

BauchModel_9

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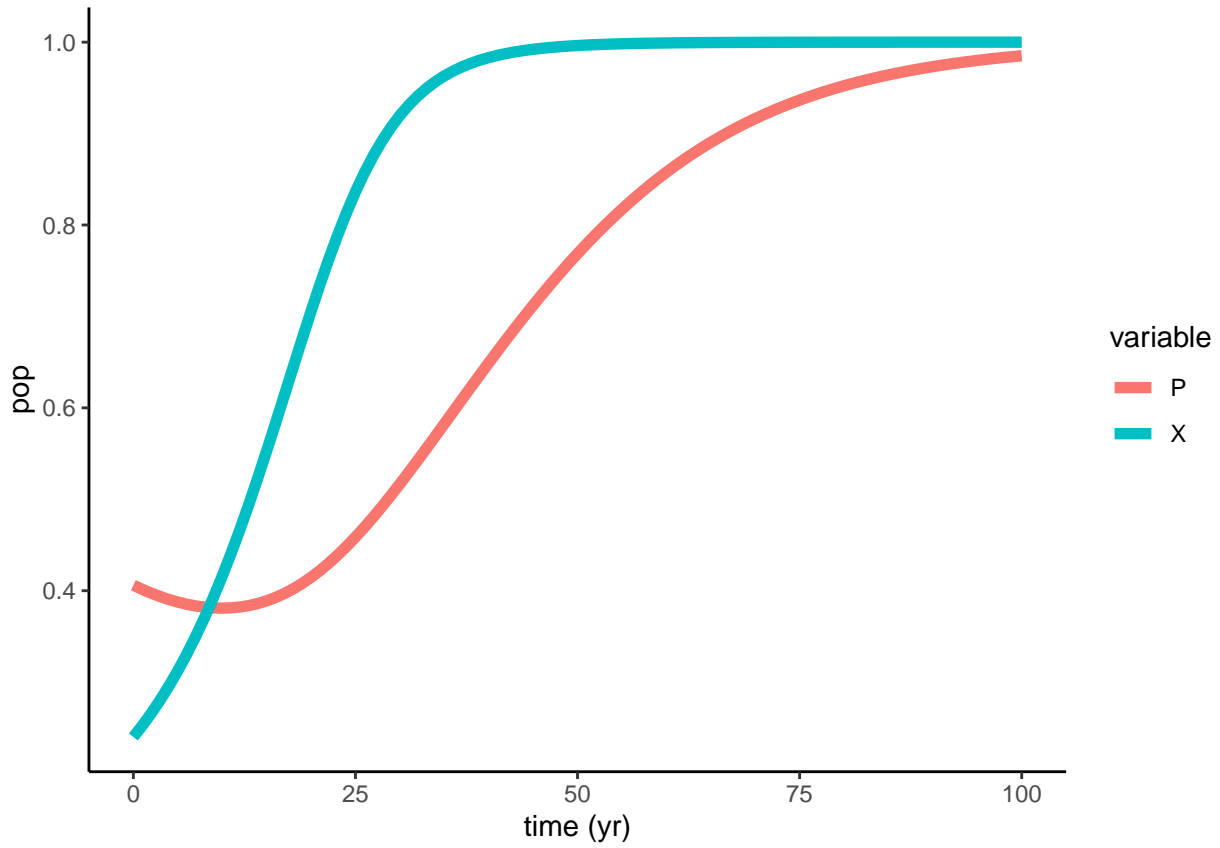


