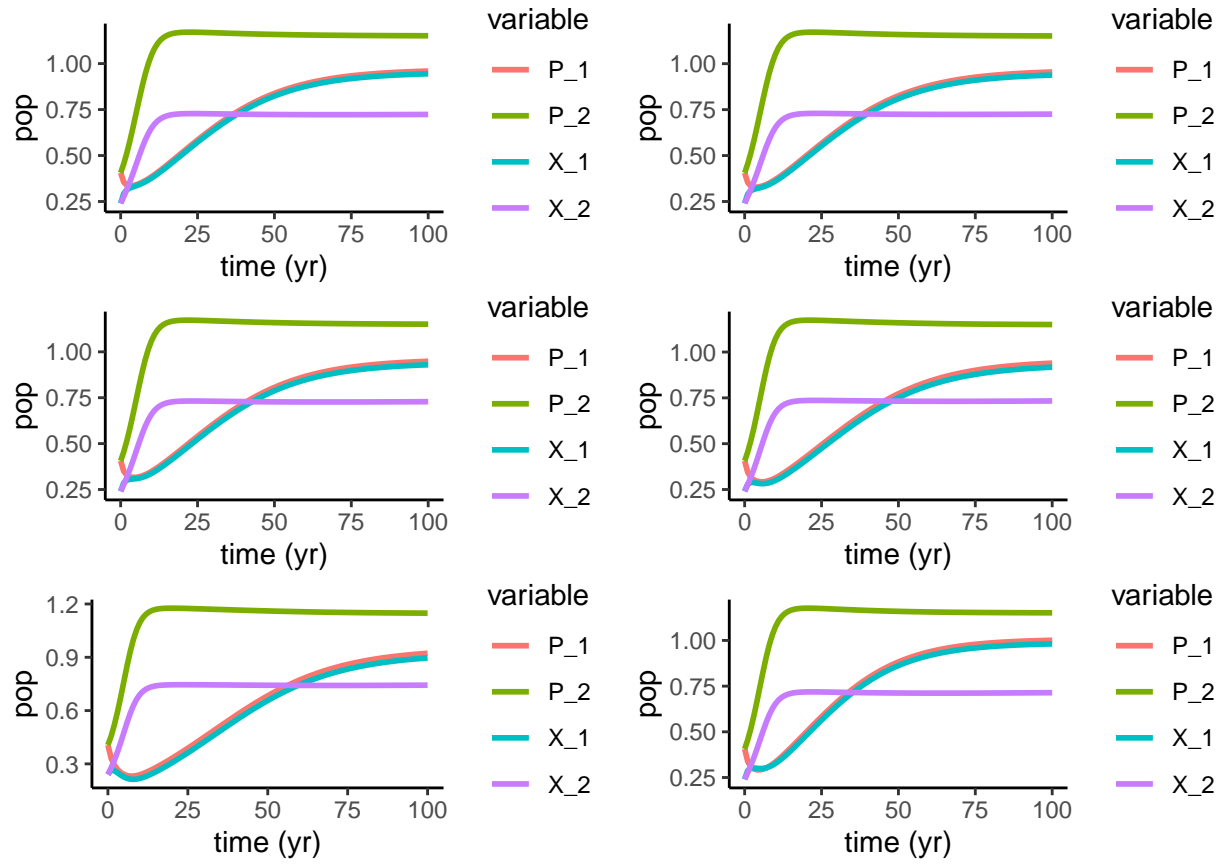


Figure 4: S - supply and demand, range 0.1 to 1

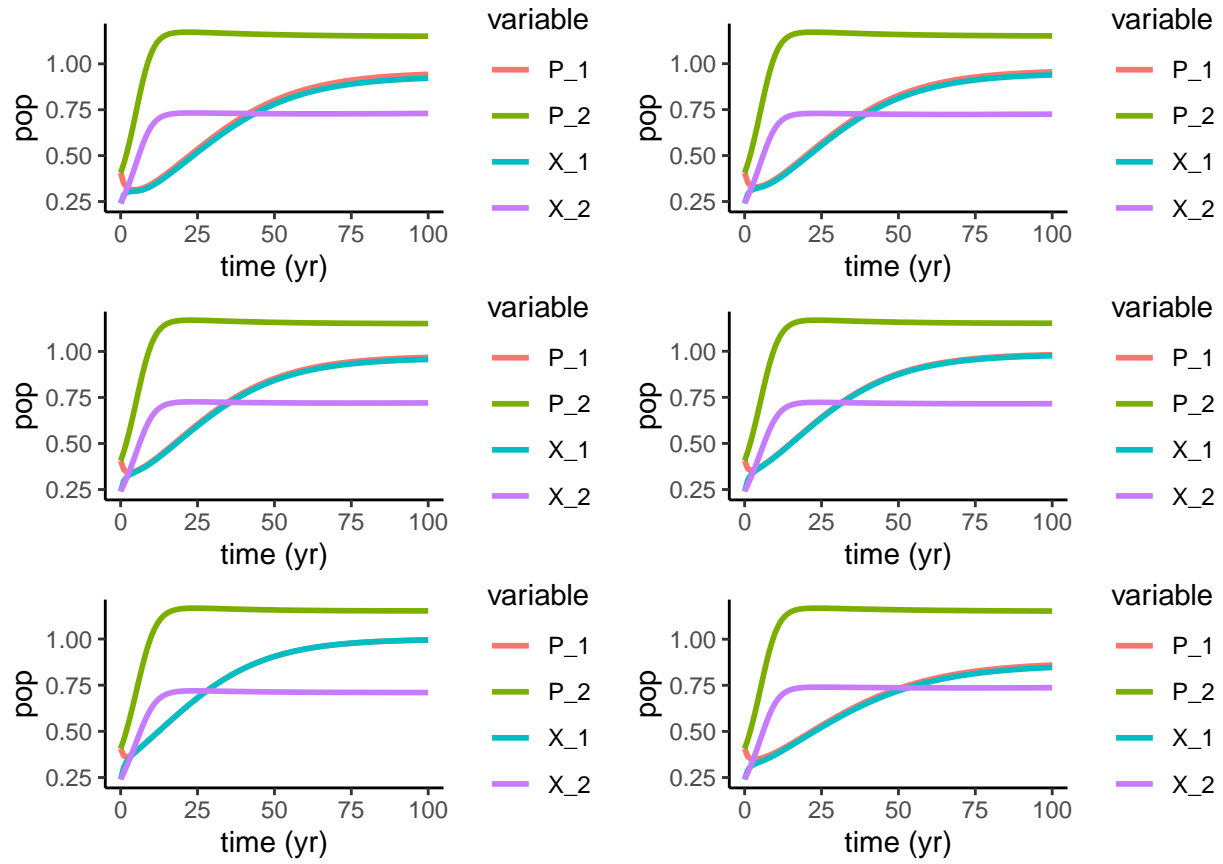


Figure 5: h - Harvesting efficiency, range 0 to 0.1. Note, default is .075

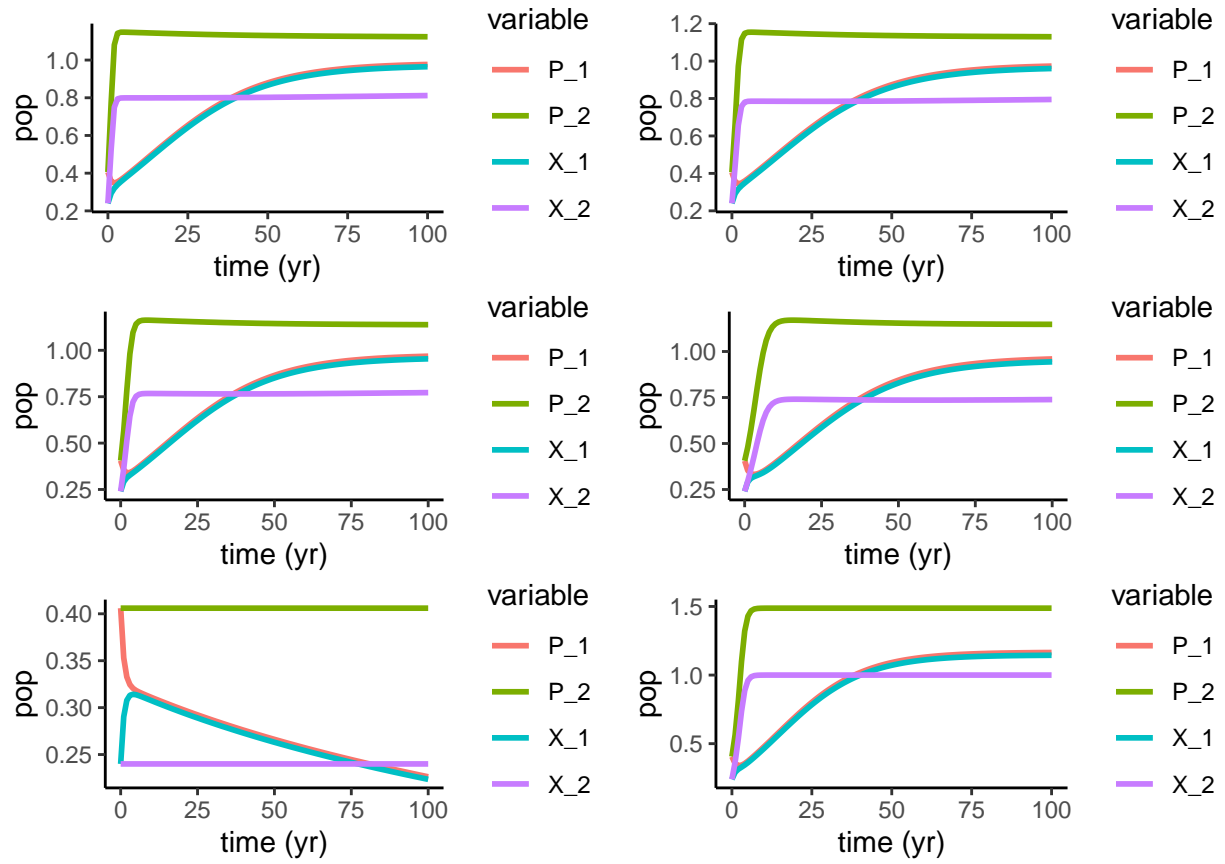


Figure 6: K - Social learning rate 0 to 1

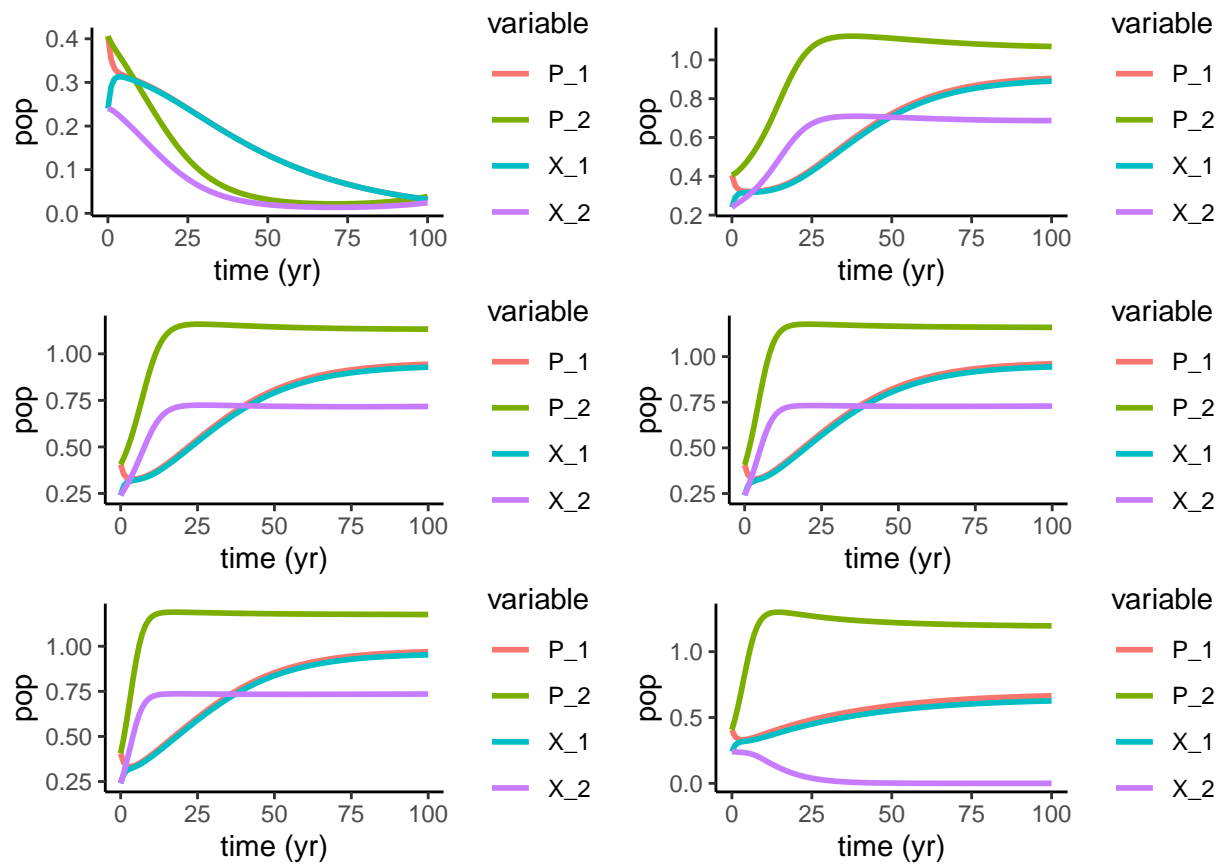


