

# BauchModel\_DefaultParamsHighMovement

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Figure 1: Original Bauch Model

Table 1: Parameter values used in this analysis

Parameter	Population_1	Population_2	Def
r	0.35	0.35	Fish net growth
s	0.8	0.8	Supply and demand
h	0.5	0.5	Harvesting efficiency
k	1.014	1.014	Social learning rate
w	0.35	0.35	Conservation cost
c	1.5	1.5	Rarity valuation
d	0.5	0.5	Social norm strength (within pop)
e	0.5	0.5	Fish emigration (from patch)
i	0.5	0.5	Fish immigration (from opposite patch)
prop	0.5	0.5	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: DEFAULTS PARAMS HIGH MOVEMENT

Function:

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

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

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

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

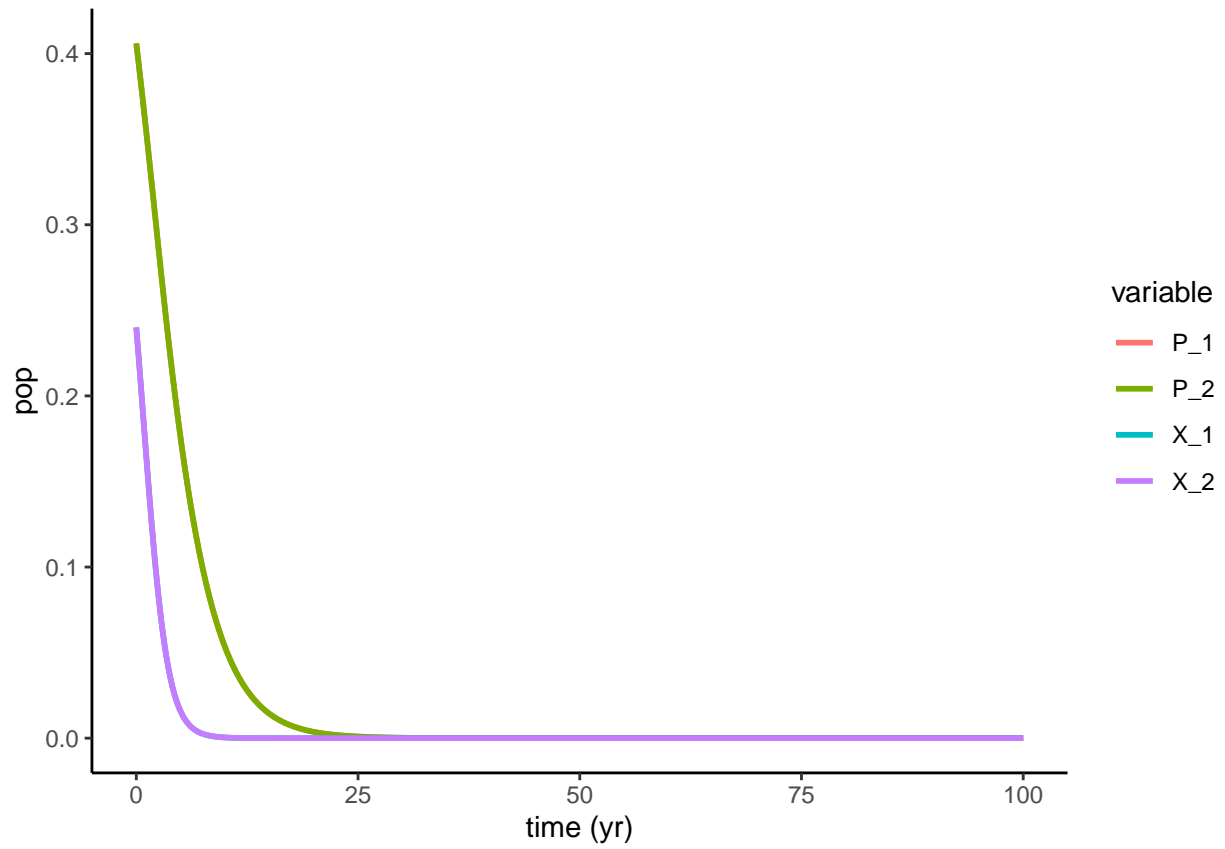


Figure 2: New Model with default paramters

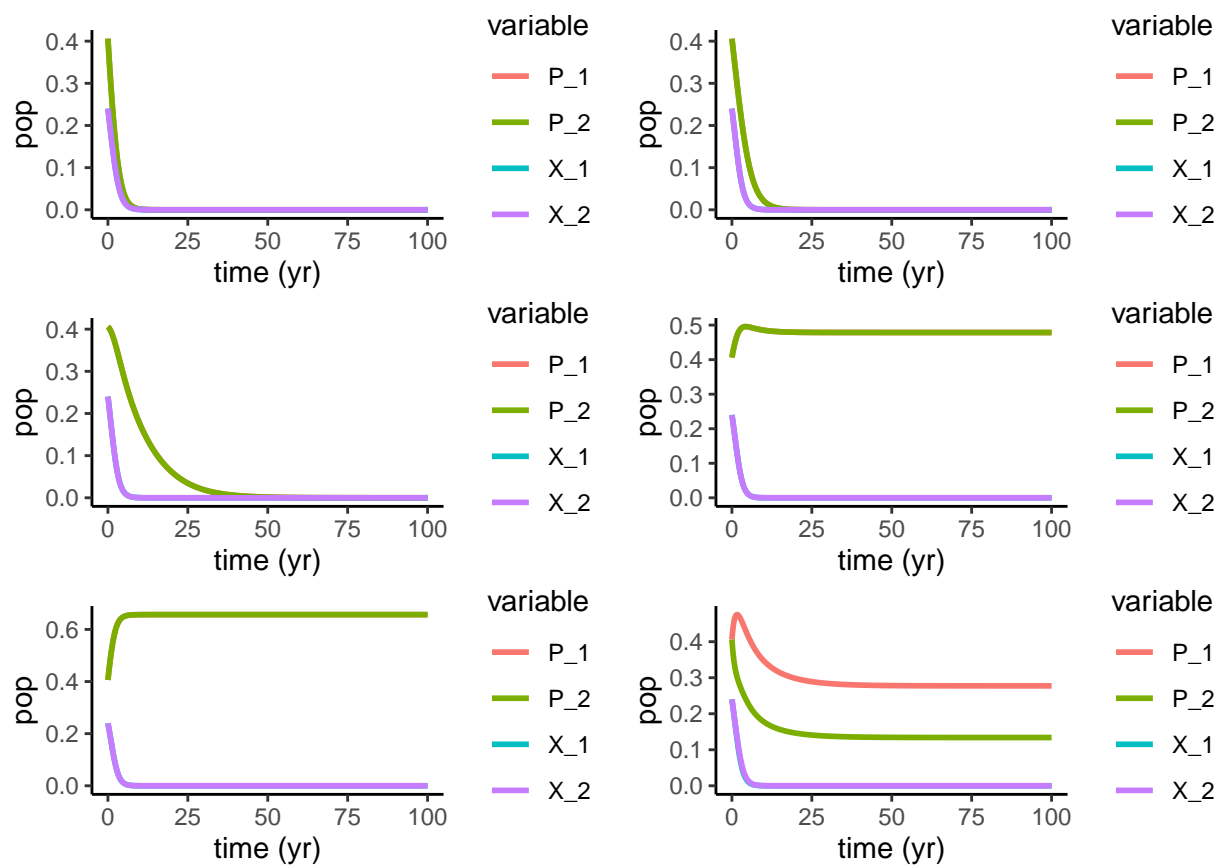