Figure 1: Original Bauch Model

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

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

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

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

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

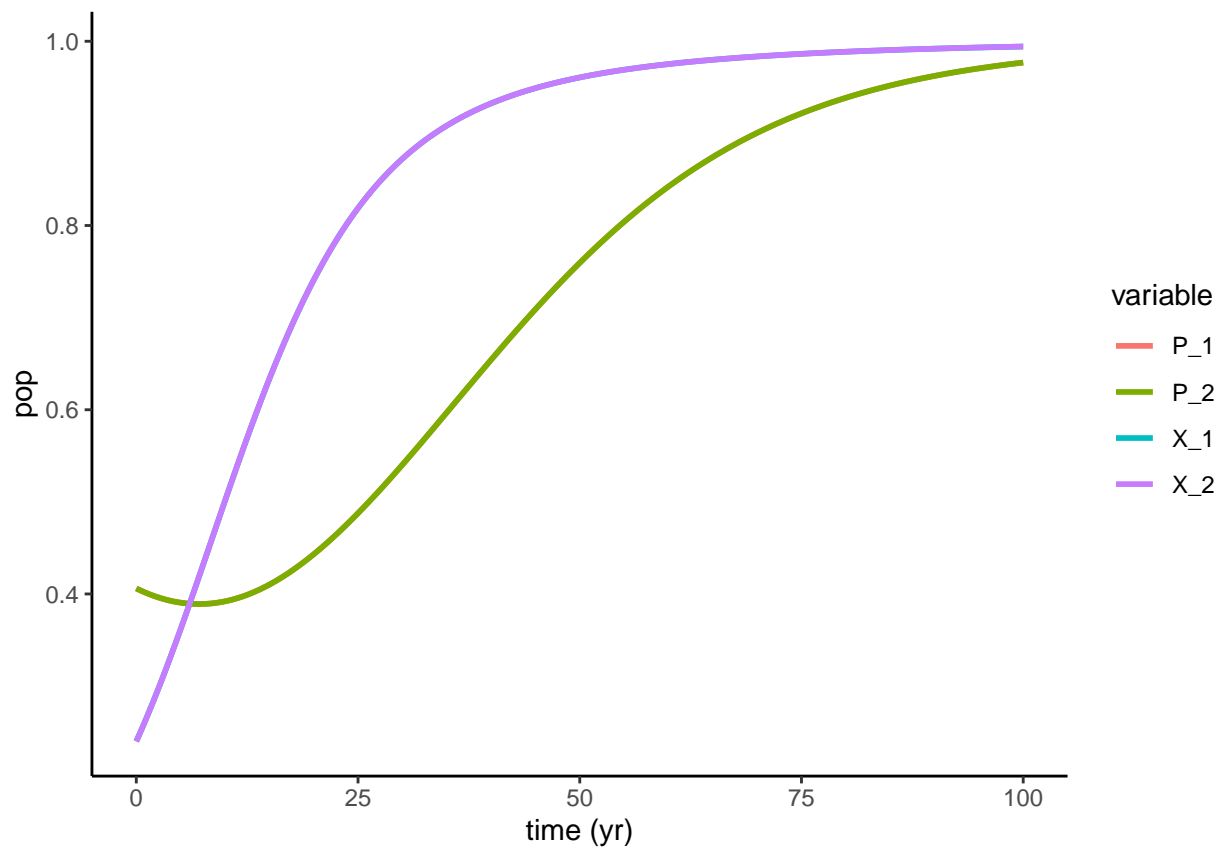


Figure 2: New Model with default paramters

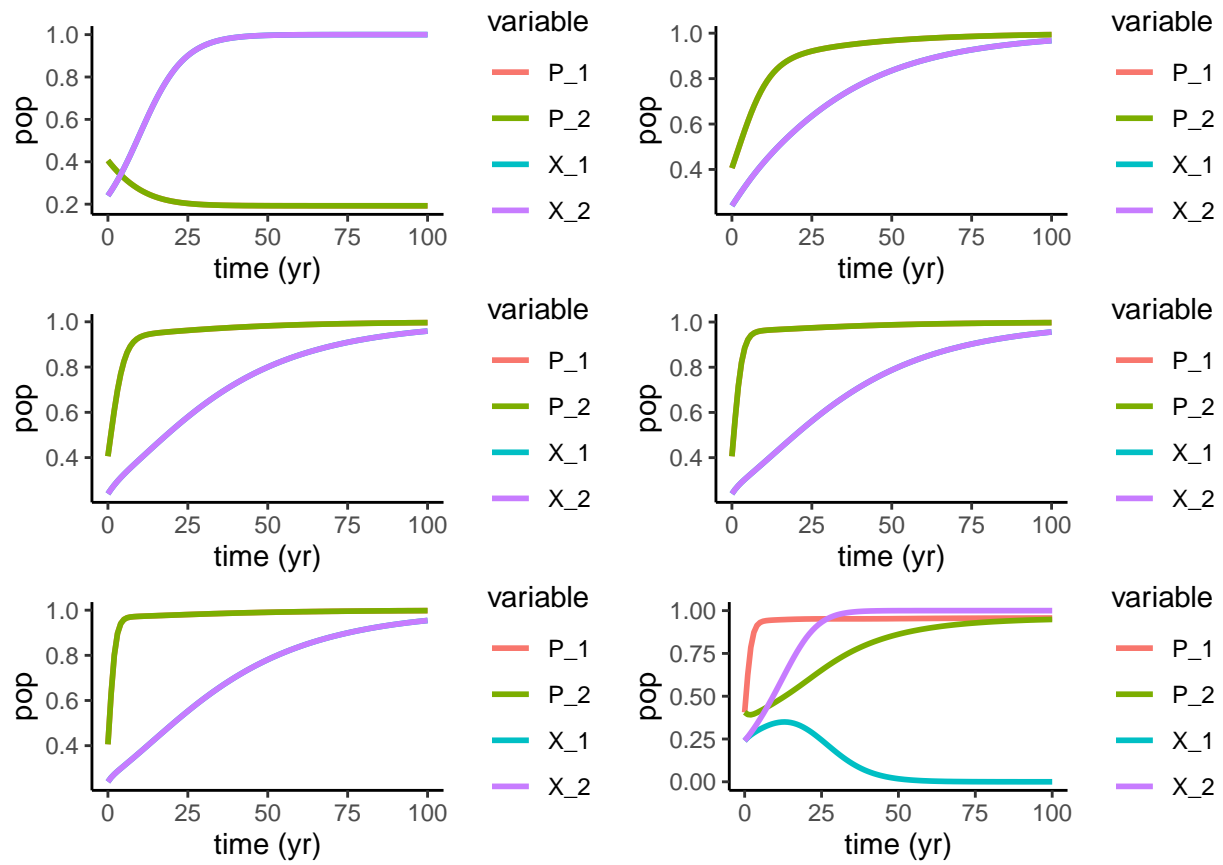


Figure 3: R - Net growth/fecundity, range 0 to 1

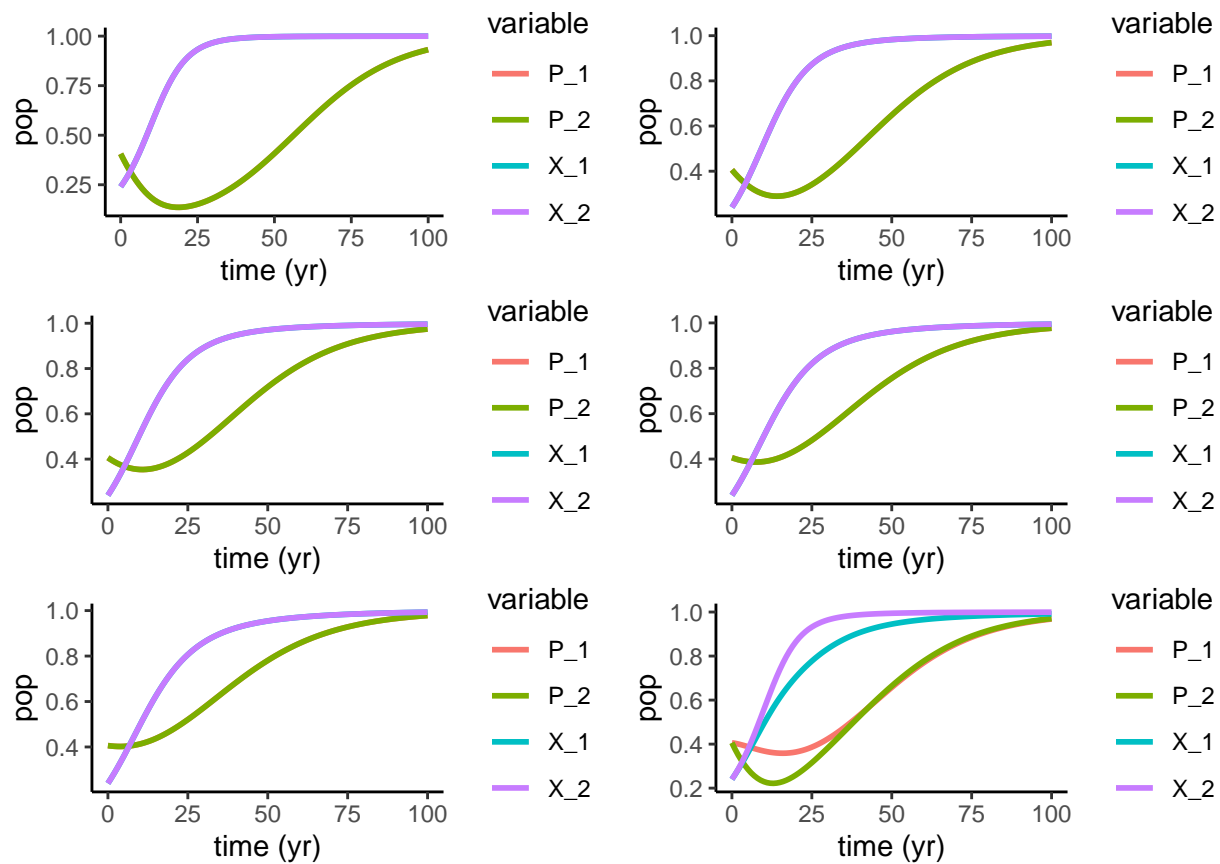


Figure 4: S - supply and demand, range 0.1 to 1

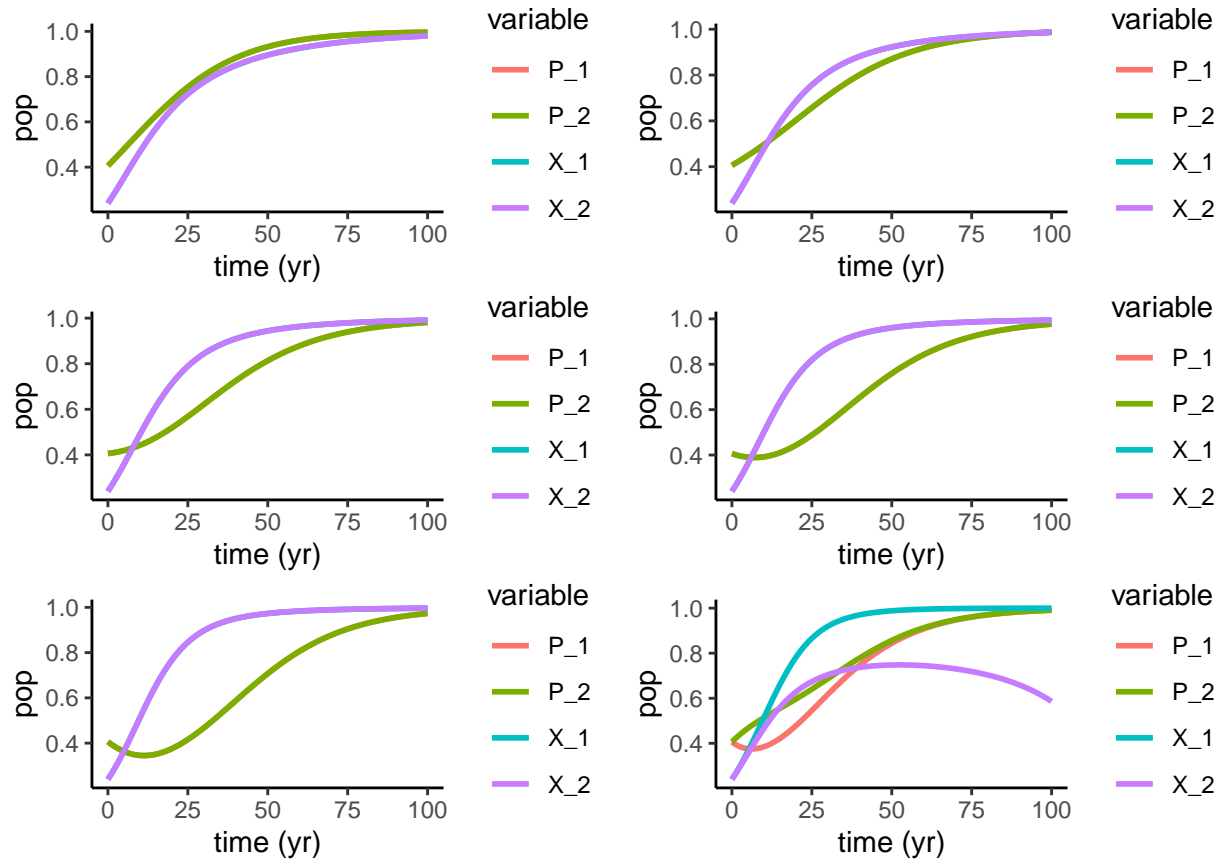


Figure 5: h - Harvesting efficiency, range 0 to 0.1. Note, default is .075

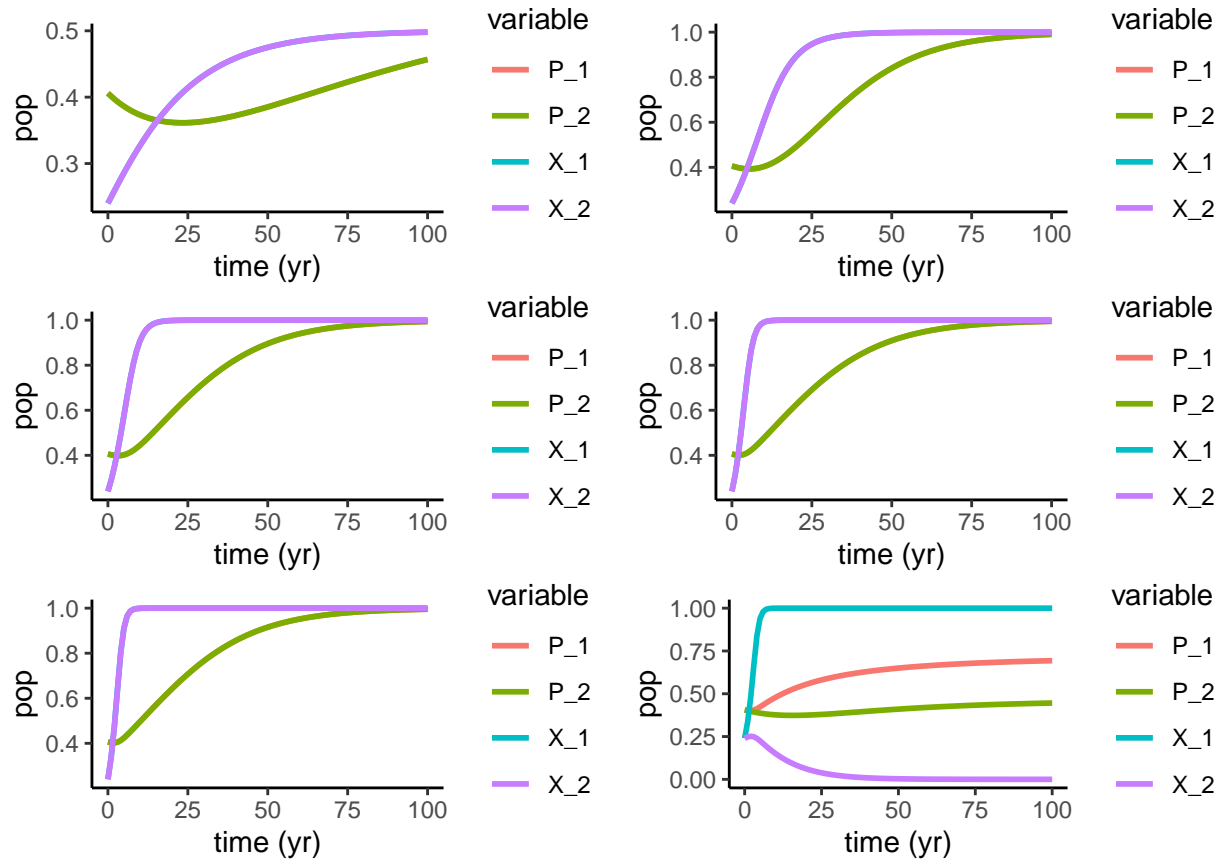


Figure 6: K - Social learning rate 0 to 1

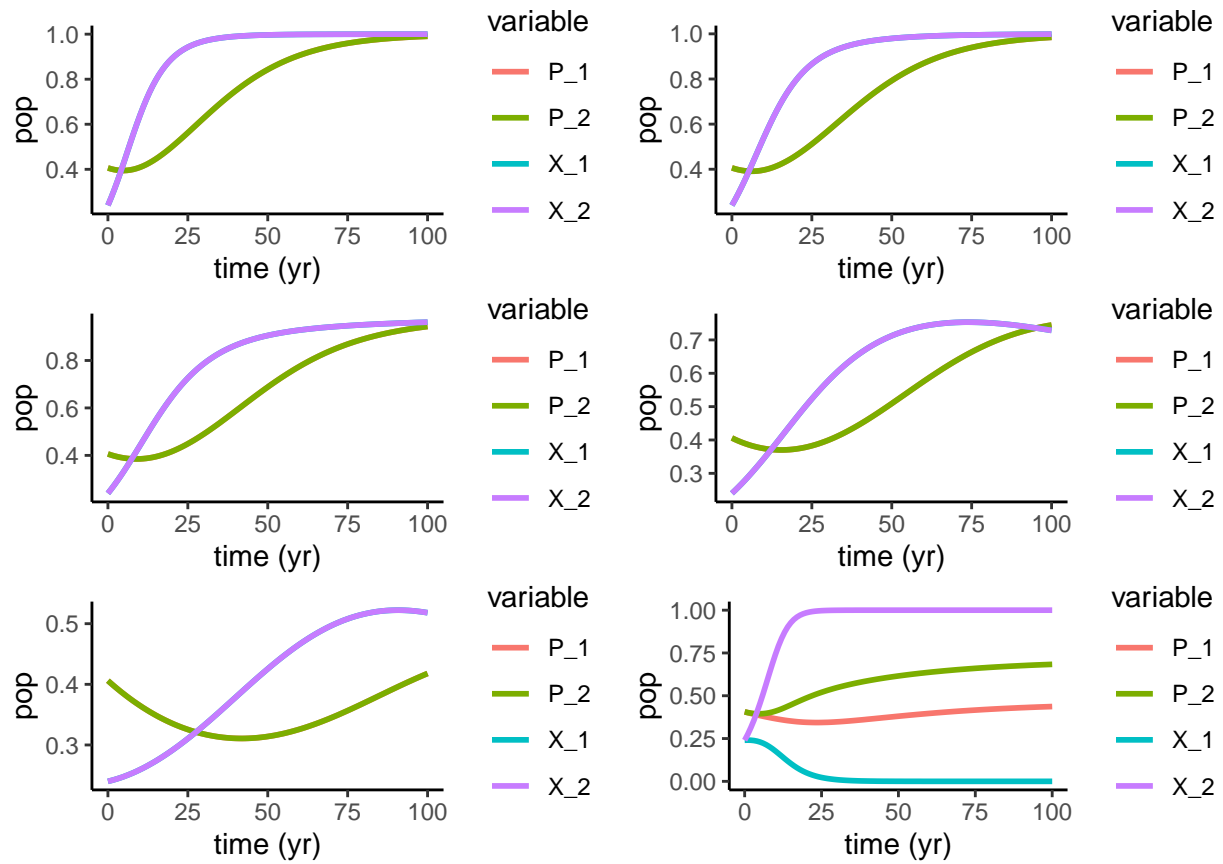