Figure 7: w - conservation costs

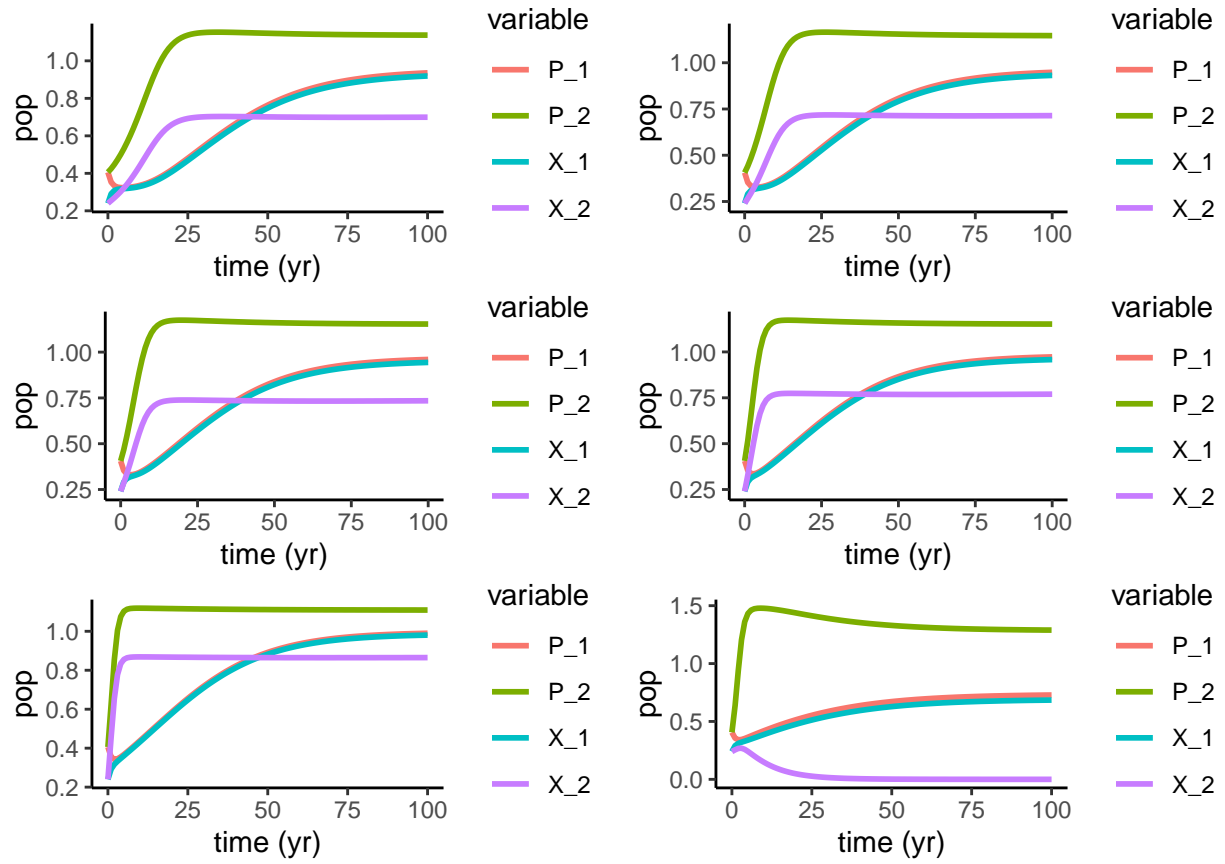


Figure 8: c - rarity valuation param

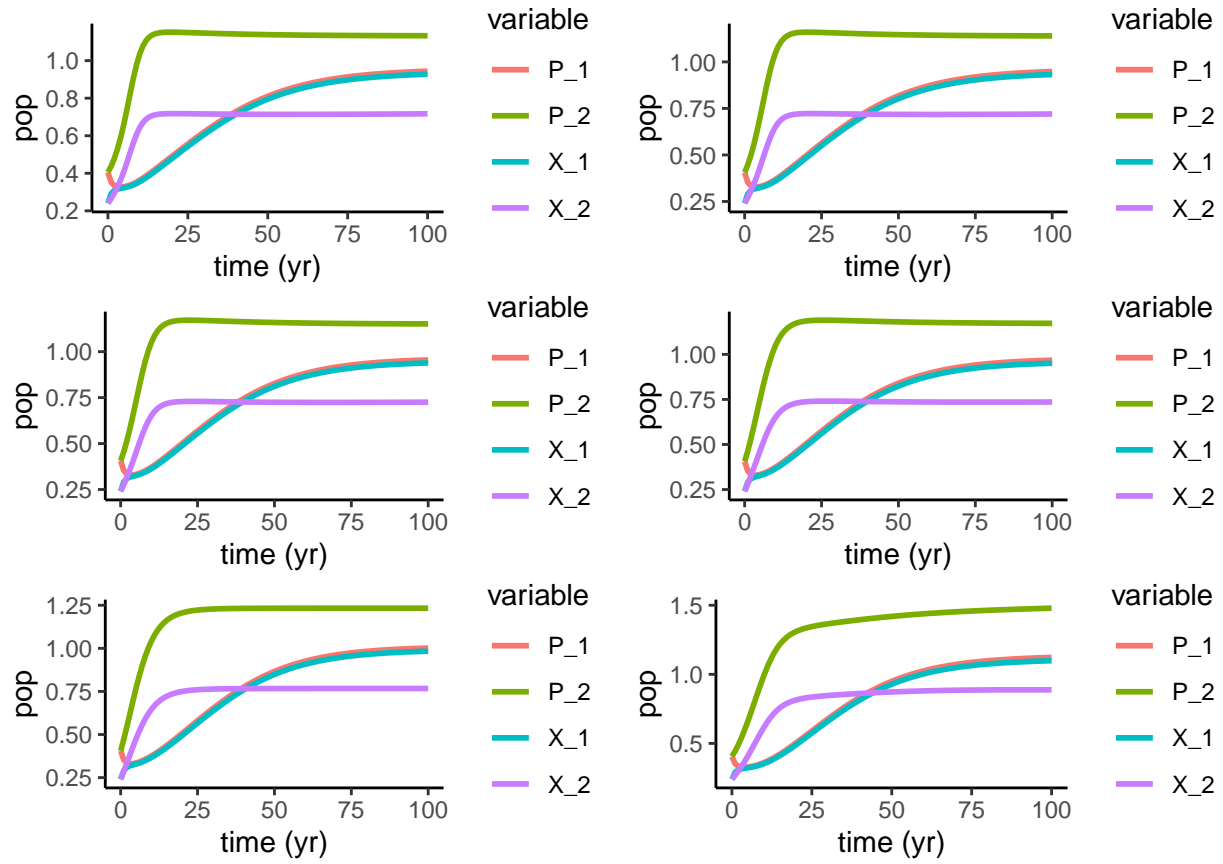


Figure 9: d - social norm strength

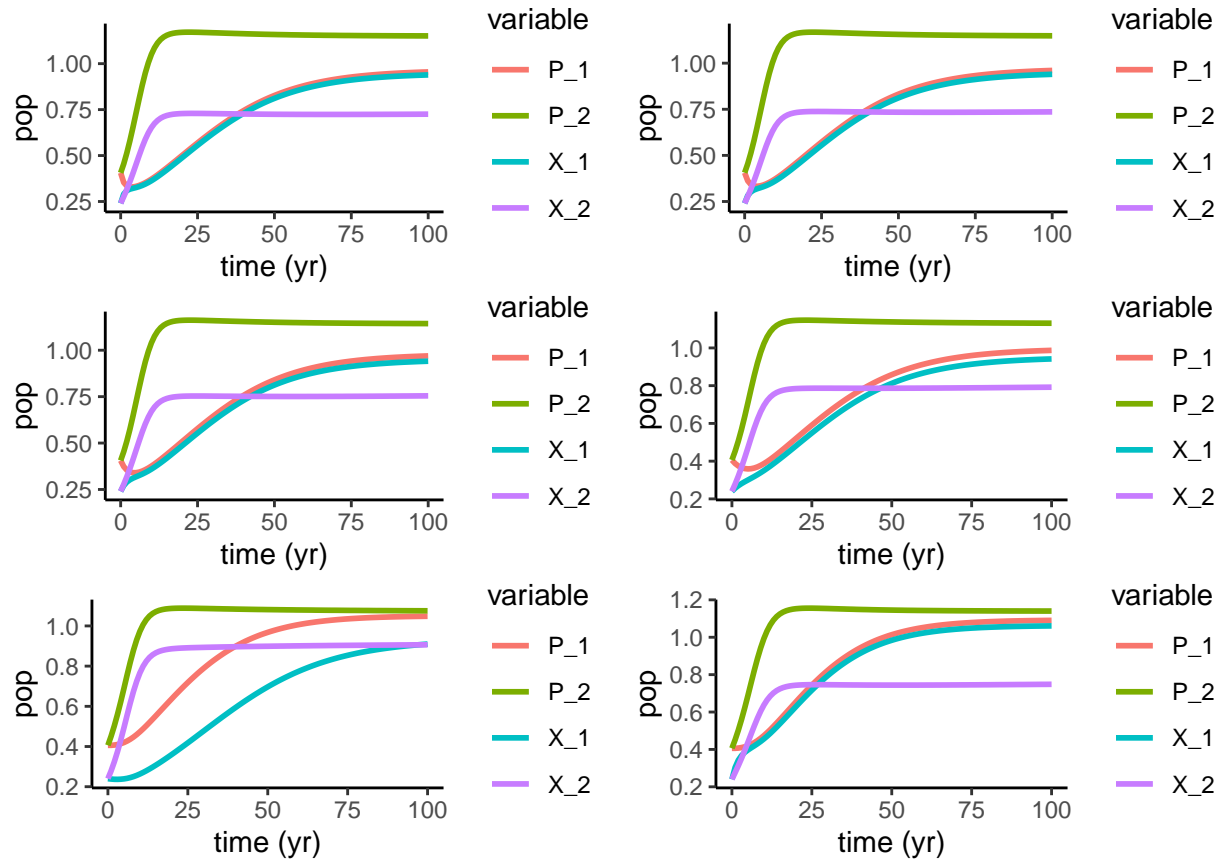


Figure 10: roh - fish diffusion

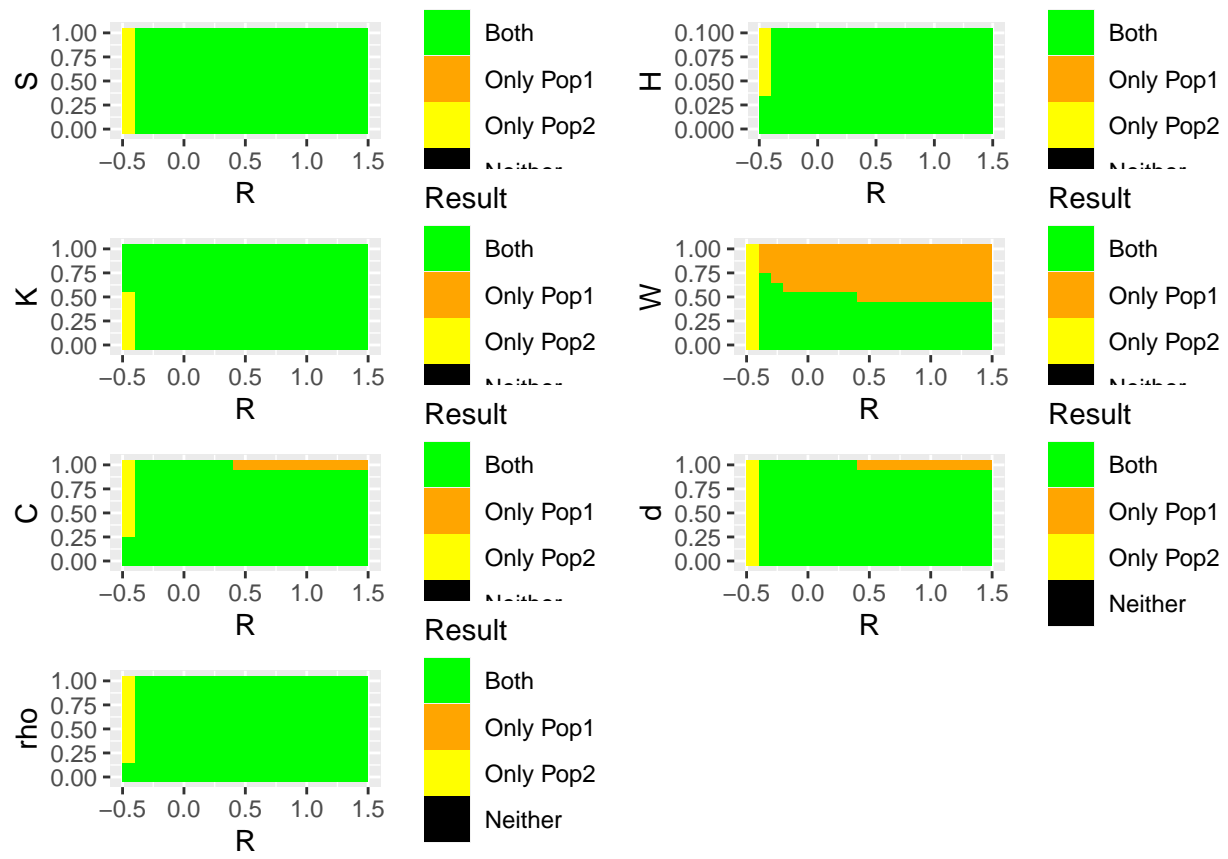


Figure 11: R parameter planes

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## DLSODA- At current T (=R1), MXSTEP (=I1) steps
##         taken on this call before reaching TOUT
## In above message, I1 = 5000
##
## In above message, R1 = 19.1815
##

```

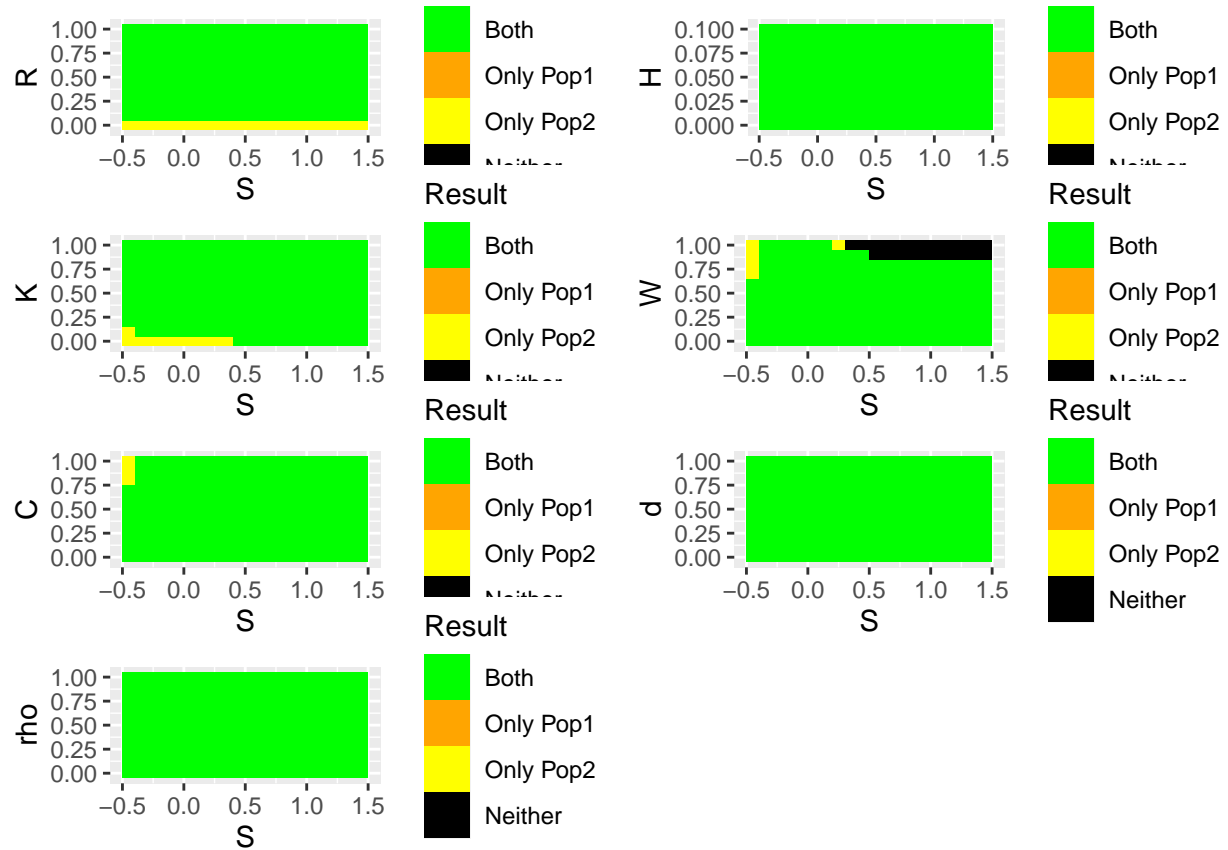


Figure 12: S parameter planes

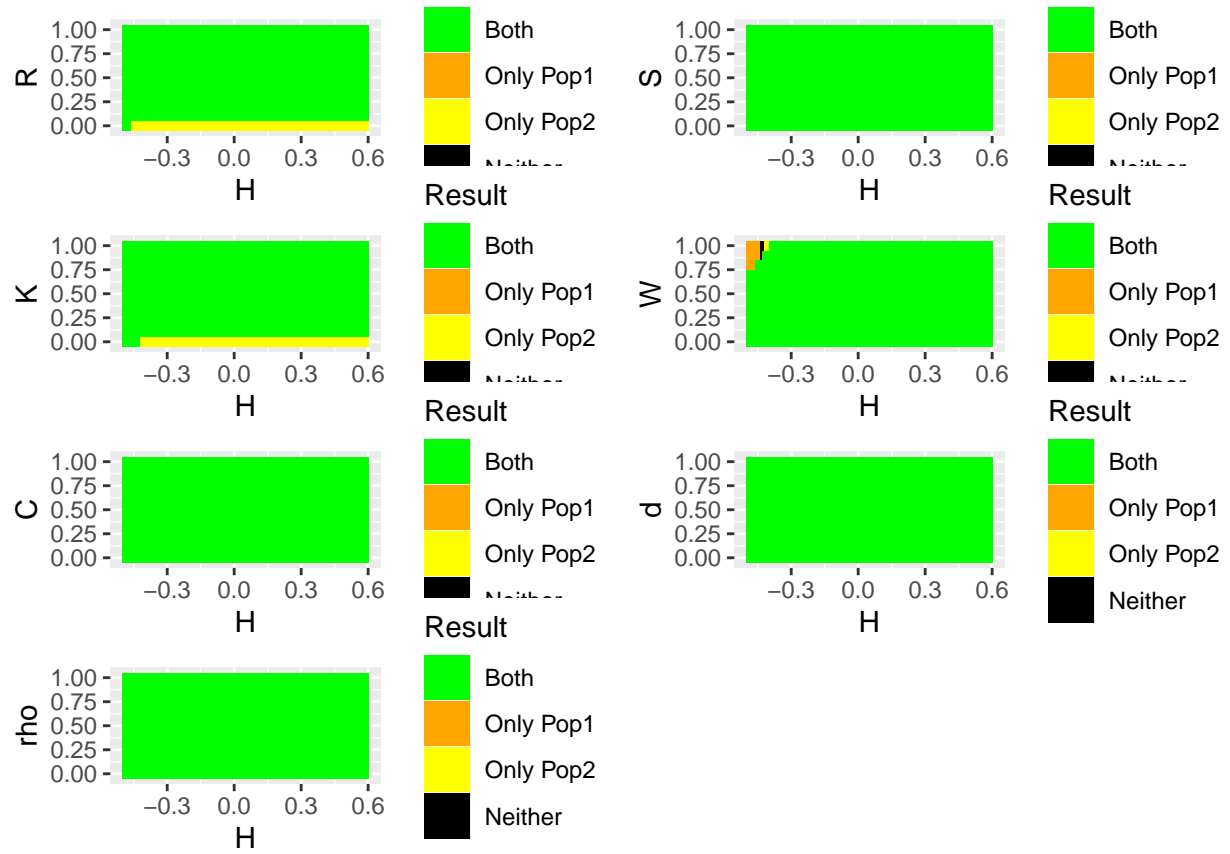