Figure 7: w - conservation costs

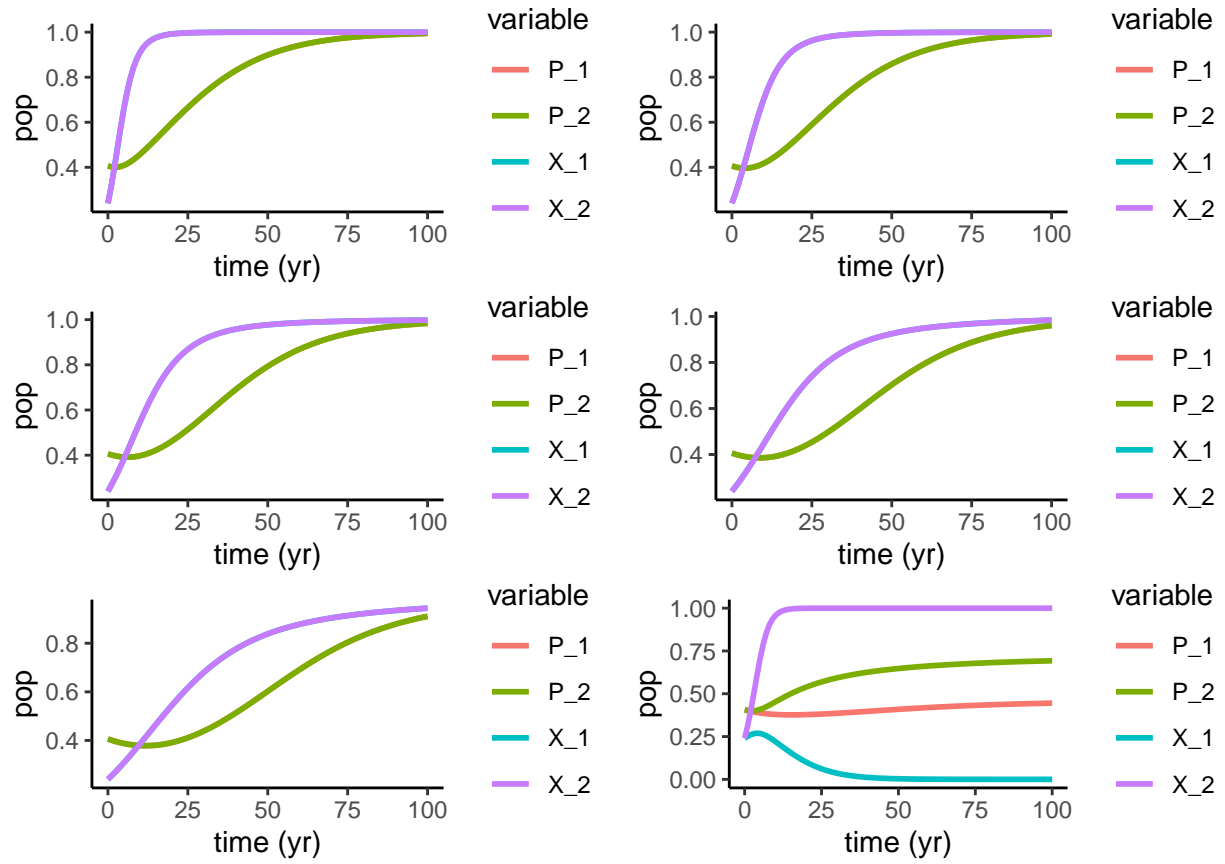


Figure 8: c - rarity valuation param

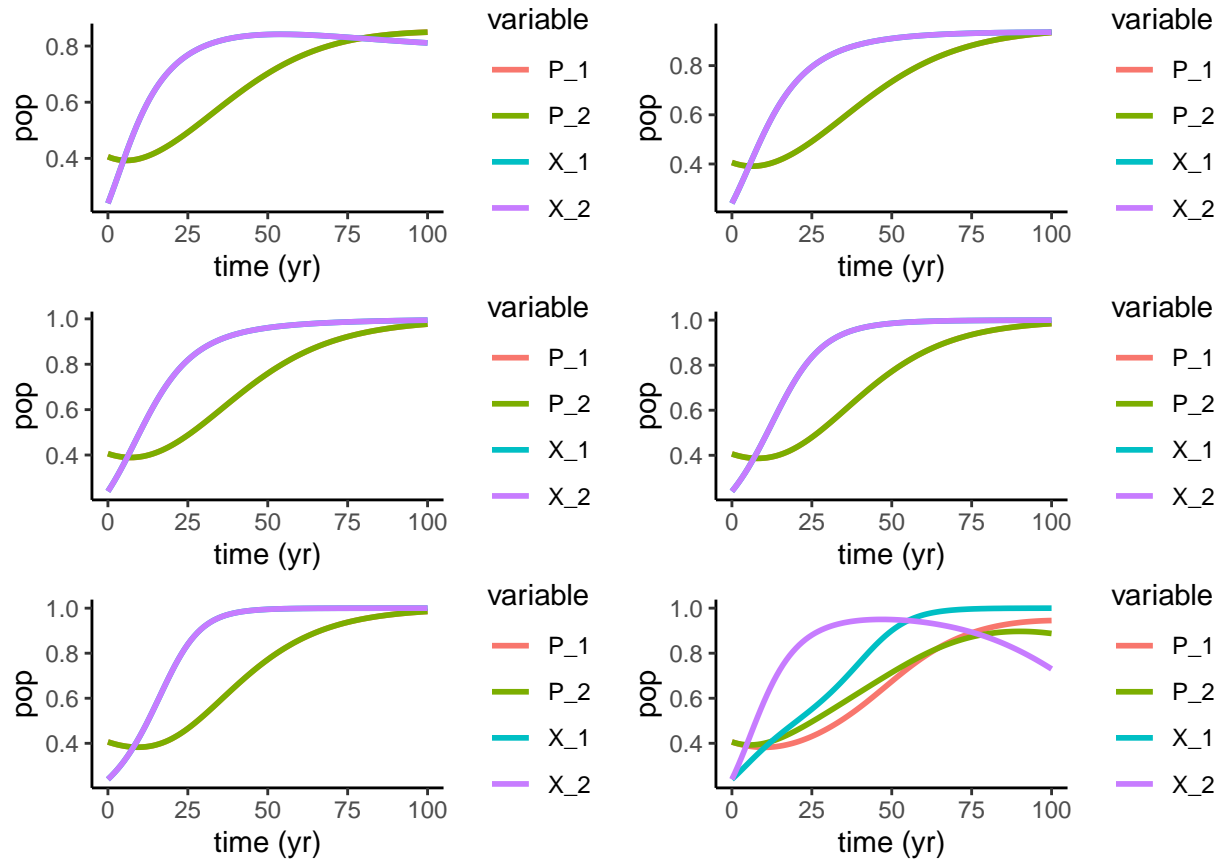


Figure 9: d - social norm strength

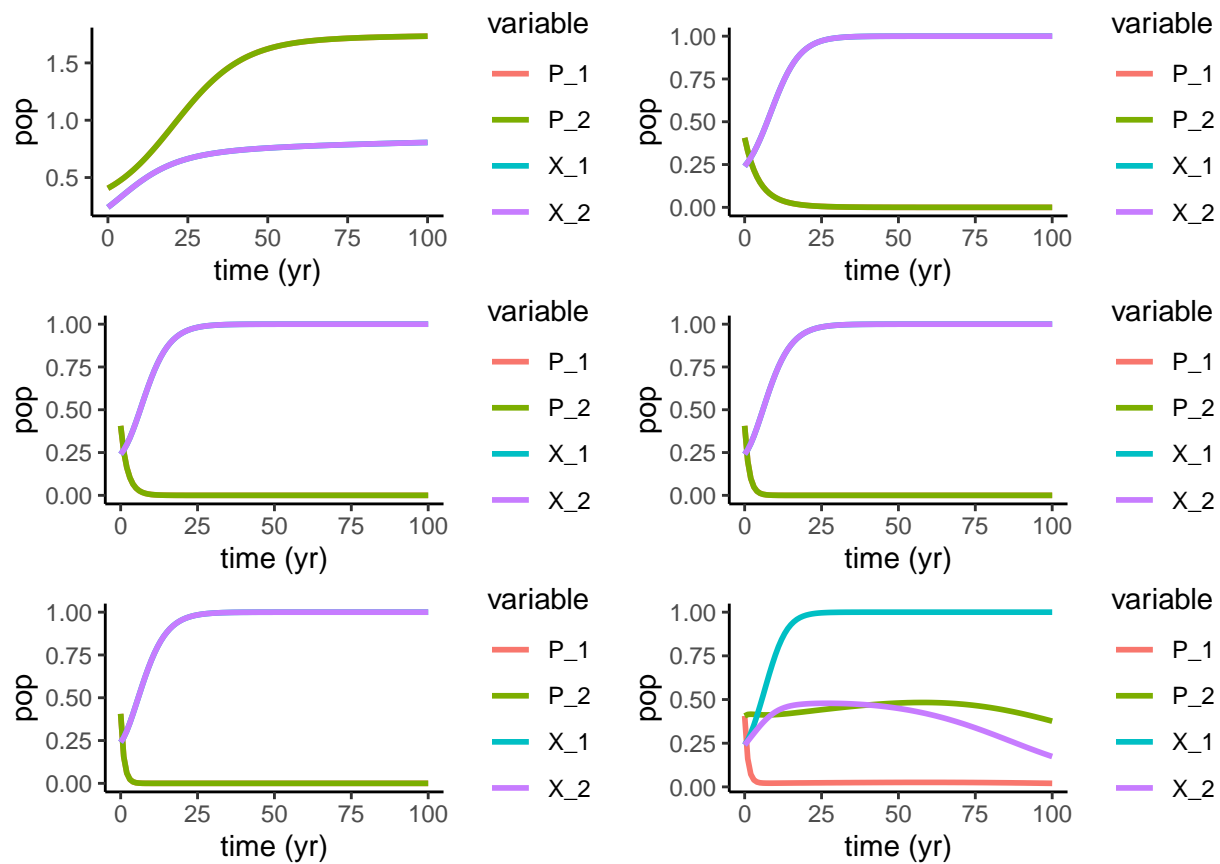


Figure 10: e - fish emigration

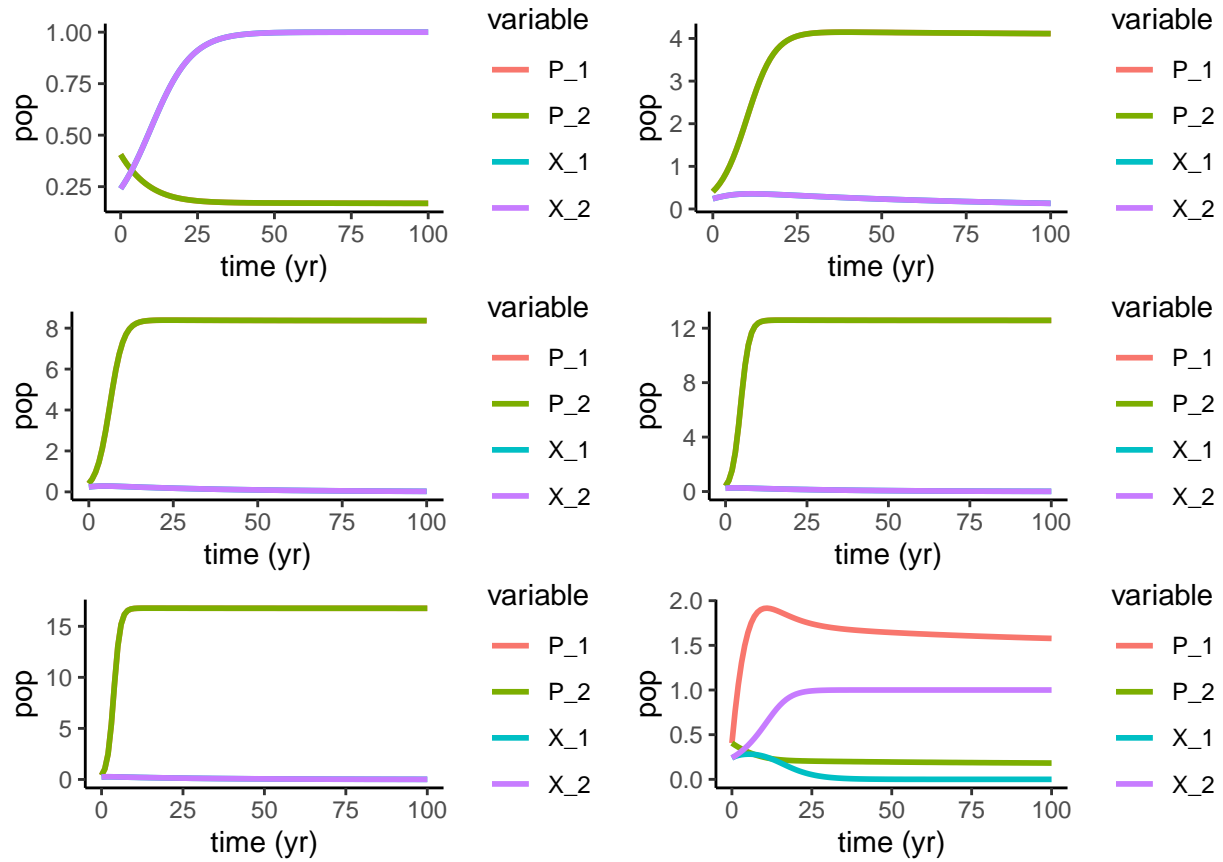


Figure 11: i - fish immigration

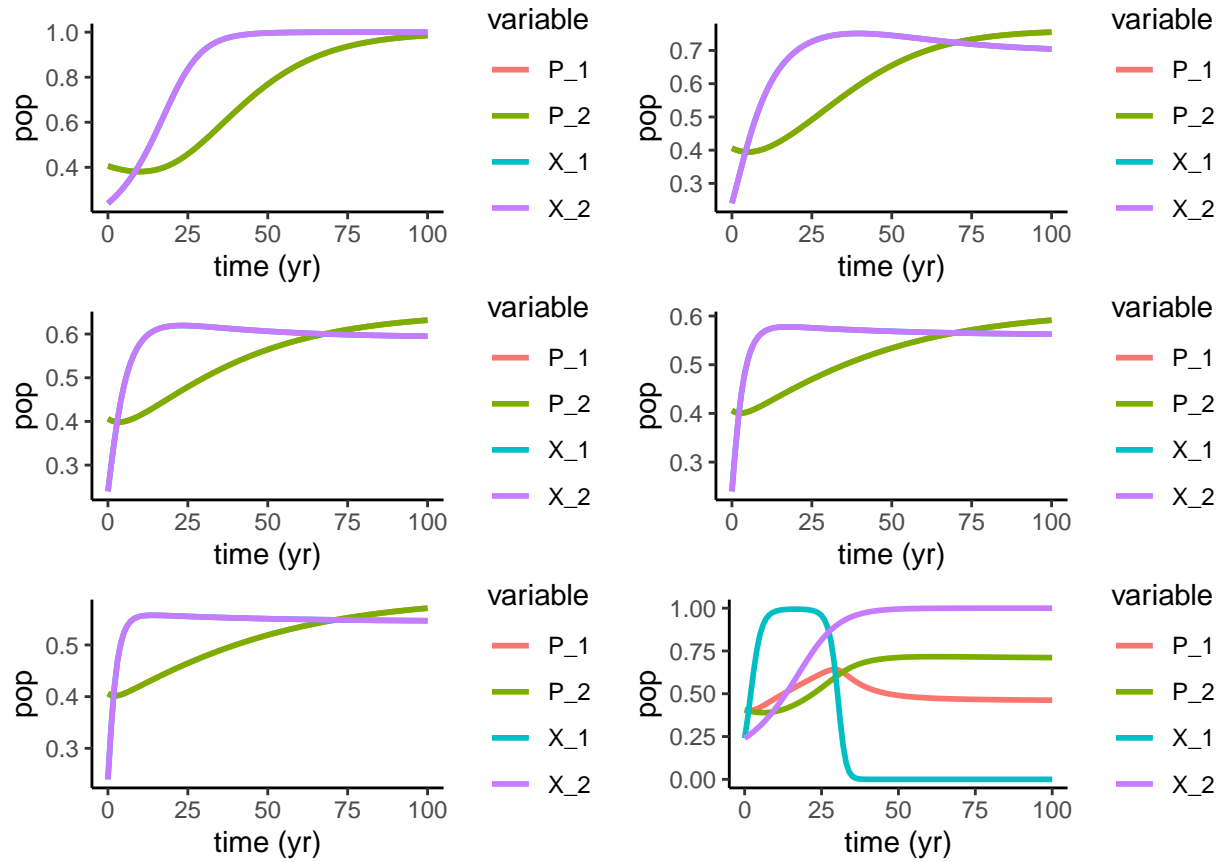


Figure 12: prop - Population influence on the other

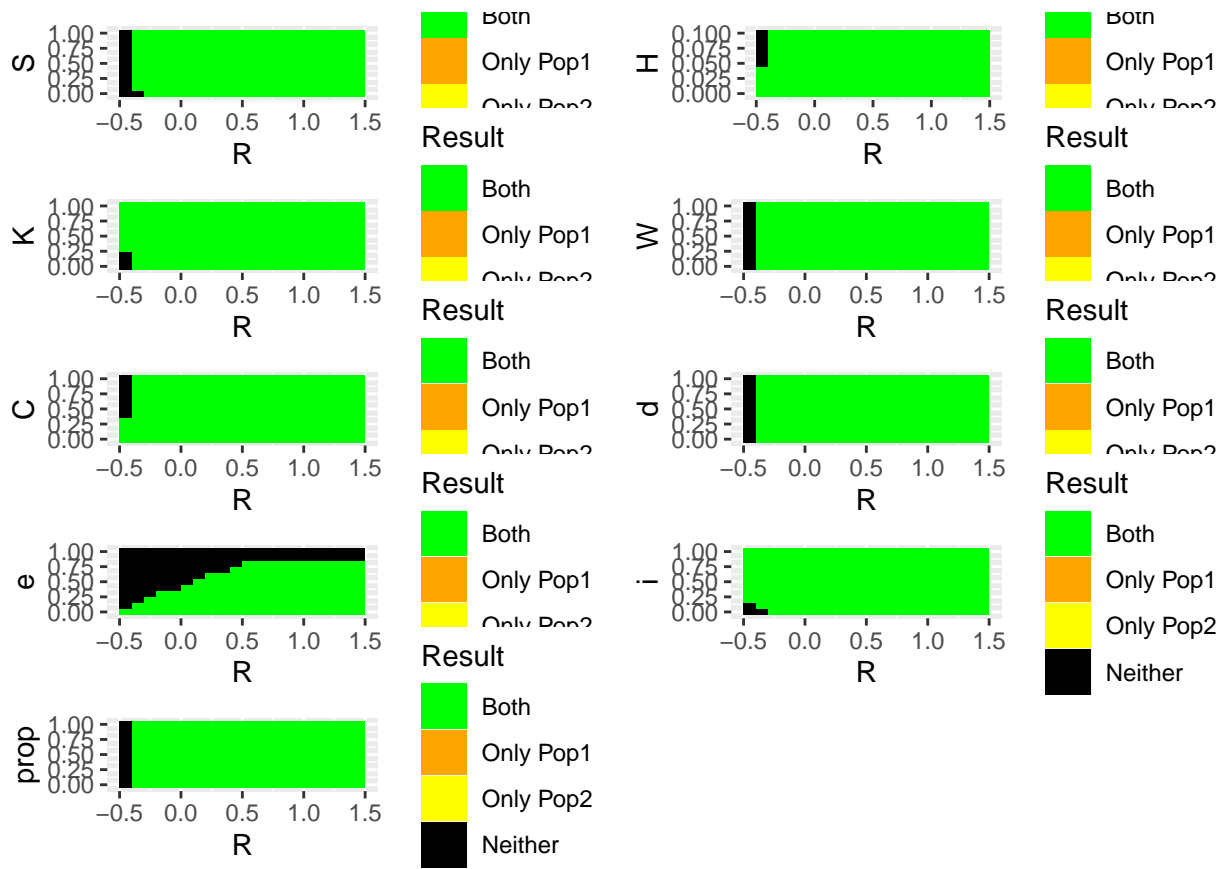


Figure 13: R parameter planes

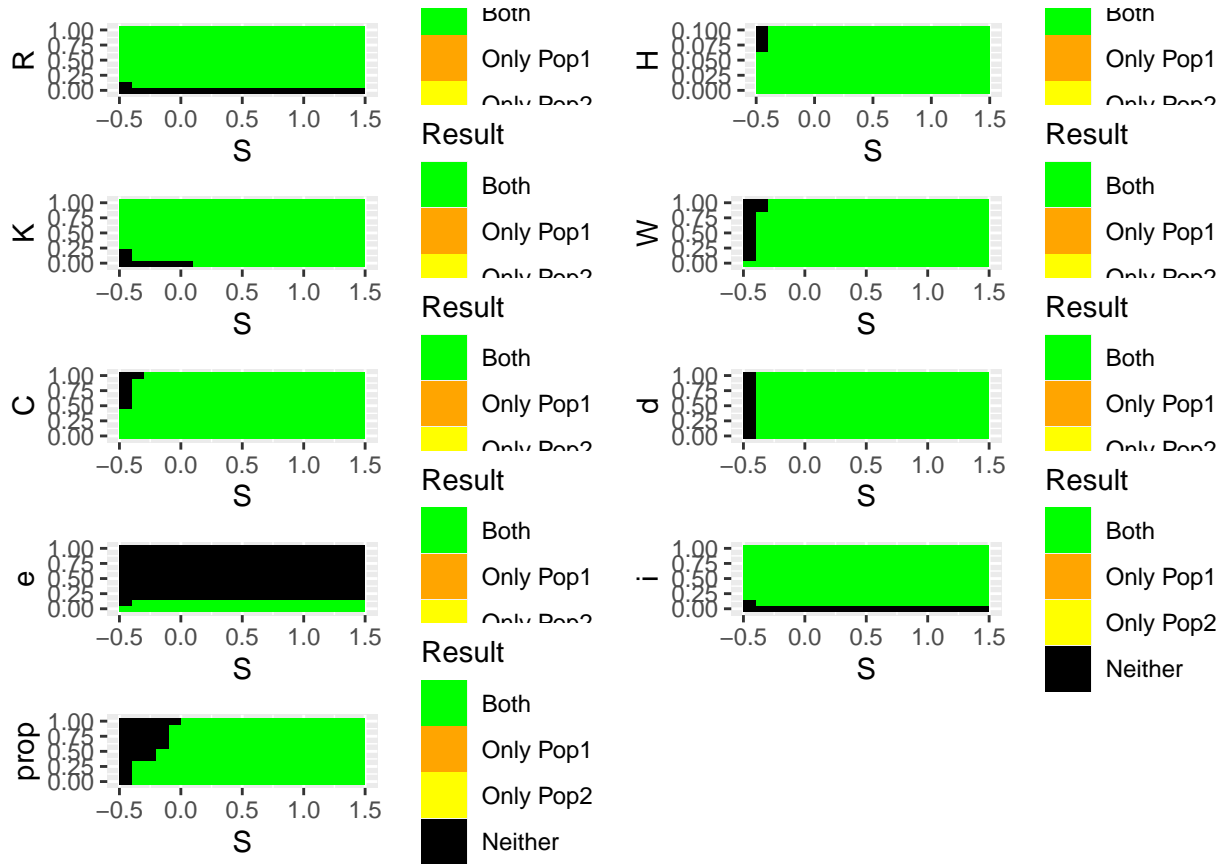


Figure 14: S parameter planes

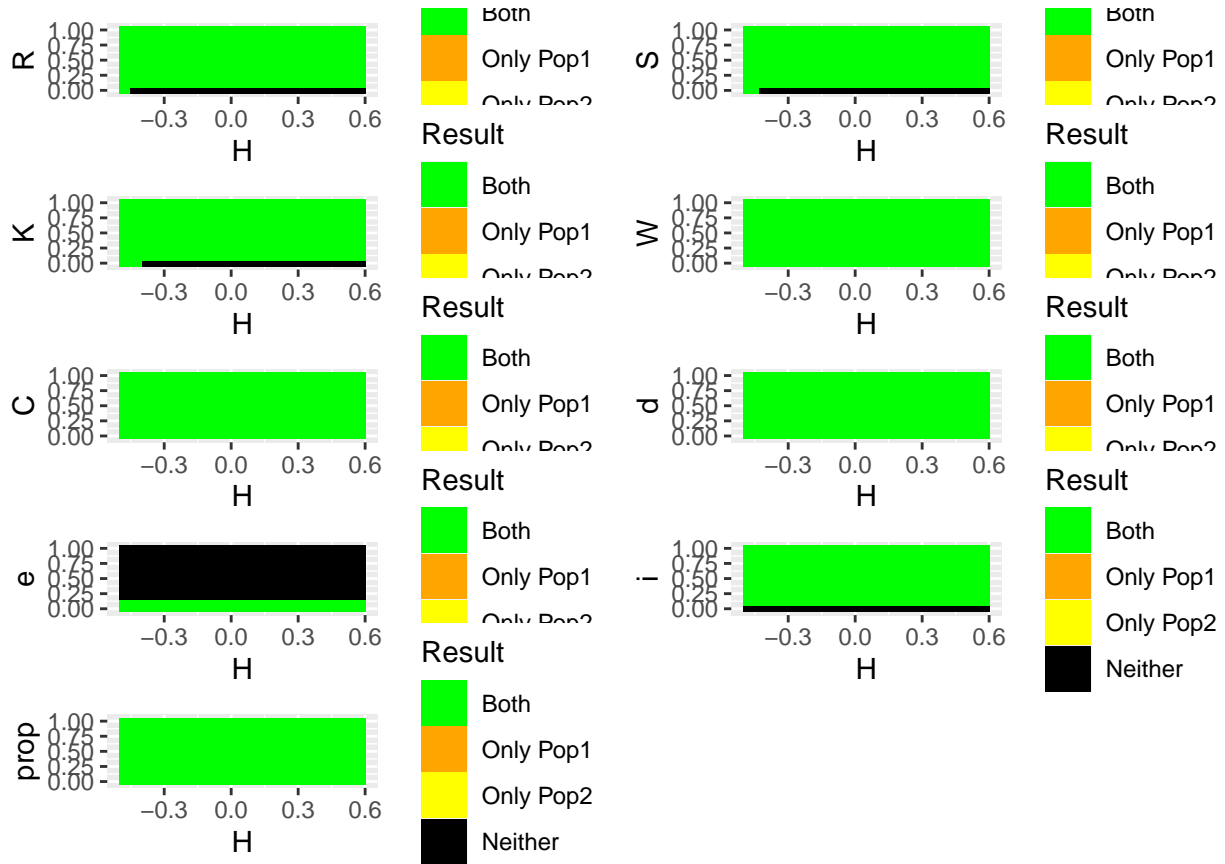


Figure 15: h parameter planes

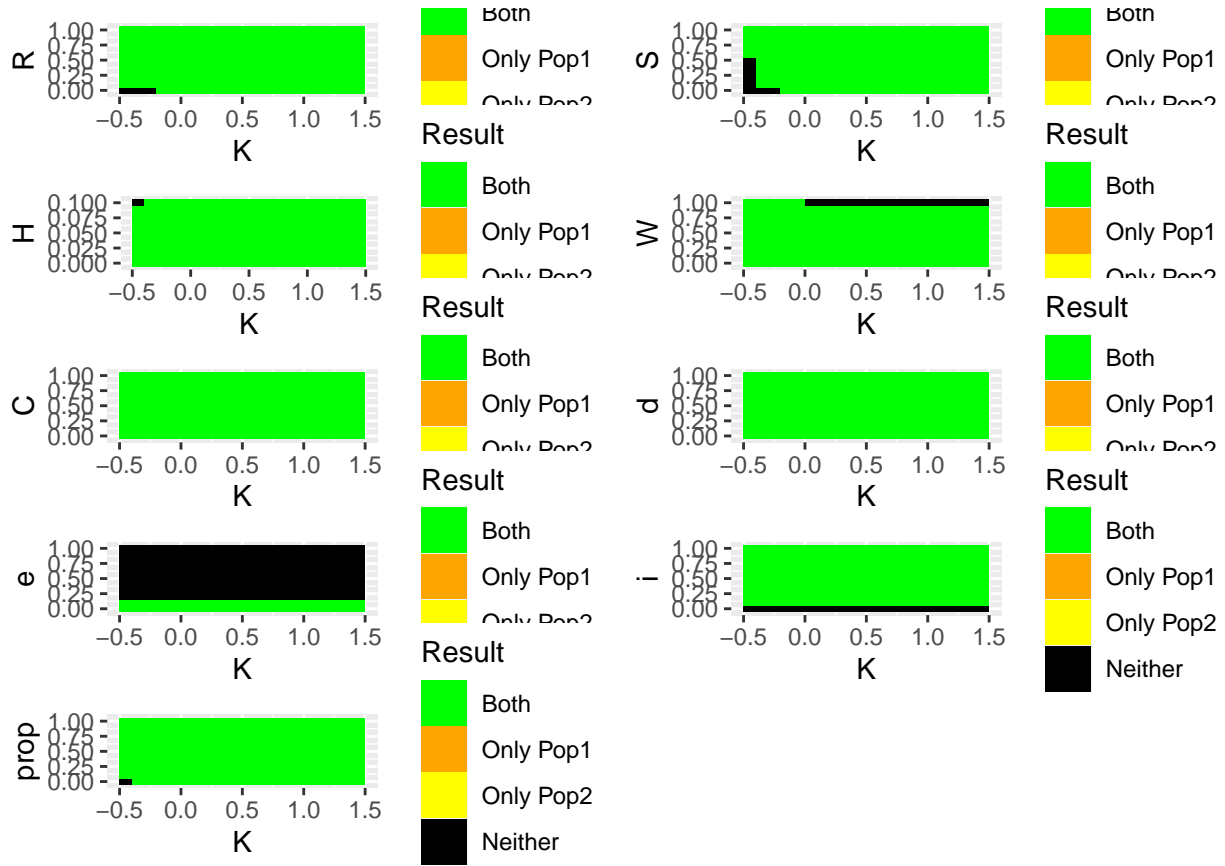


Figure 16: K parameter planes ranging from 0-1

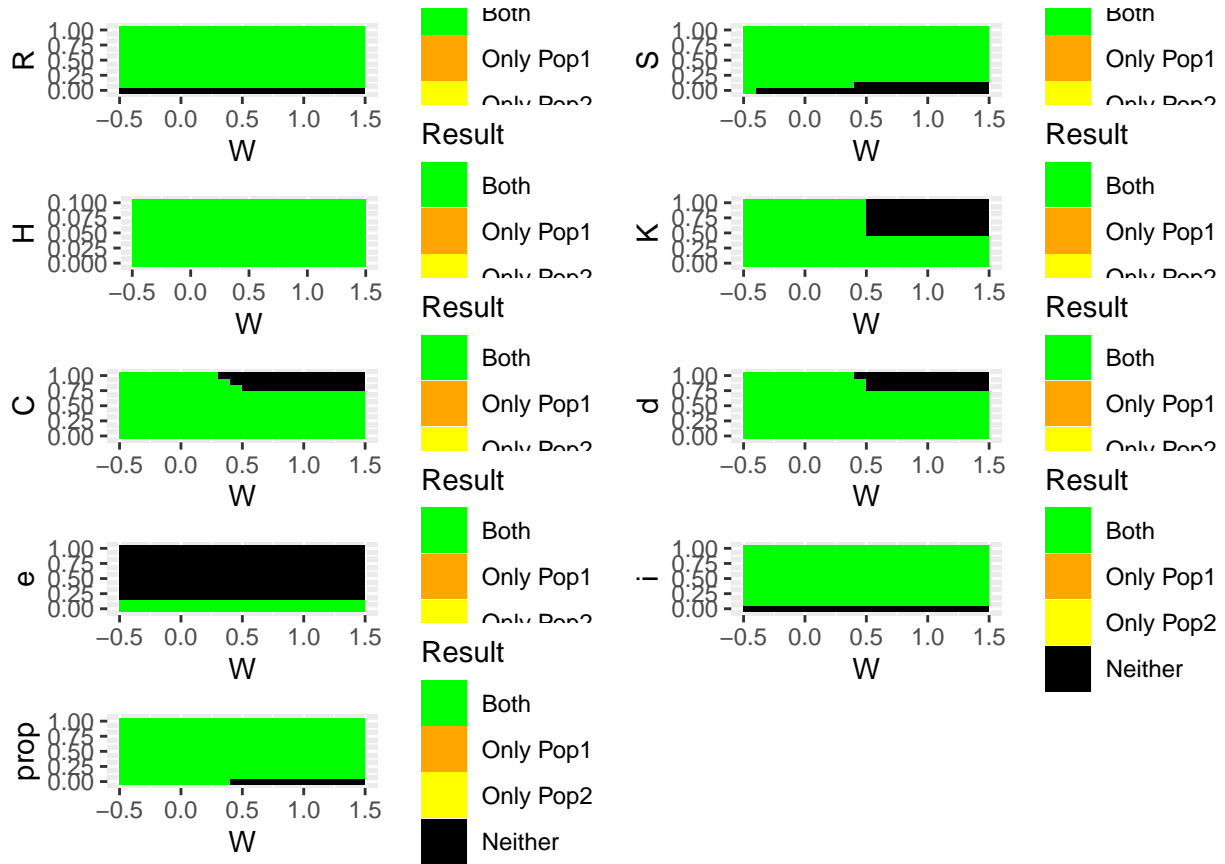


Figure 17: w parameter planes