Figure 13: h parameter planes

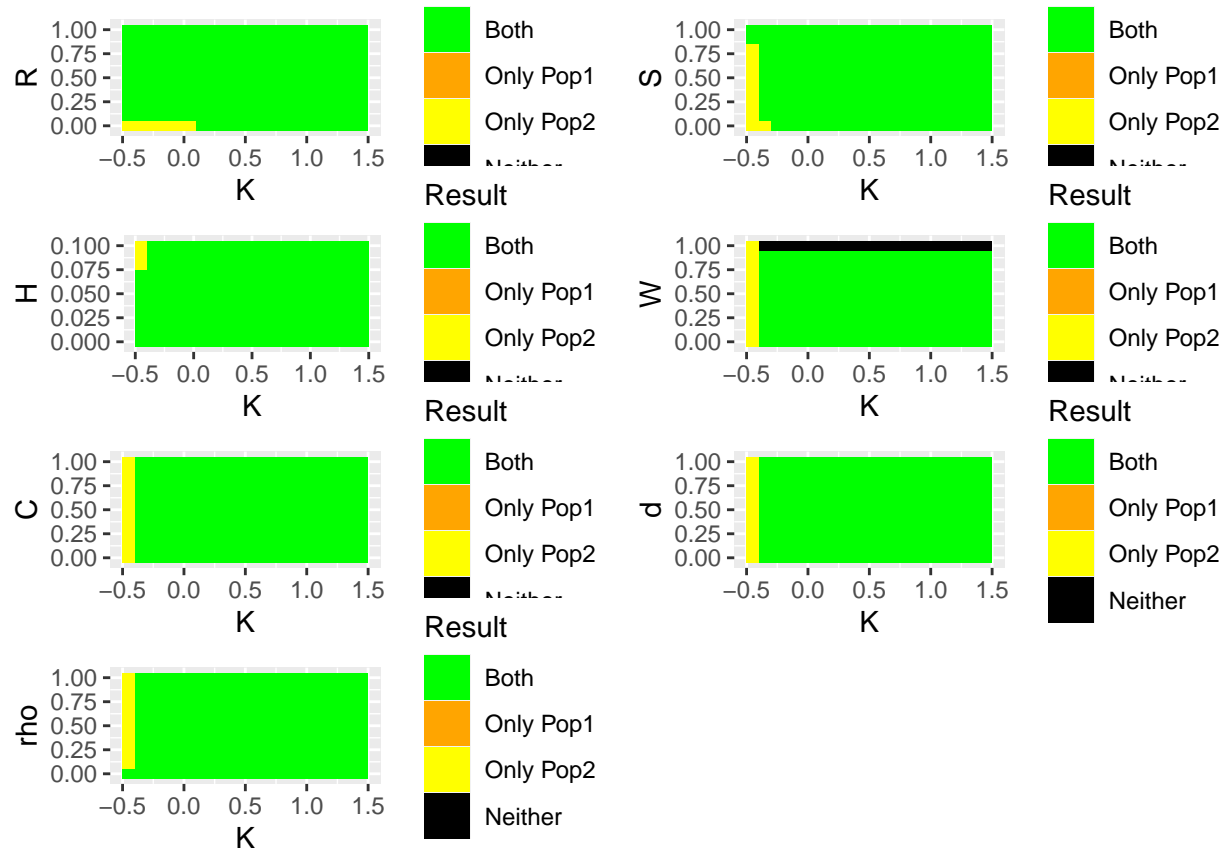


Figure 14: K parameter planes ranging from 0-1

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## DLSODA- At current T (=R1), MXSTEP (=I1) steps
##         taken on this call before reaching TOUT
## In above message, I1 = 5000
##
## In above message, R1 = 19.1815
##

```

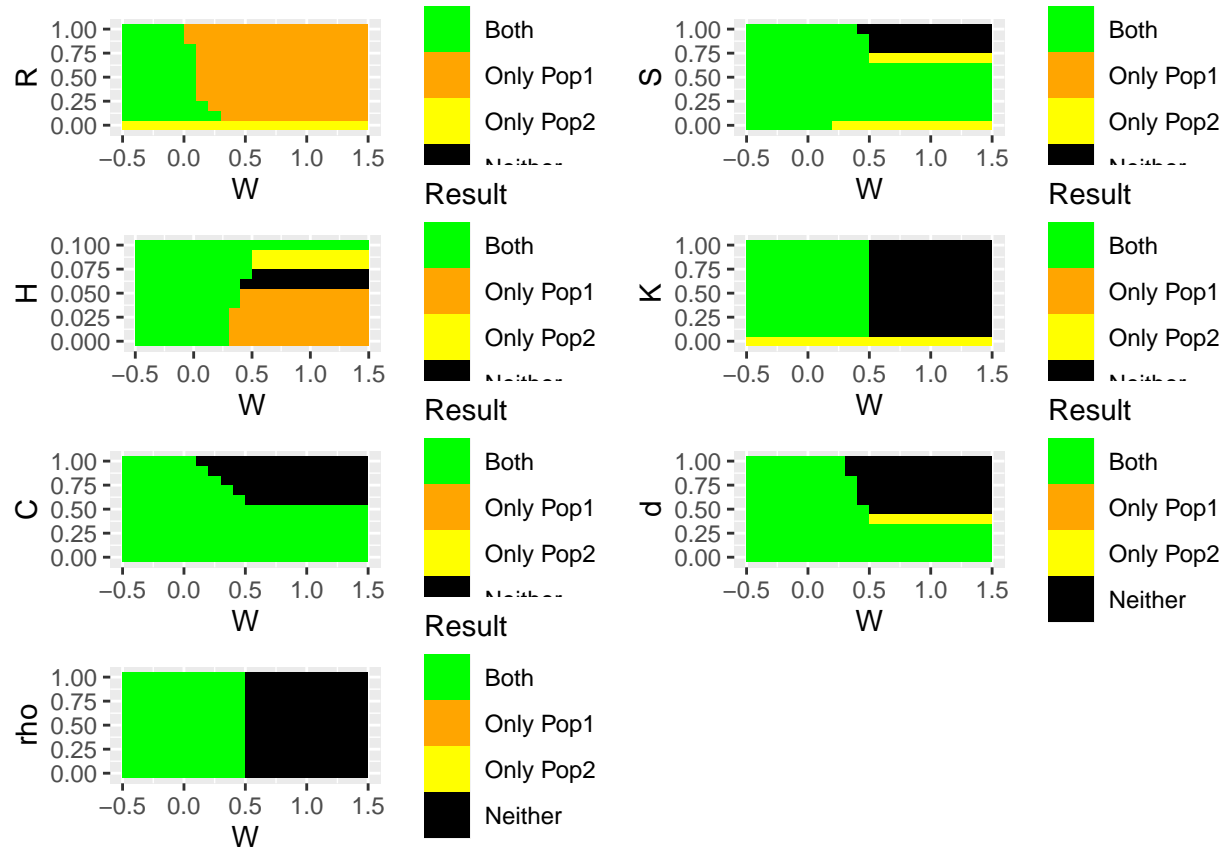


Figure 15: w parameter planes

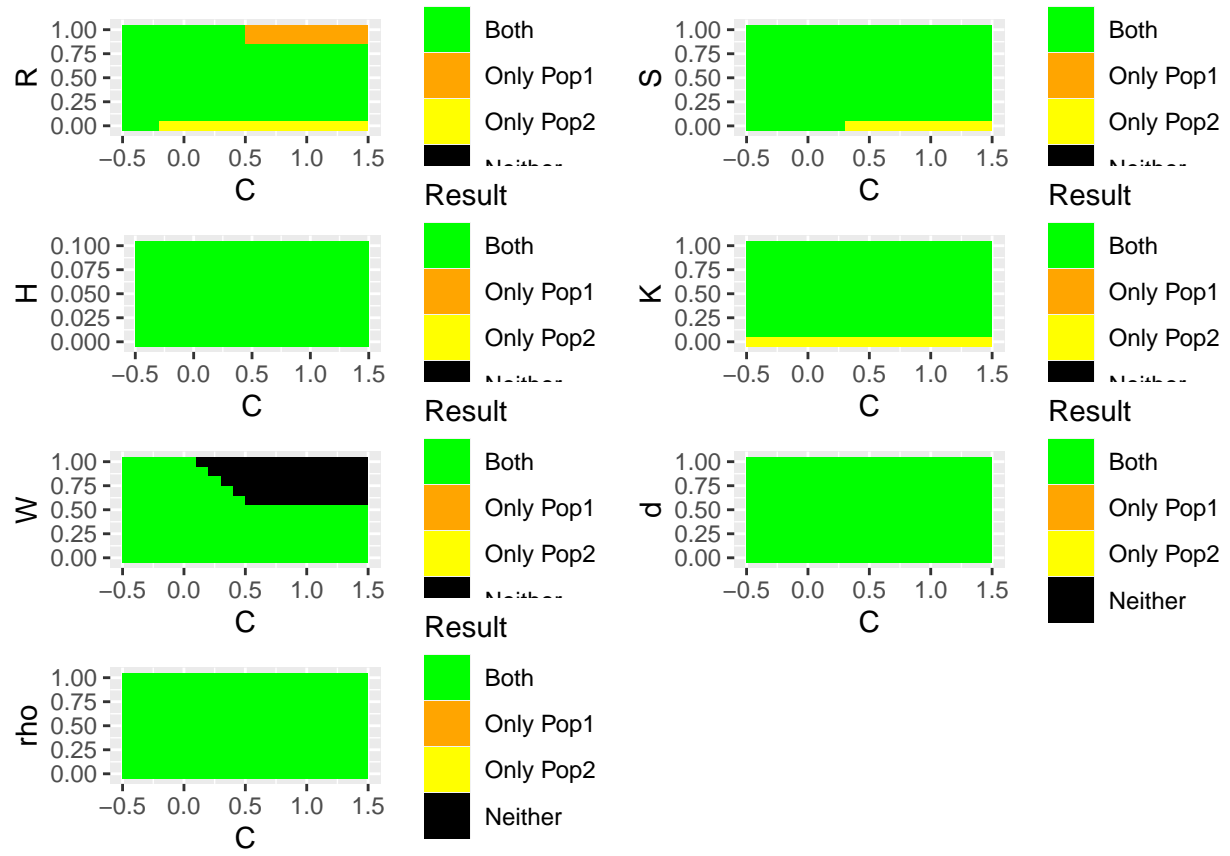


Figure 16: c parameter planes

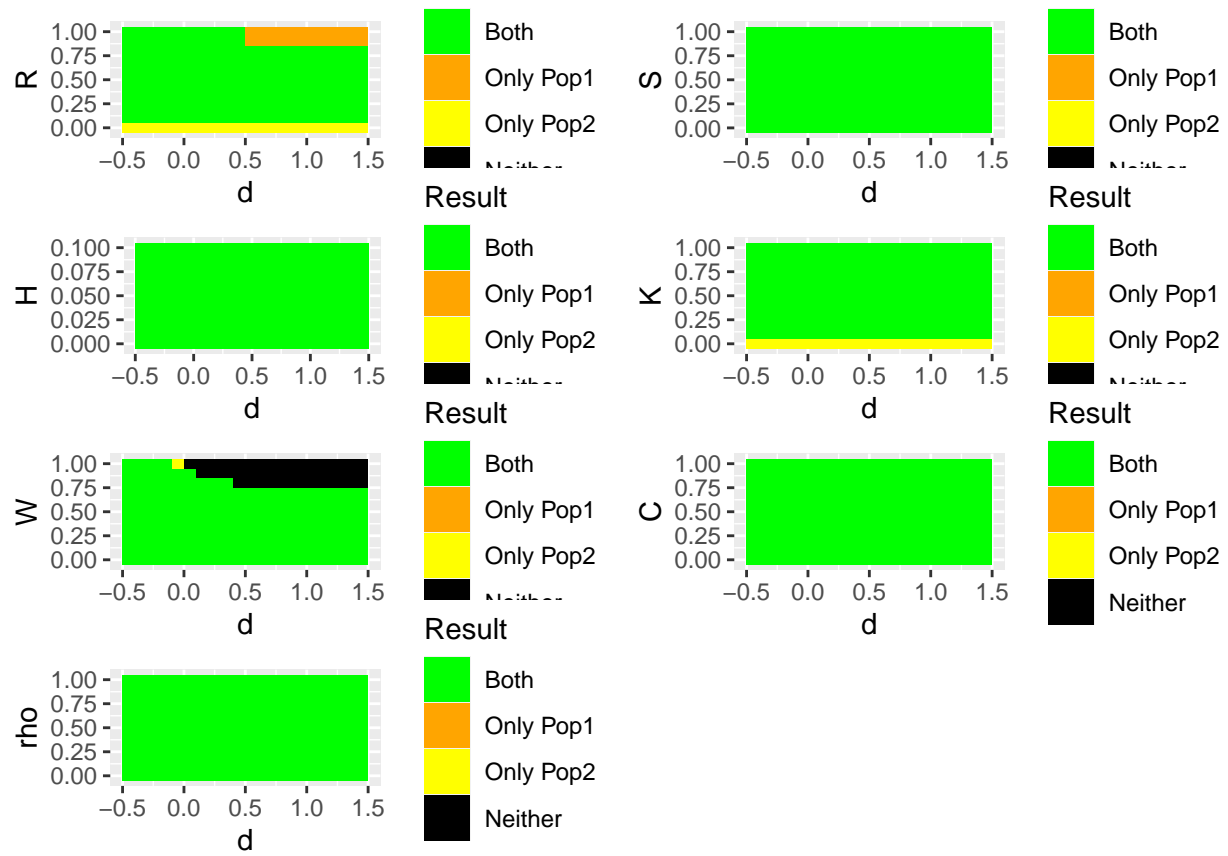


Figure 17: d parameter planes