```

## DLSODA- At T (=R1) and step size H (=R2), the
##         corrector convergence failed repeatedly
##         or with ABS(H) = HMIN
## In above message, R1 = 95.6093, R2 = 1.85511e-10
##
## DLSODA- At T (=R1) and step size H (=R2), the
##         corrector convergence failed repeatedly
##         or with ABS(H) = HMIN
## In above message, R1 = 79.0594, R2 = 1.27077e-10
##
## DLSODA- At T (=R1) and step size H (=R2), the
##         corrector convergence failed repeatedly
##         or with ABS(H) = HMIN
## In above message, R1 = 93.2795, R2 = 2.61321e-11
##
## DLSODA- At T (=R1) and step size H (=R2), the
##         corrector convergence failed repeatedly
##         or with ABS(H) = HMIN
## In above message, R1 = 75.223, R2 = 2.86229e-10
##

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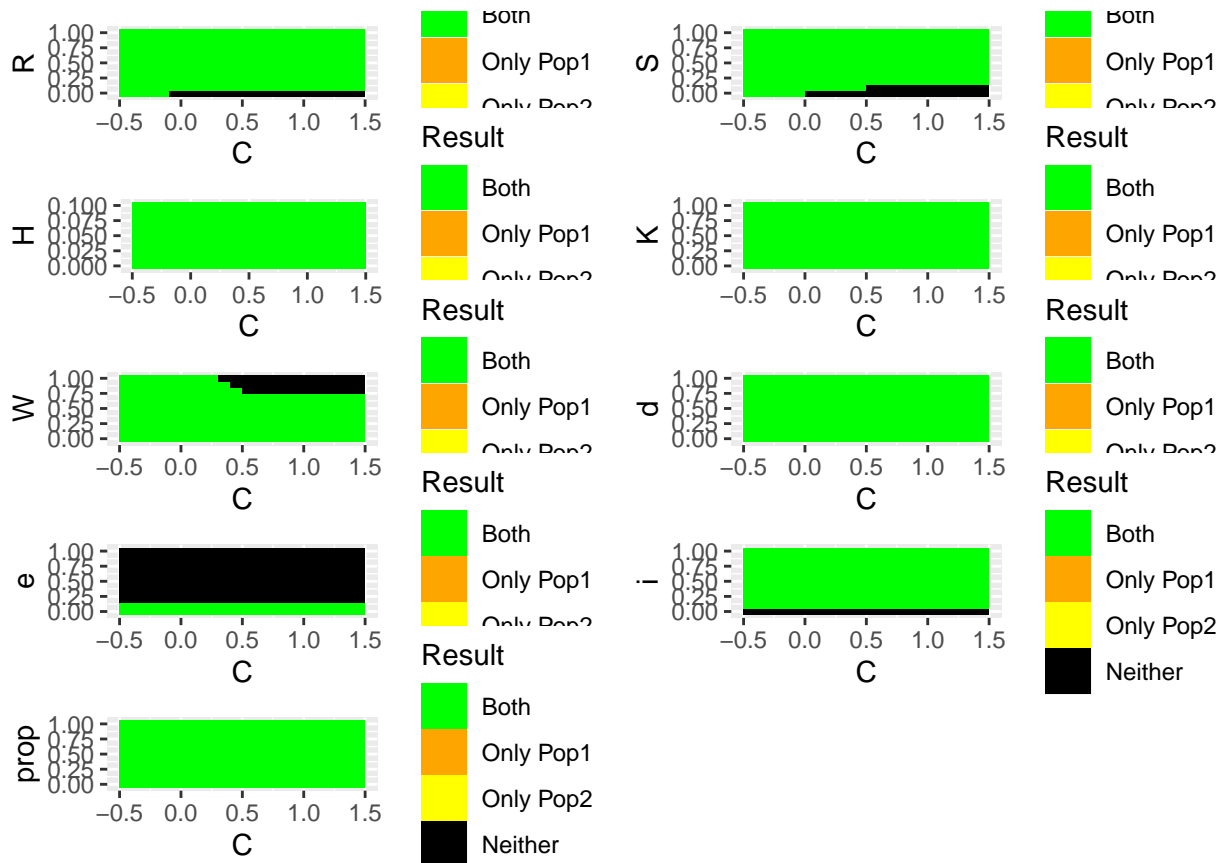


Figure 18: c parameter planes

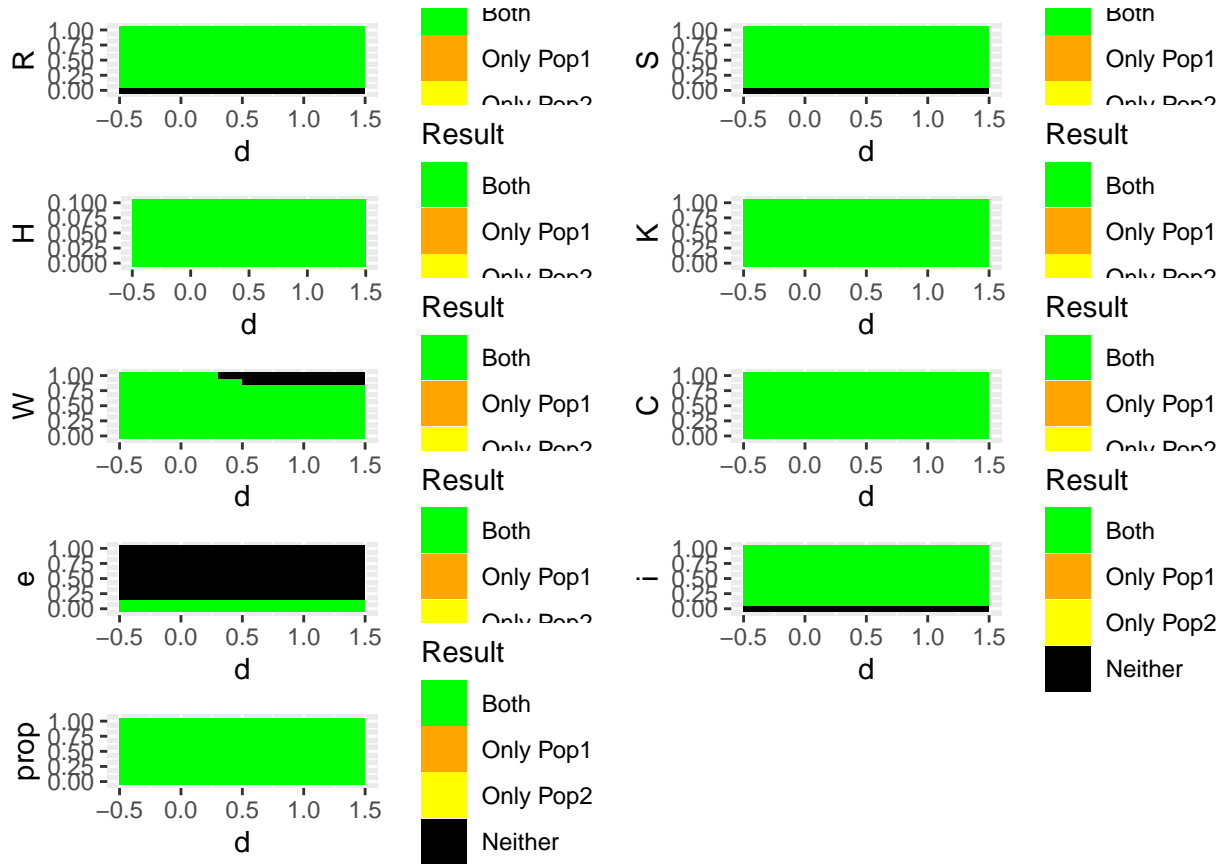


Figure 19: d parameter planes

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## DLSODA- At T (=R1) and step size H (=R2), the
##         corrector convergence failed repeatedly
##         or with ABS(H) = HMIN
## In above message, R1 = 95.6093, R2 = 1.85511e-10
##
## DLSODA- At T (=R1) and step size H (=R2), the
##         corrector convergence failed repeatedly
##         or with ABS(H) = HMIN
## In above message, R1 = 79.0594, R2 = 1.27077e-10
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##
## DLSODA- At T (=R1) and step size H (=R2), the
##         corrector convergence failed repeatedly
##         or with ABS(H) = HMIN
## In above message, R1 = 75.223, R2 = 2.86229e-10
##