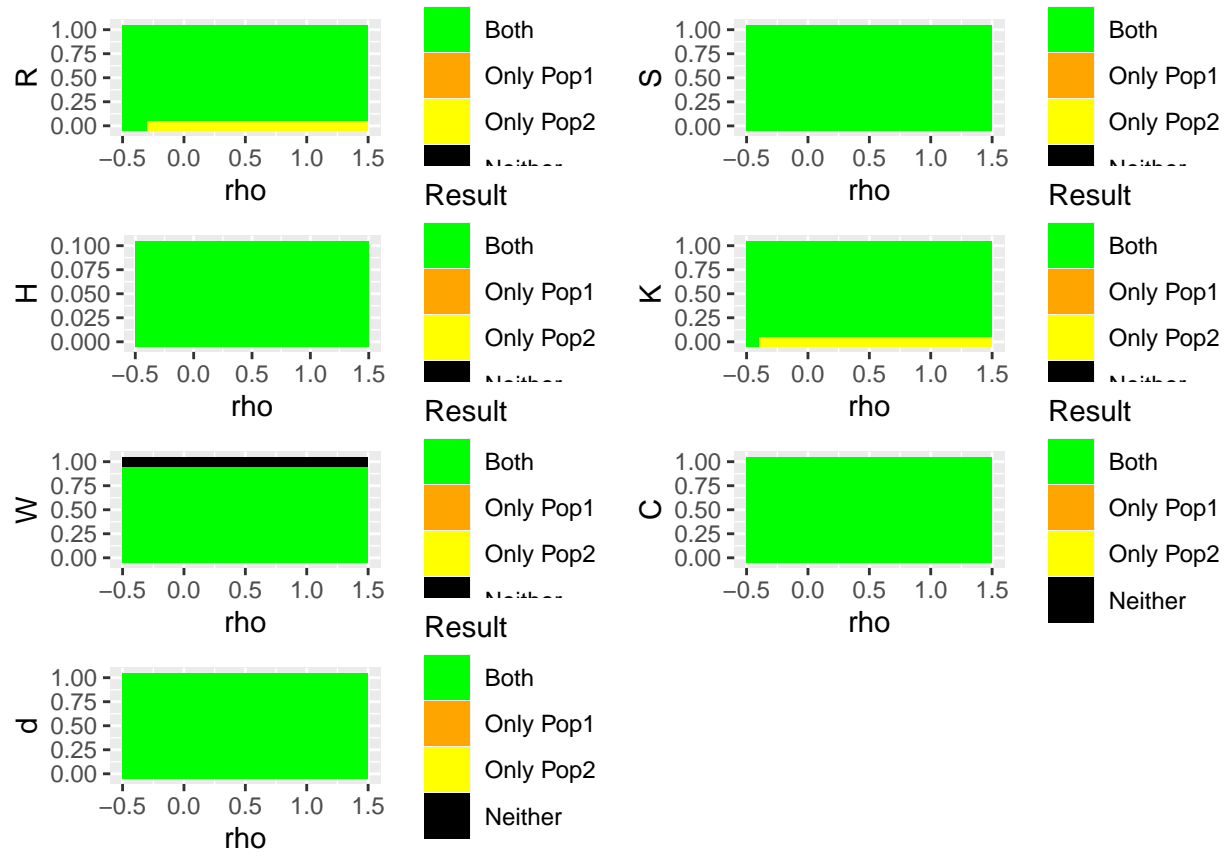


Figure 18: roh parameter planes

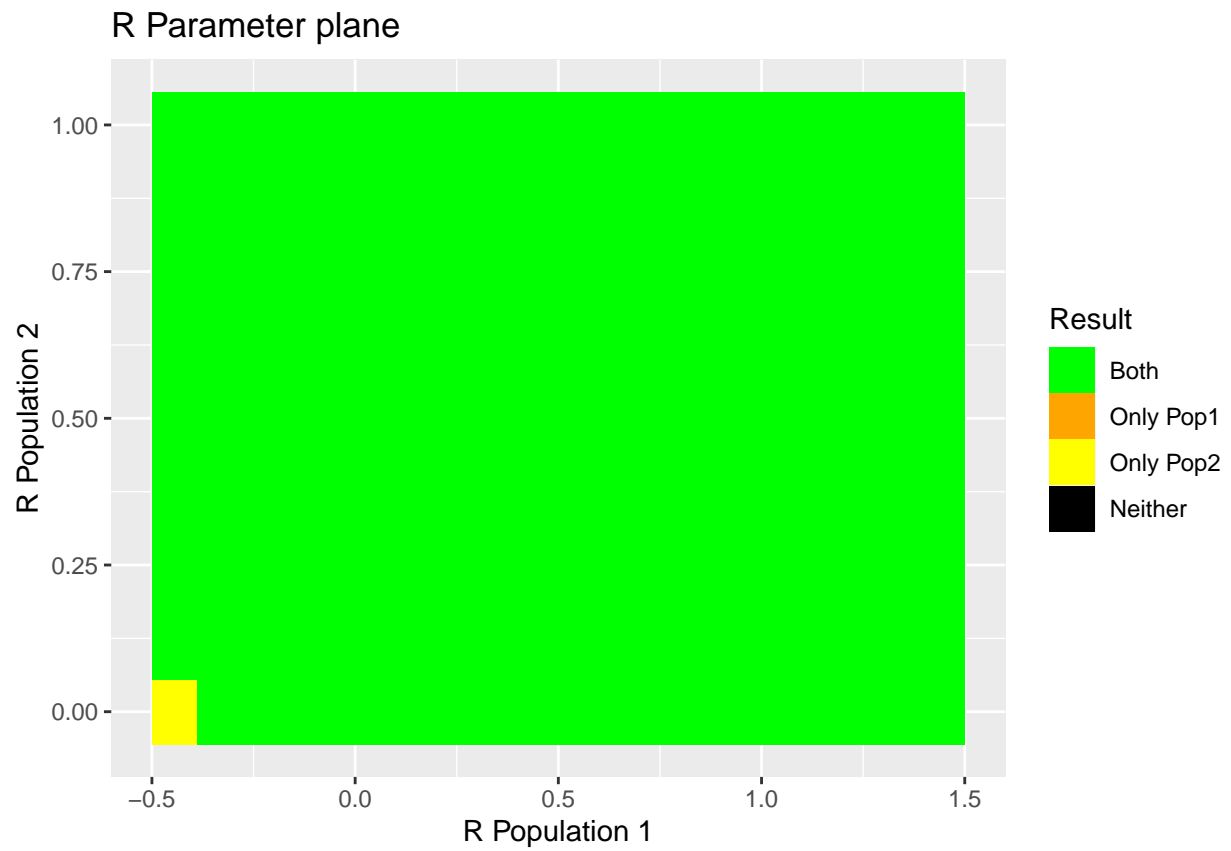


Figure 19: r population planes

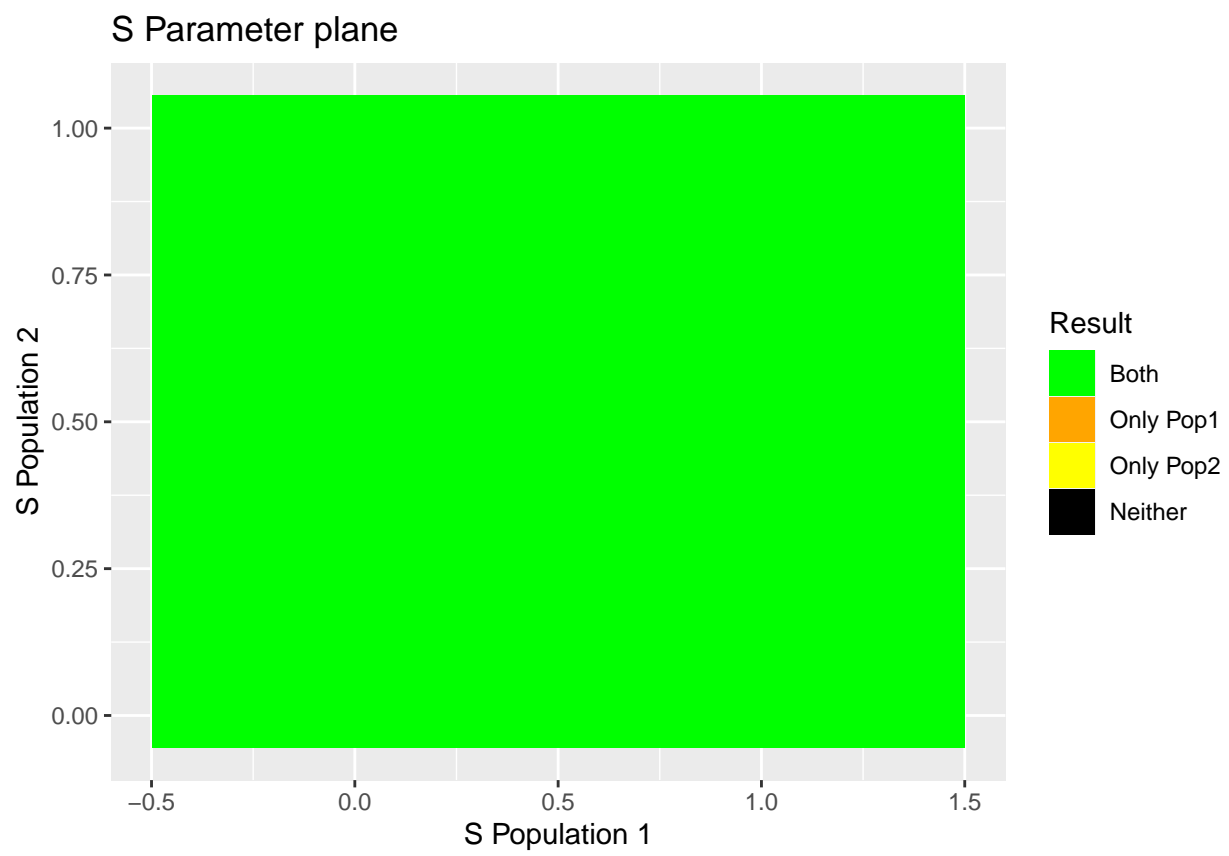


Figure 20: s population planes