```

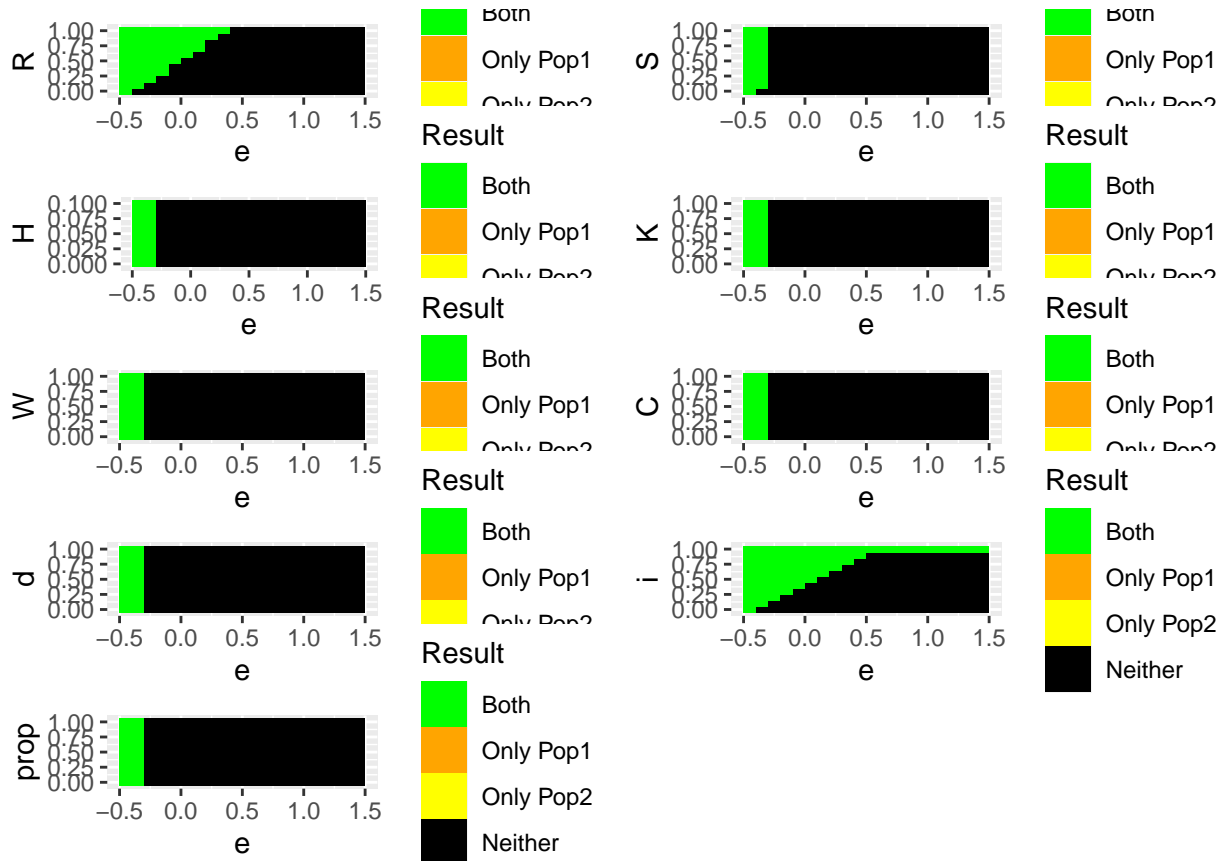


Figure 20: e parameter planes

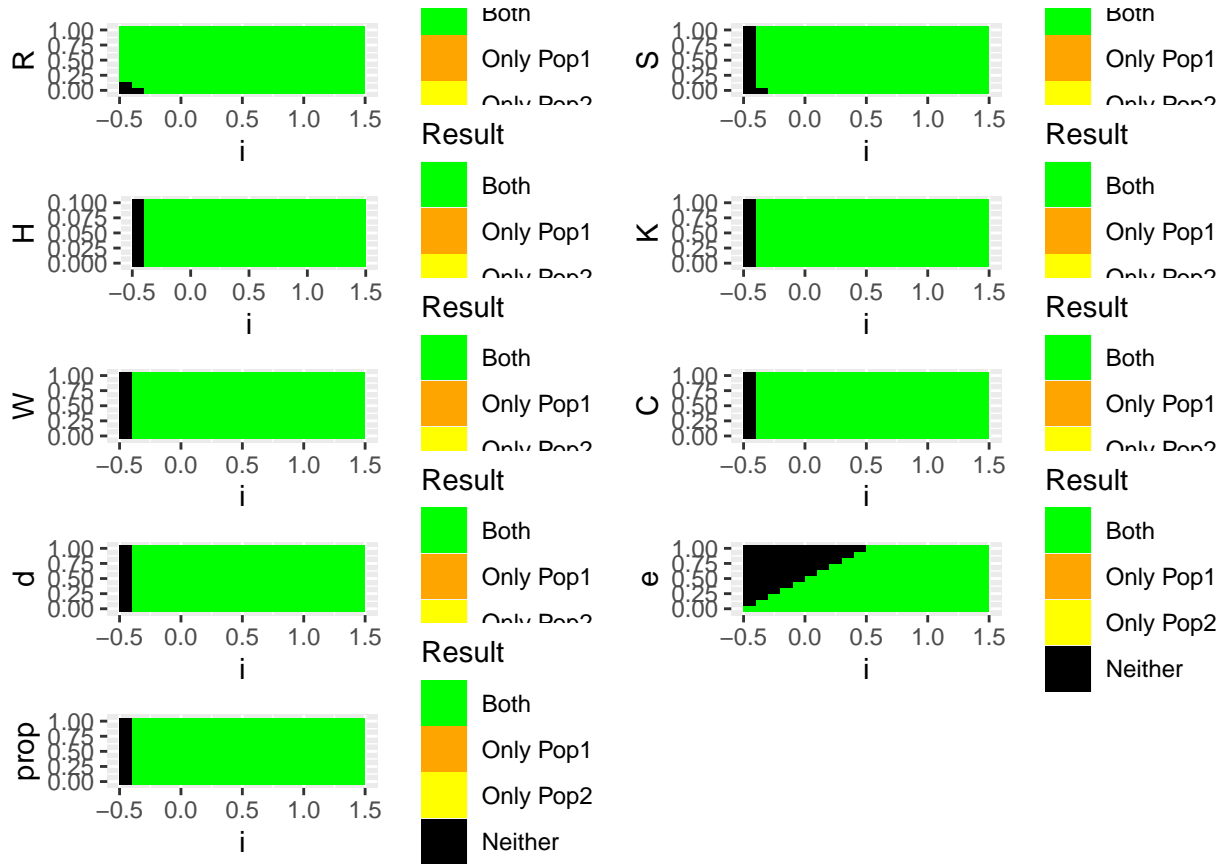


Figure 21: i parameter planes

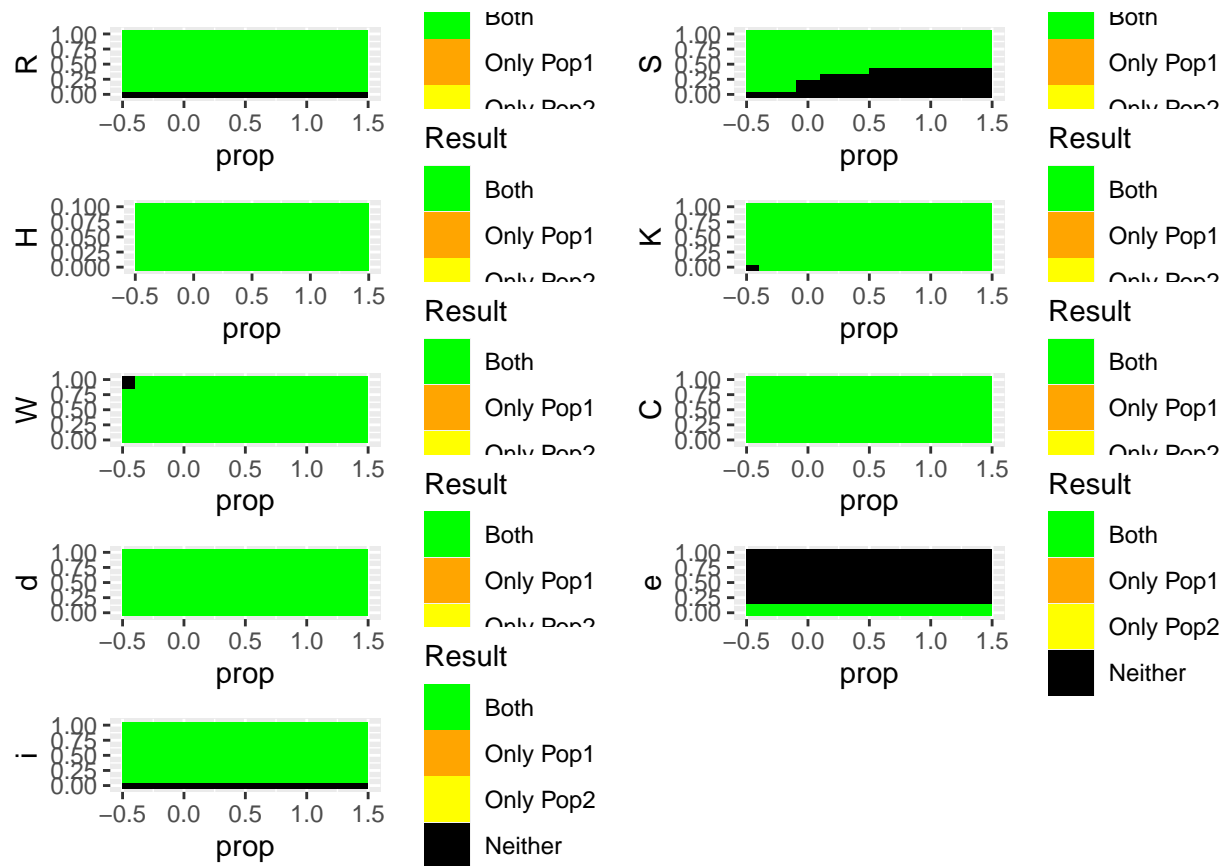


Figure 22: prop parameter planes

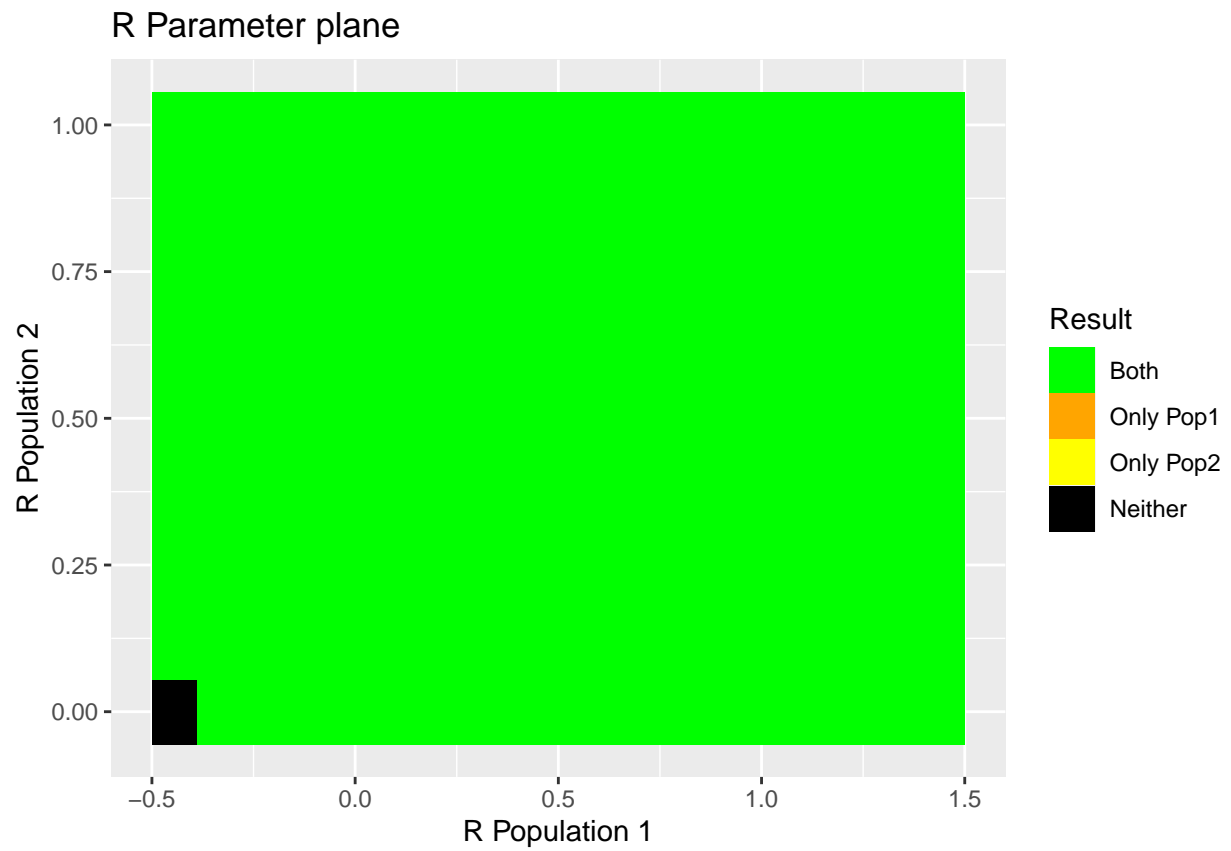


Figure 23: r population planes

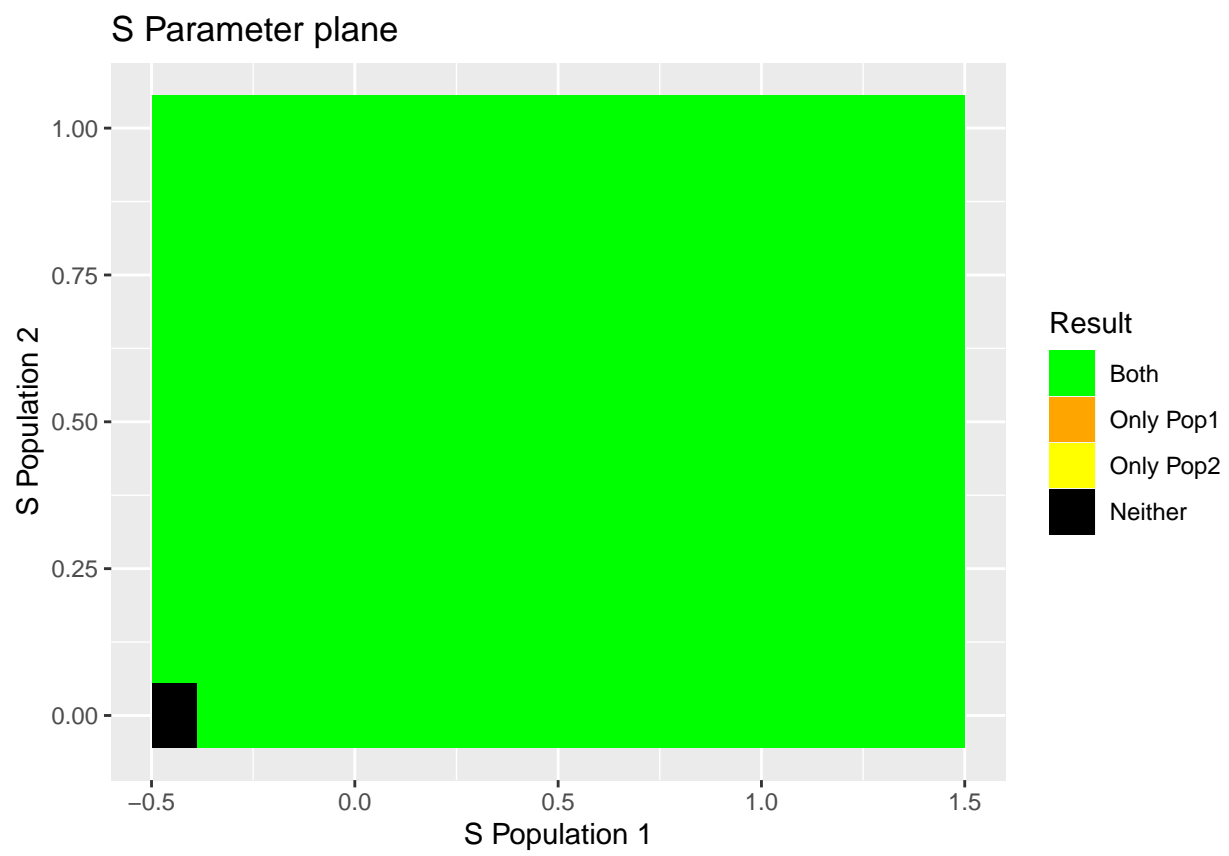


Figure 24: s population planes

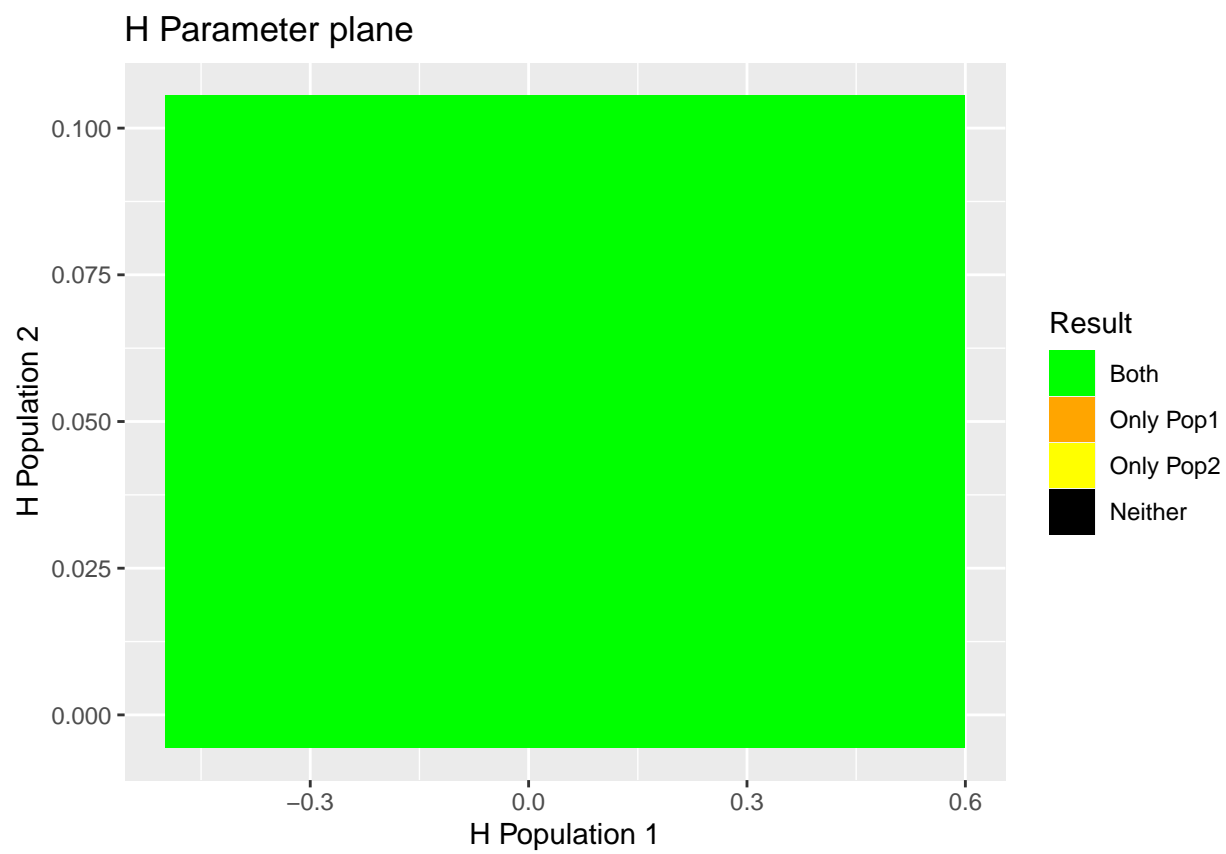


Figure 25: h population planes

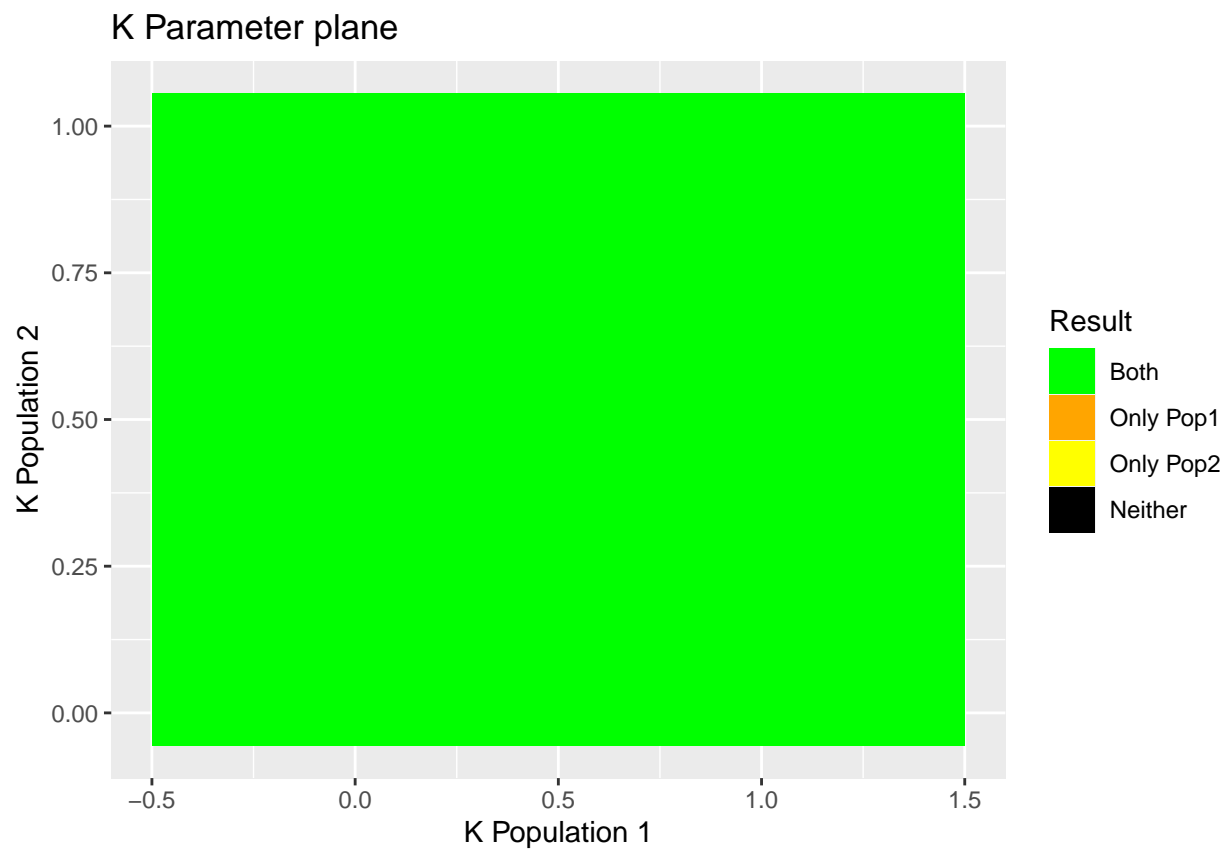


Figure 26: k population planes 0 to 1

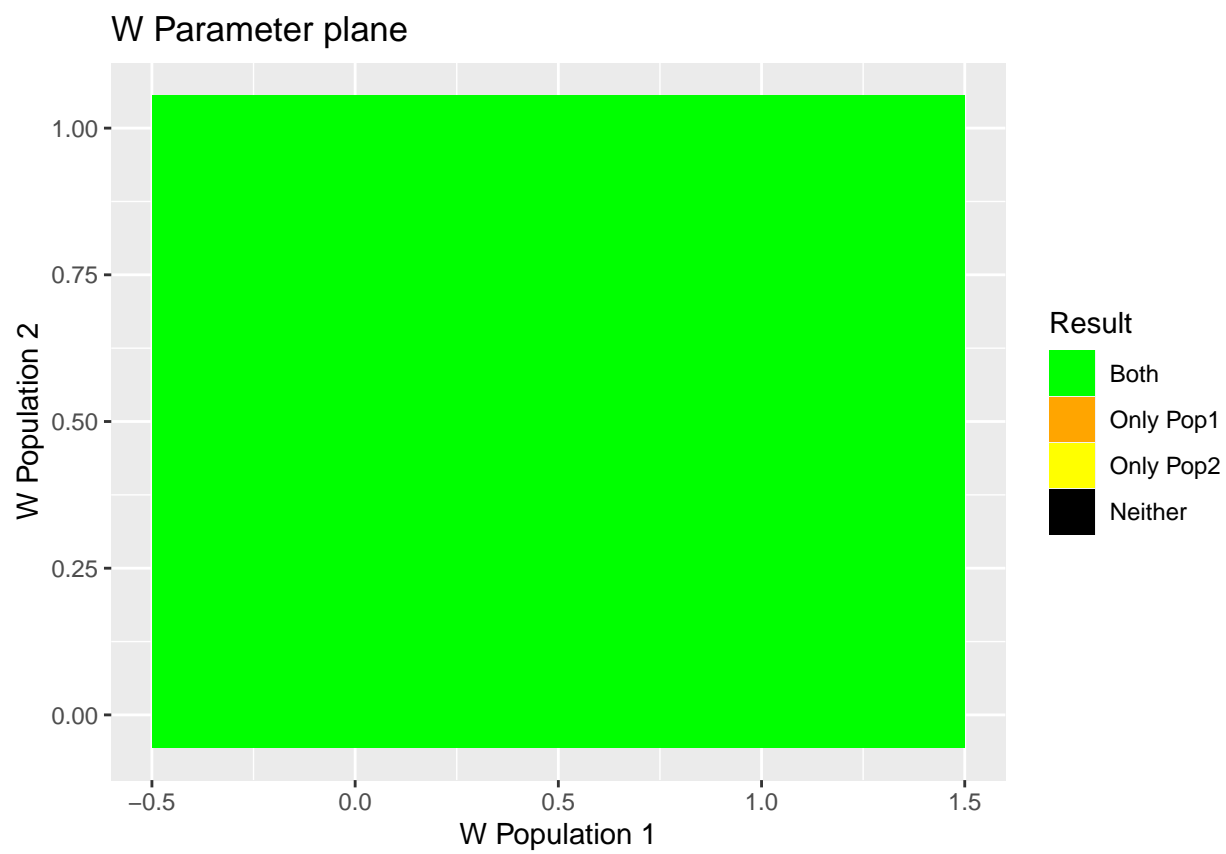


Figure 27: w population planes

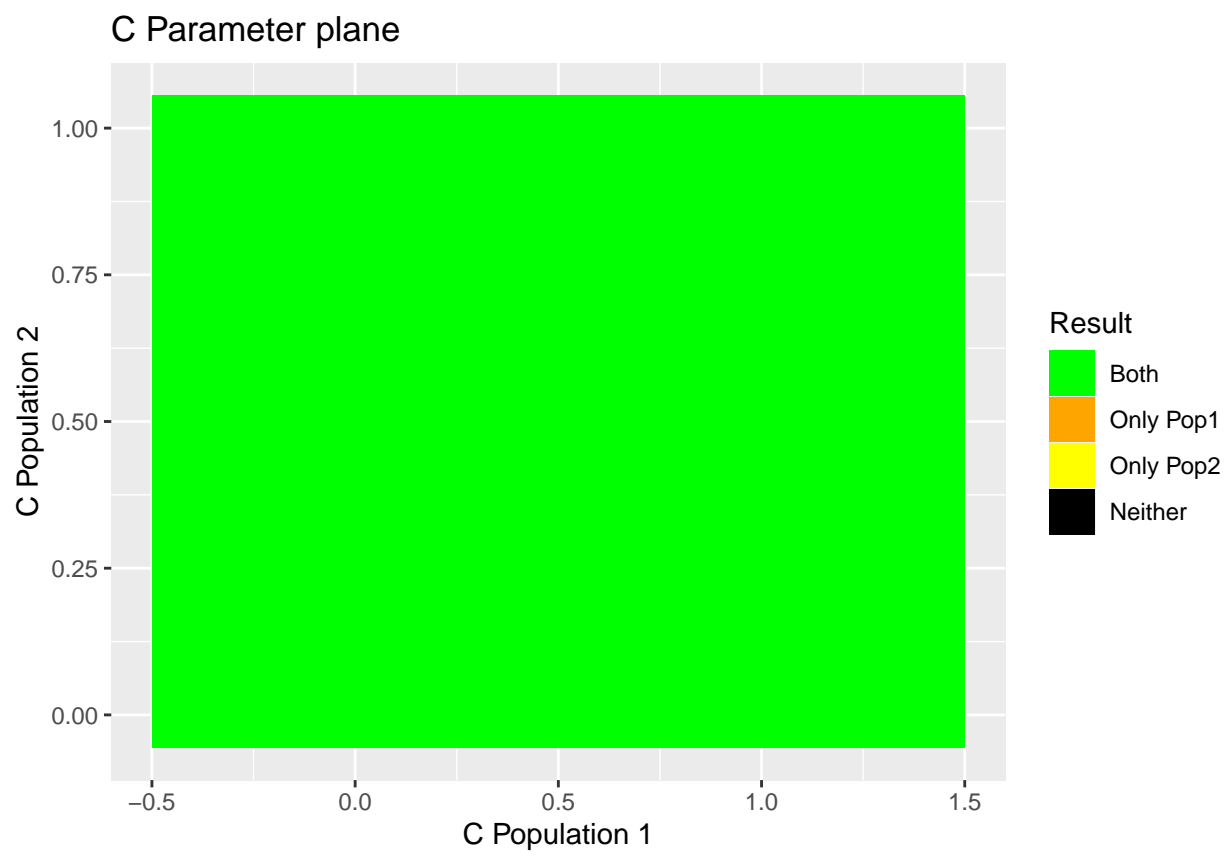