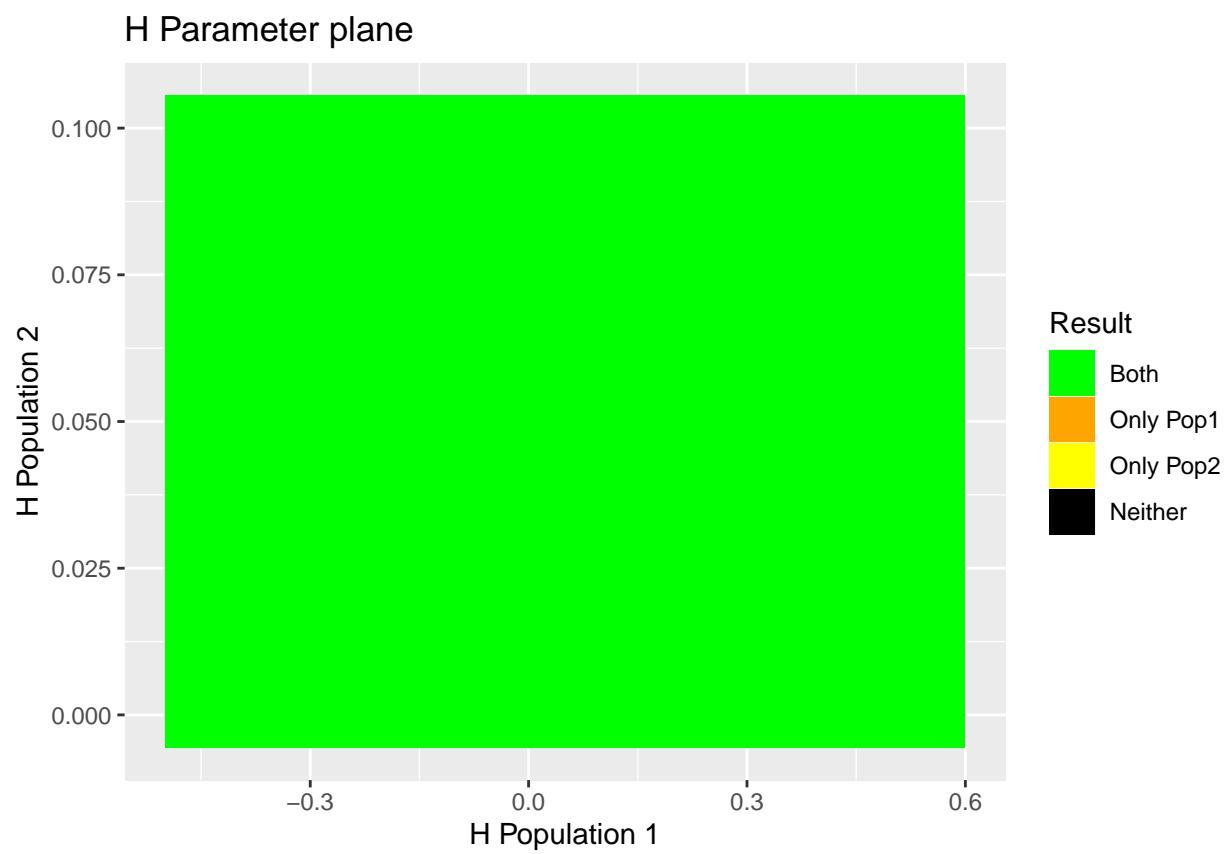


Figure 21: h population planes

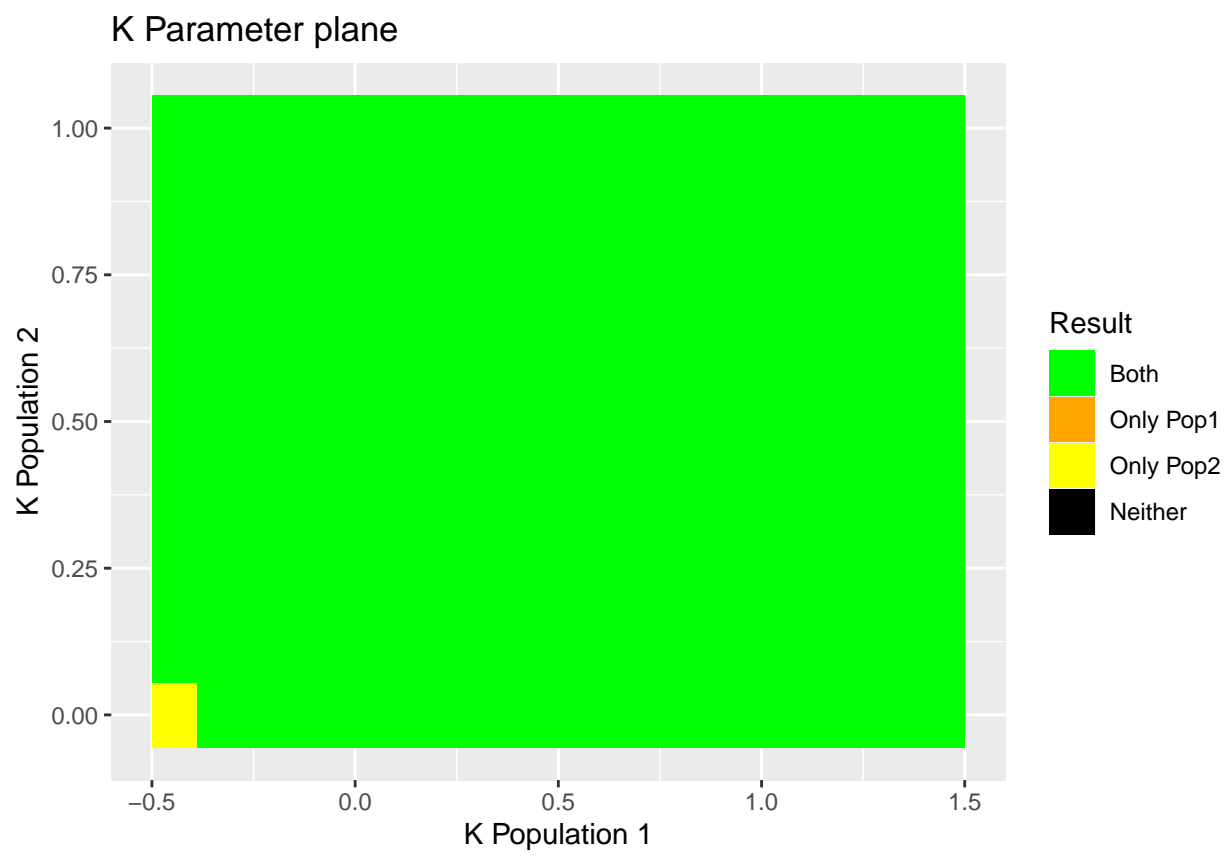


Figure 22: k population planes 0 to 1

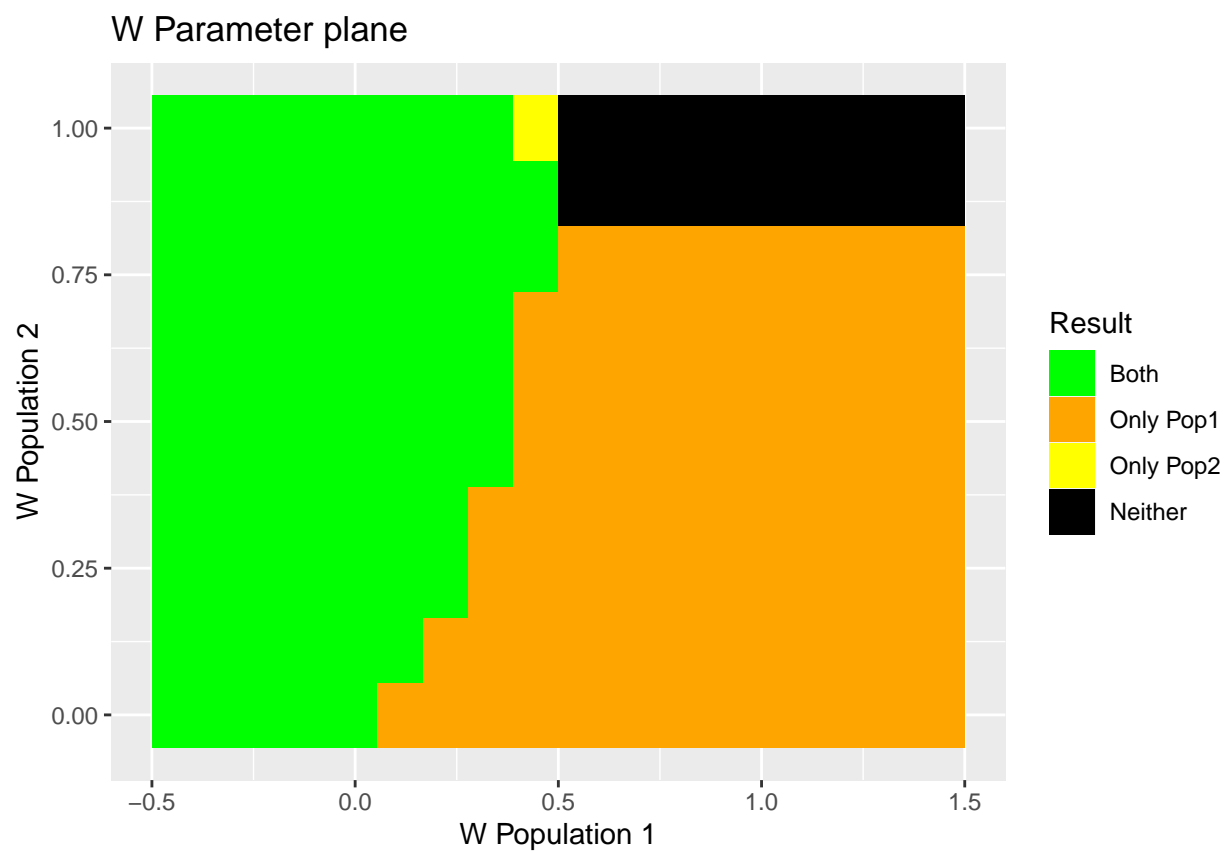


Figure 23: w population planes