Figure 28: c population planes

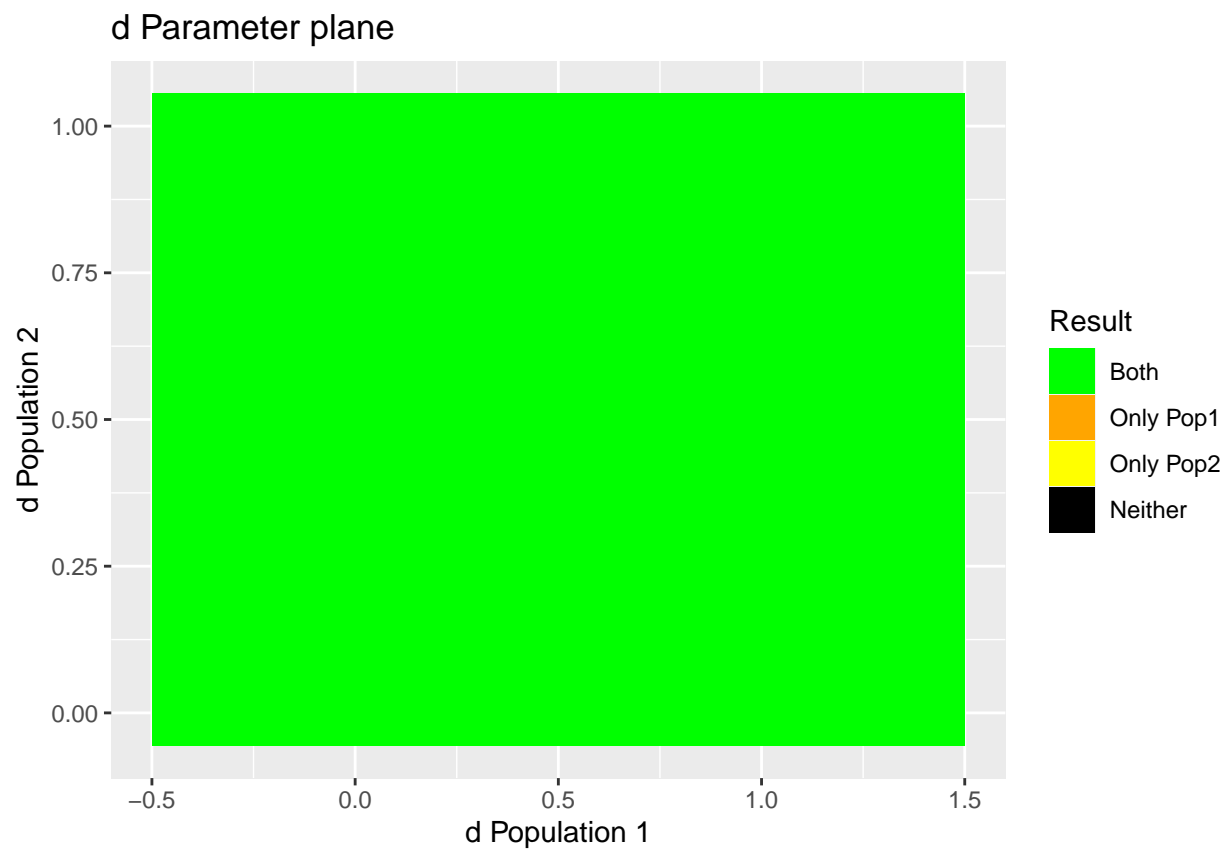


Figure 29: d population planes

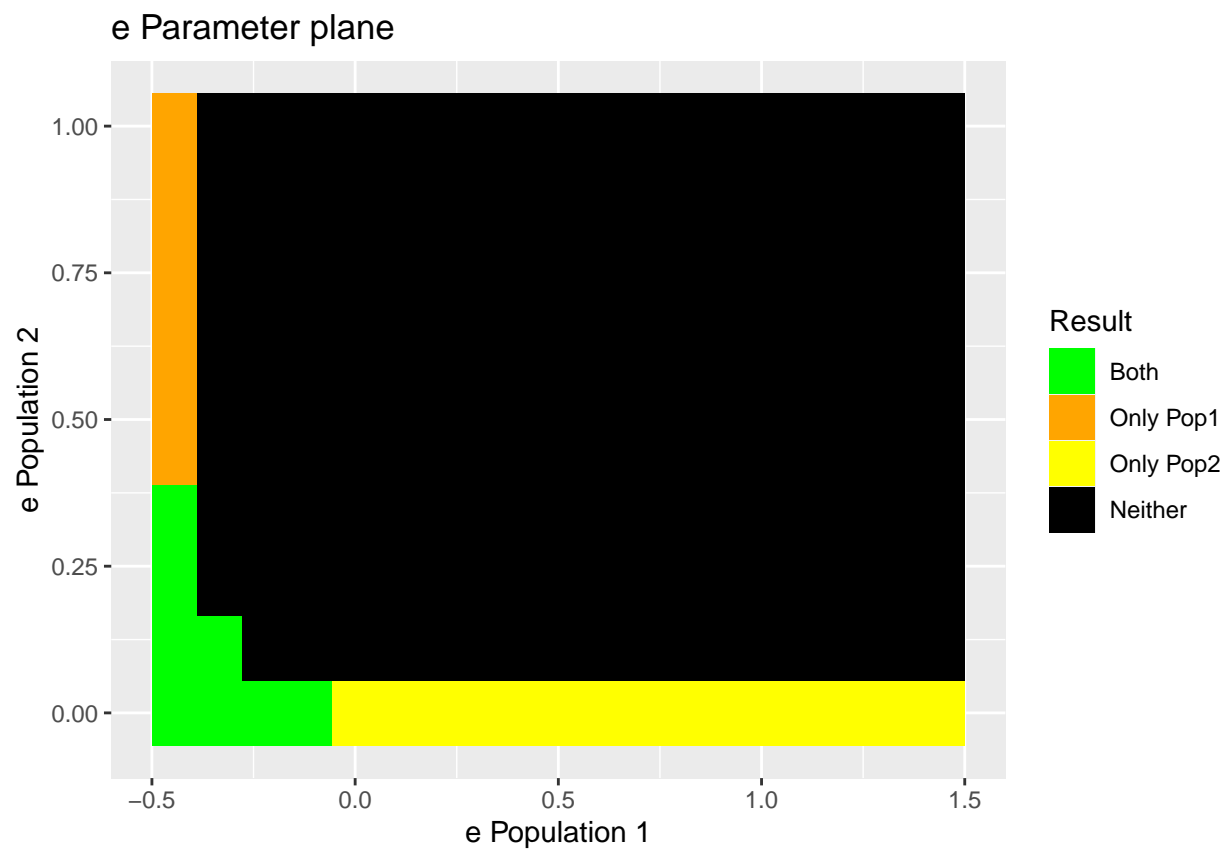


Figure 30: e population planes

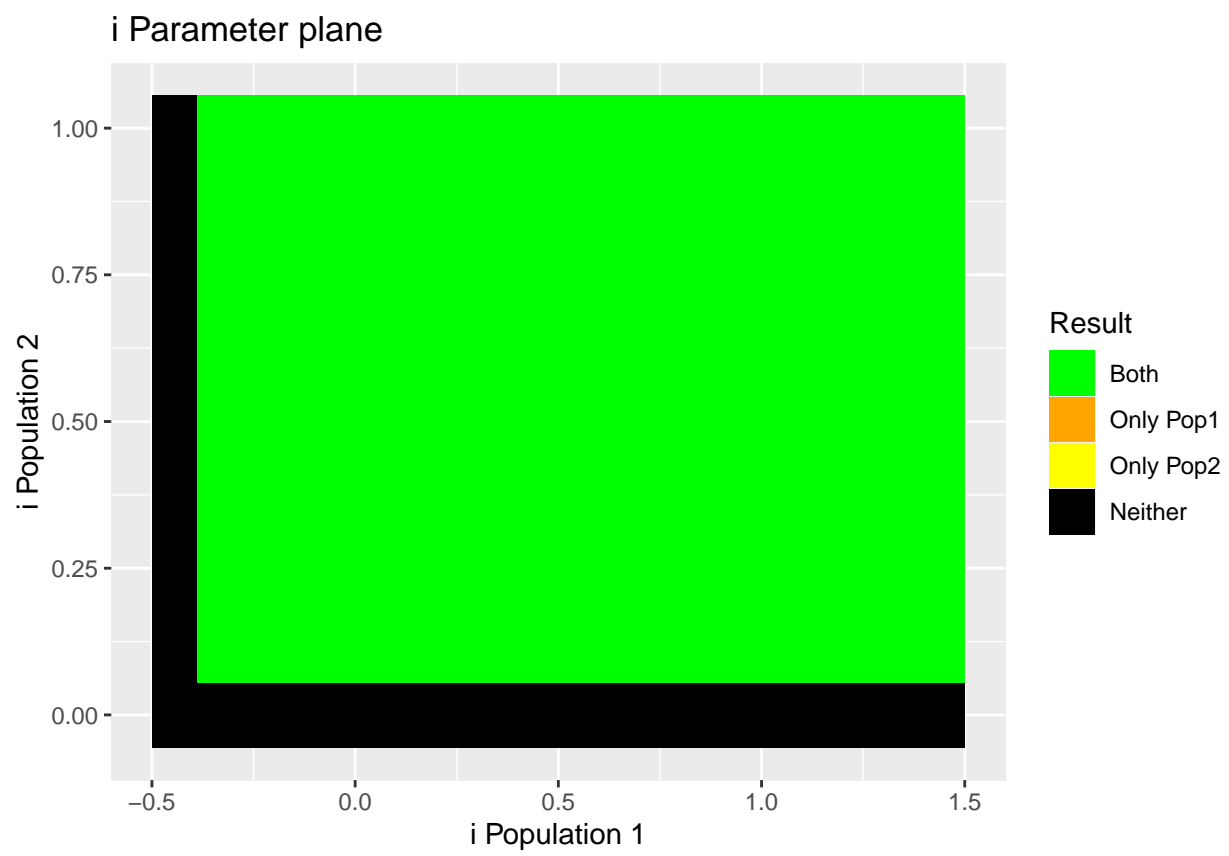


Figure 31: i population planes

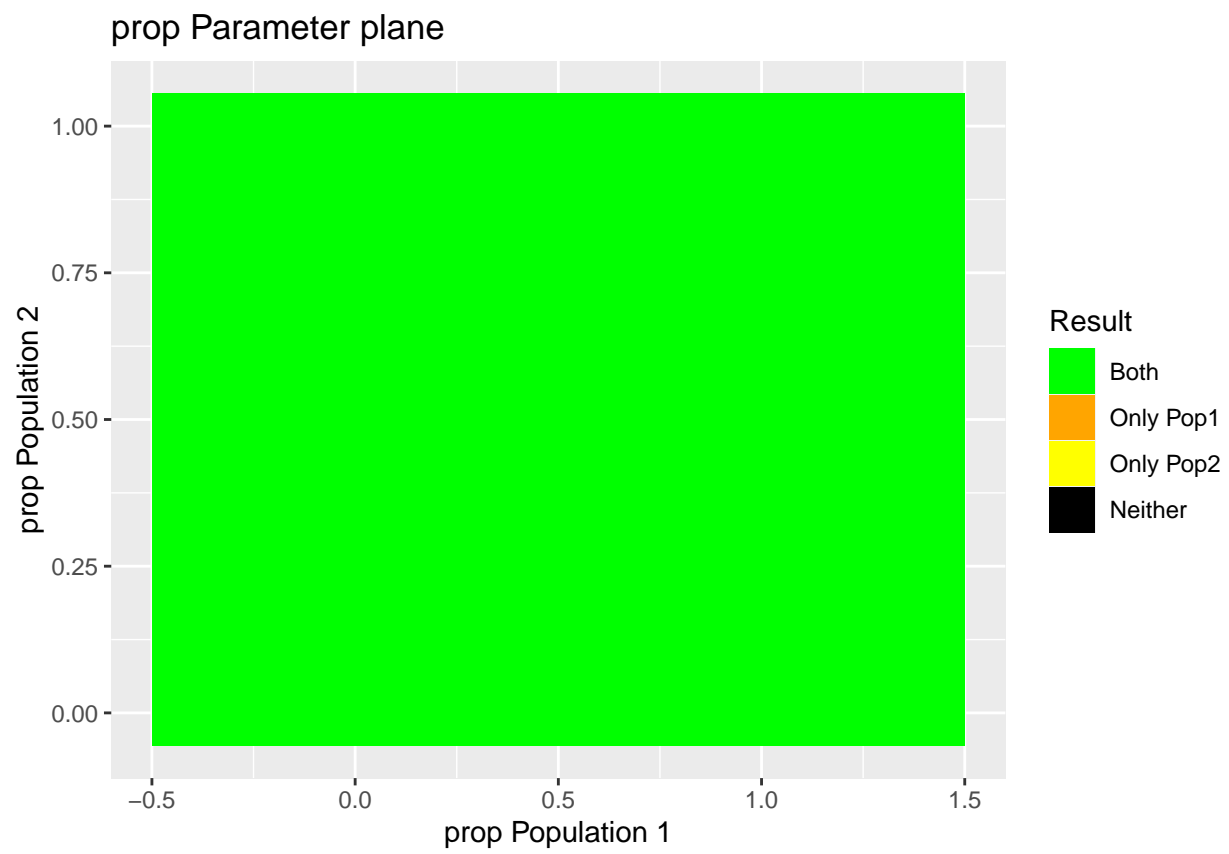


Figure 32: prop population planes