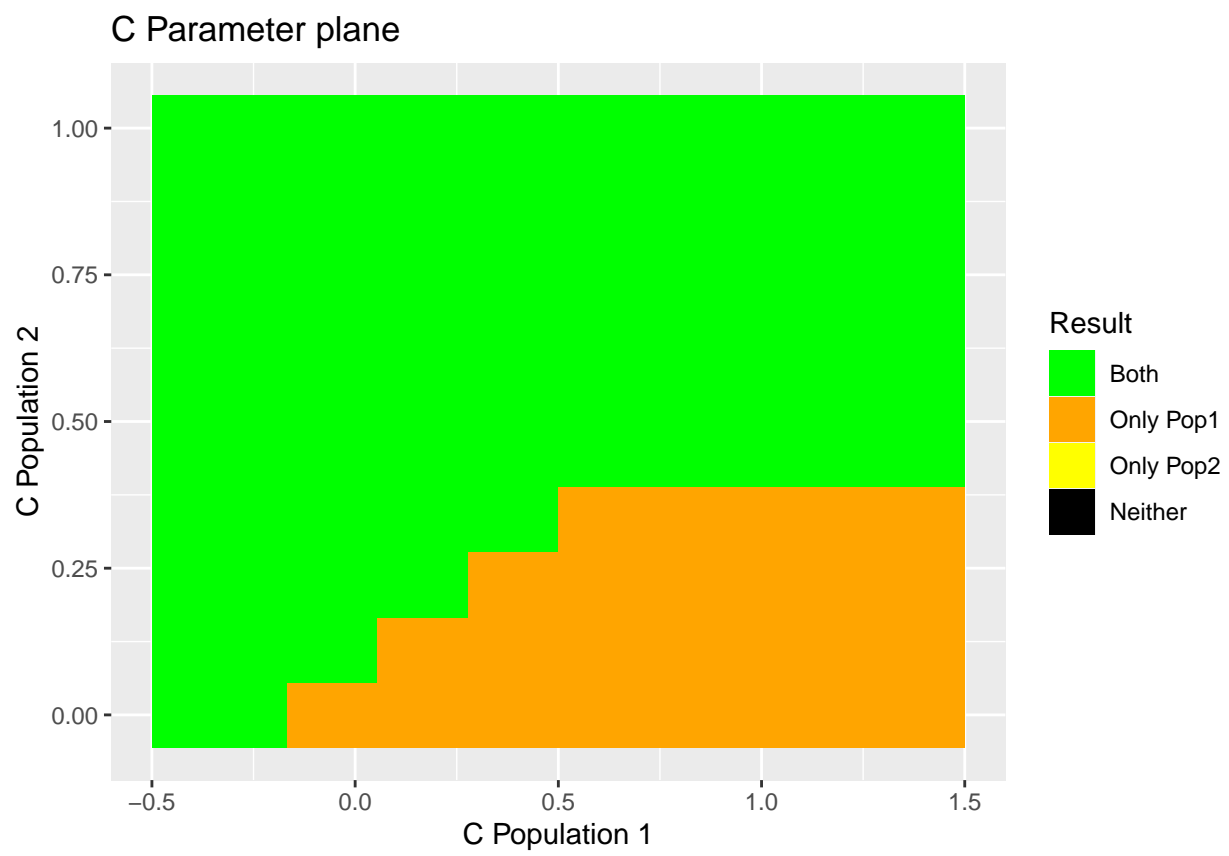


Figure 24: c population planes

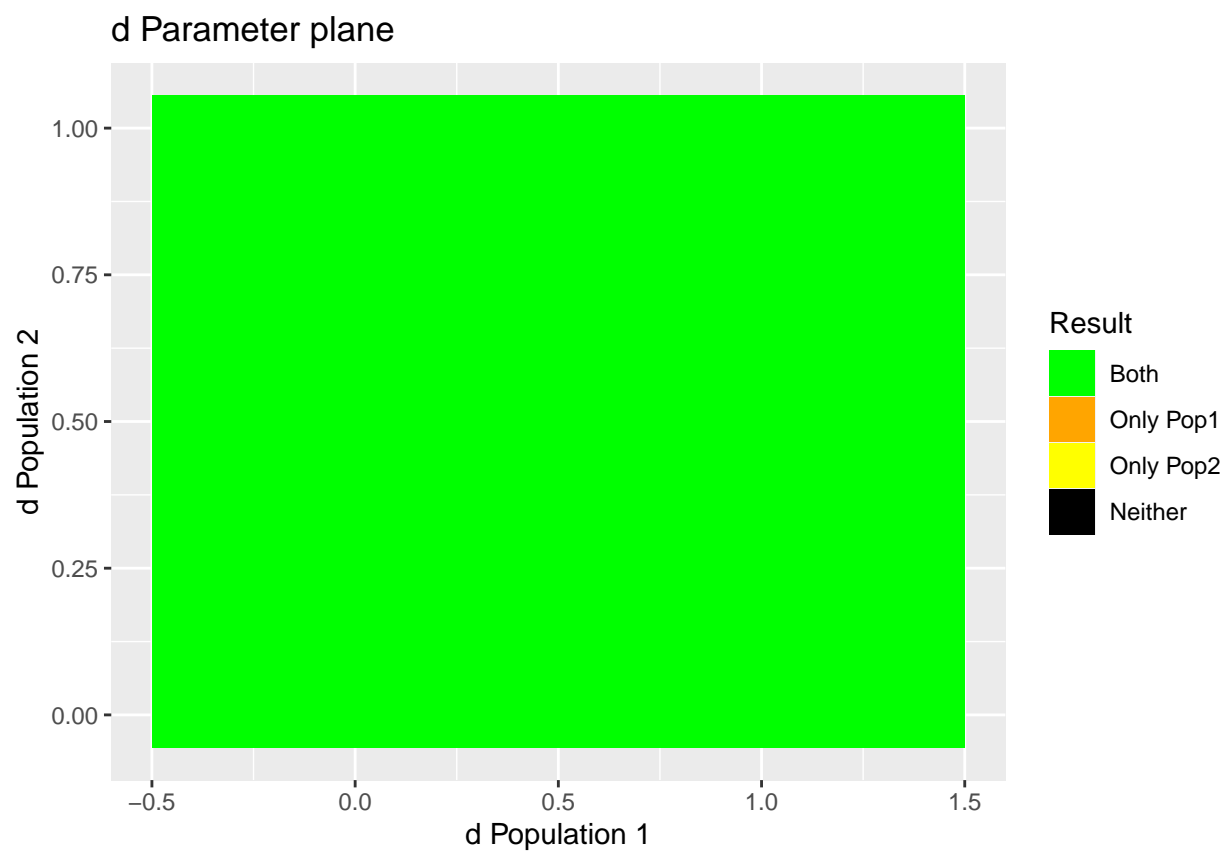


Figure 25: d population planes

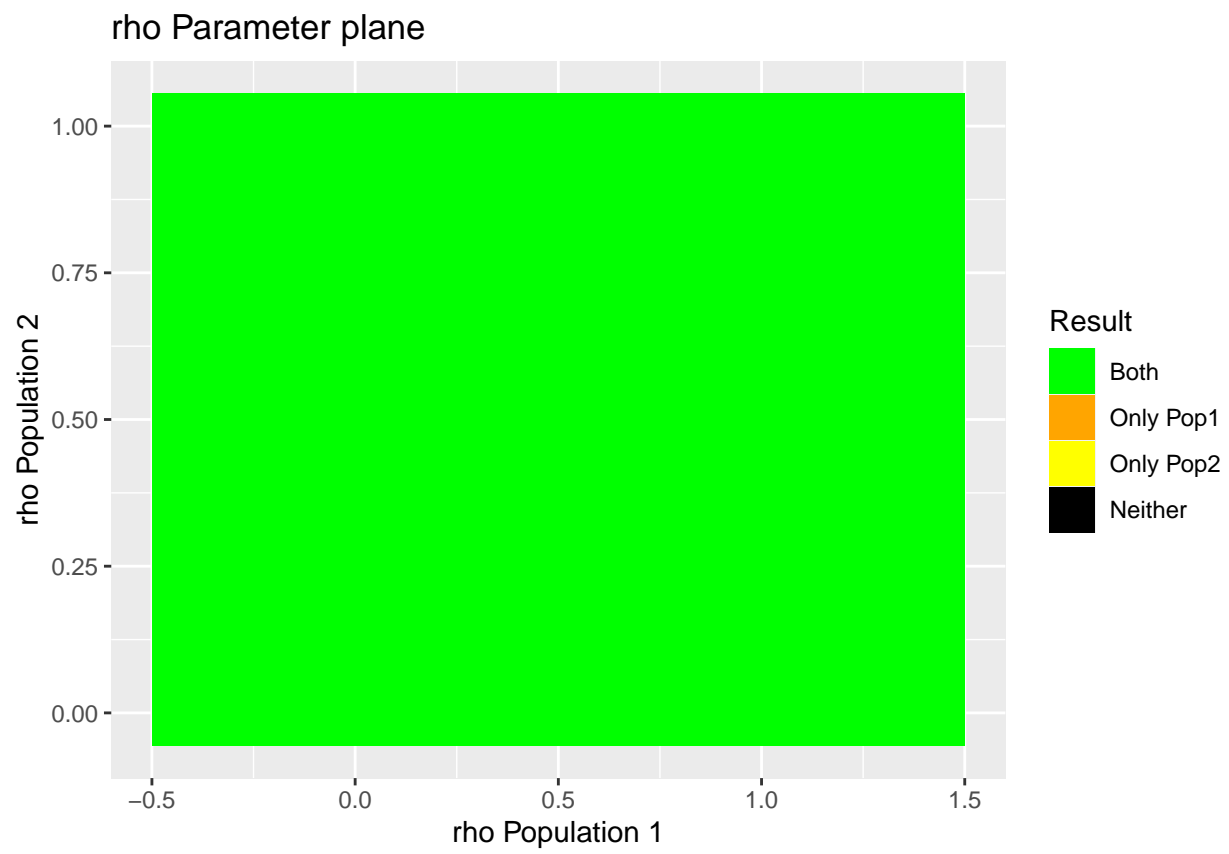


Figure 26: roh population planes