Figure 3: R - Net growth/fecundity, range 0 to 1

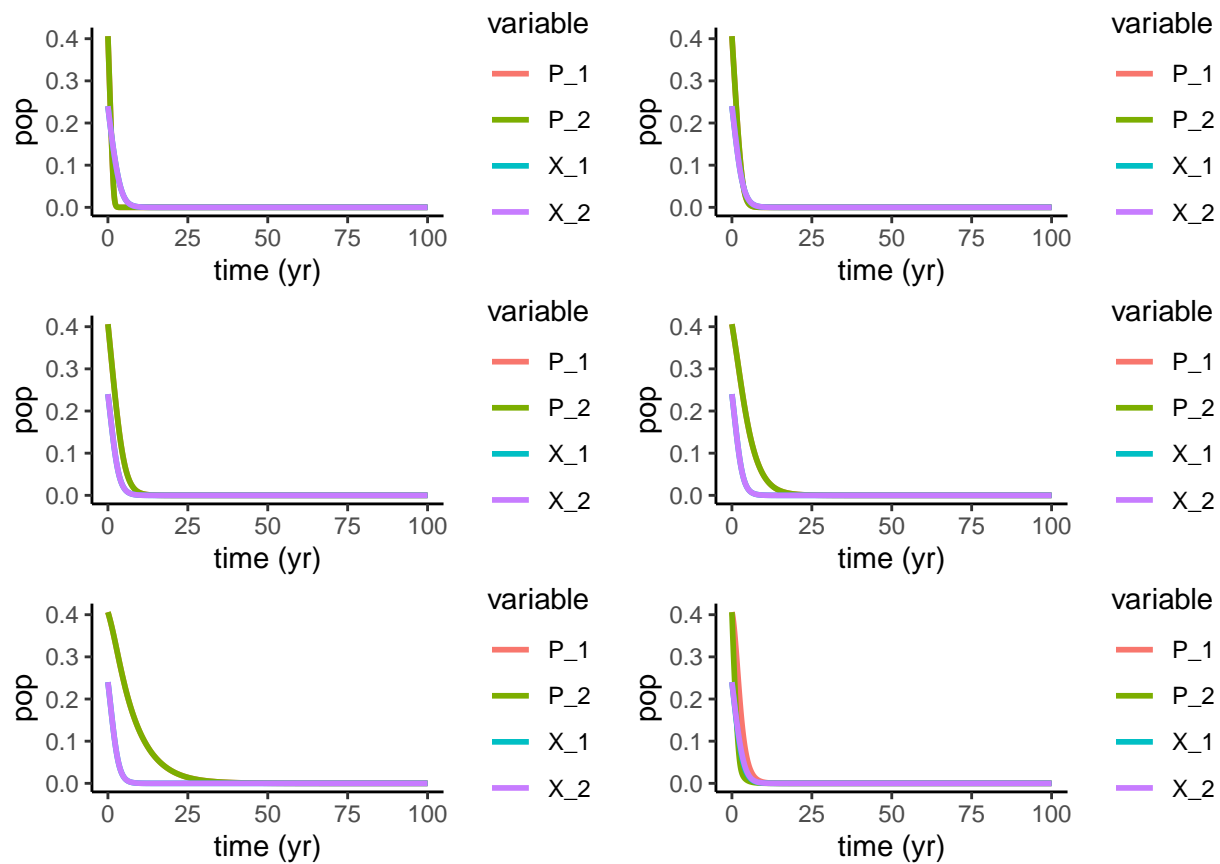


Figure 4: S - supply and demand, range 0.1 to 1

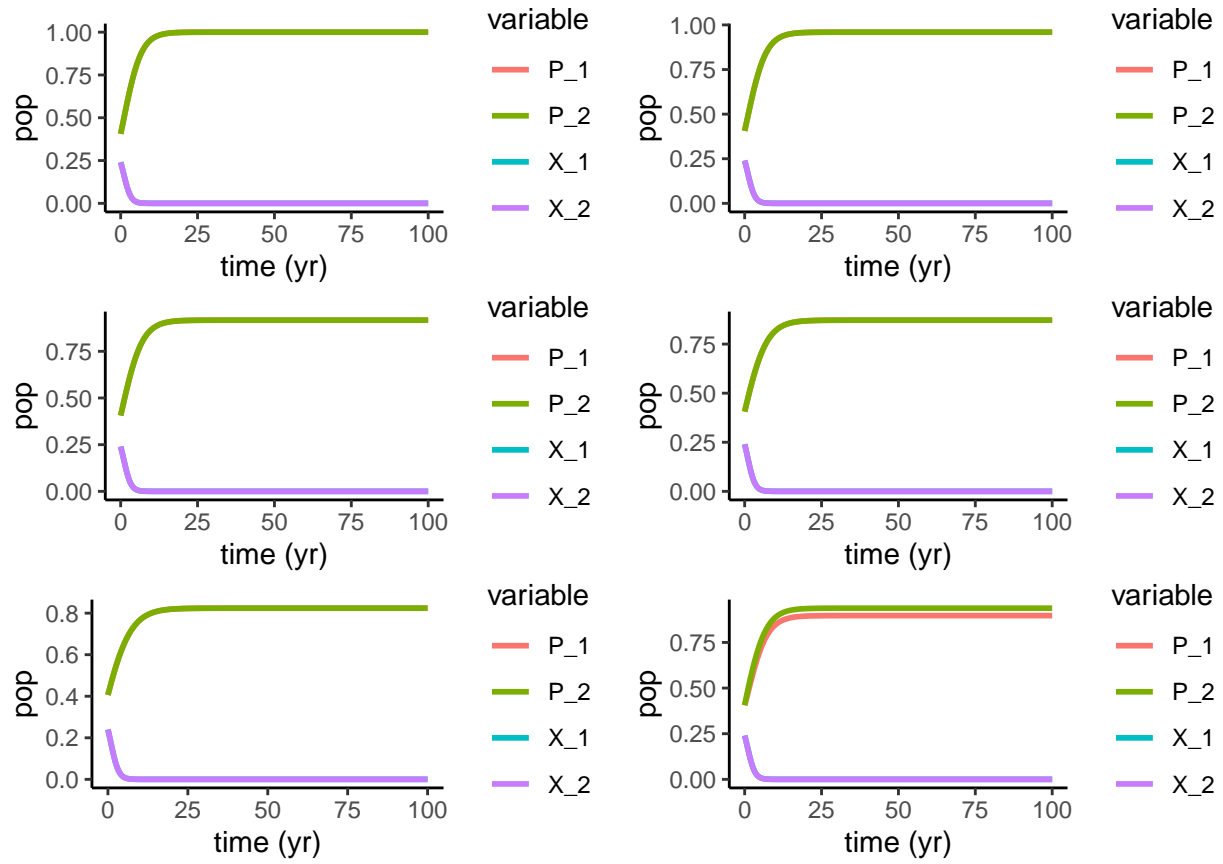


Figure 5:  $h$  - Harvesting efficiency, range 0 to 0.1. Note, default is .075

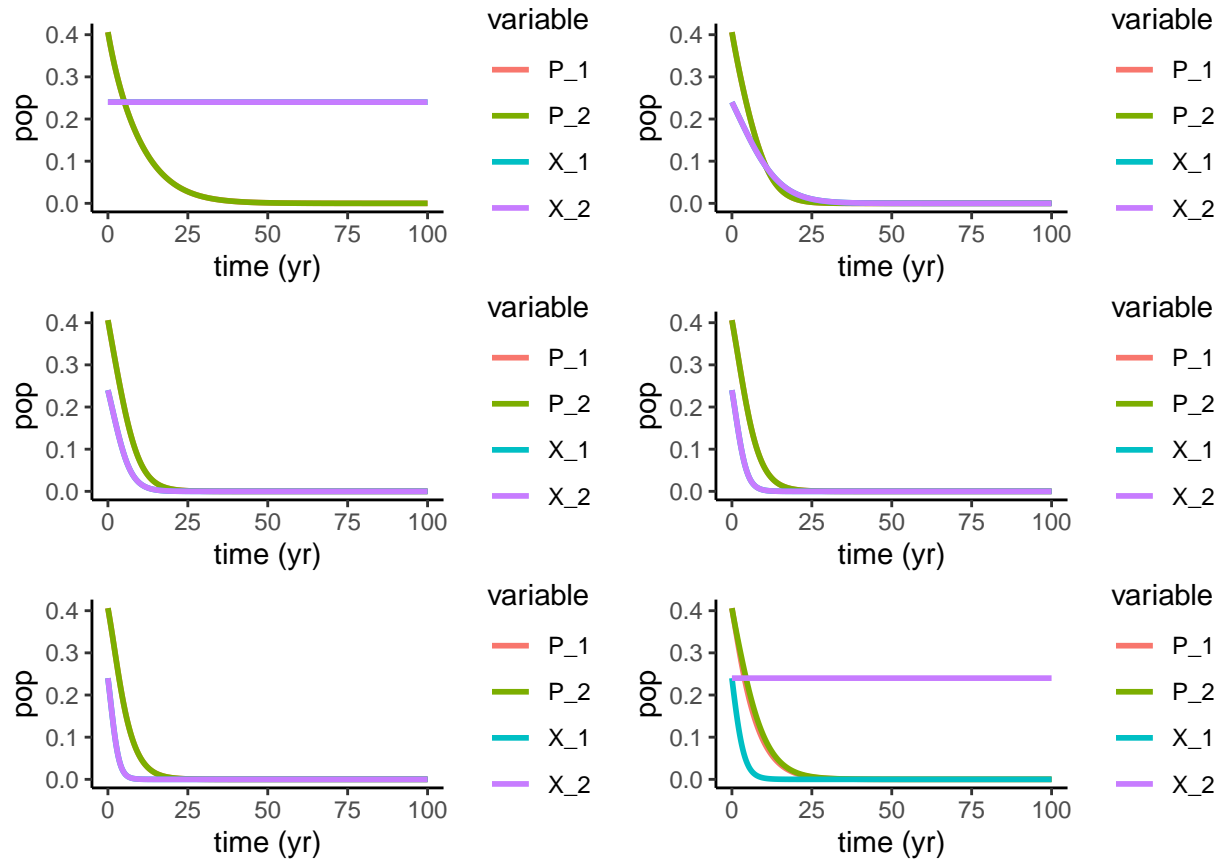


Figure 6: K - Social learning rate 0 to 1

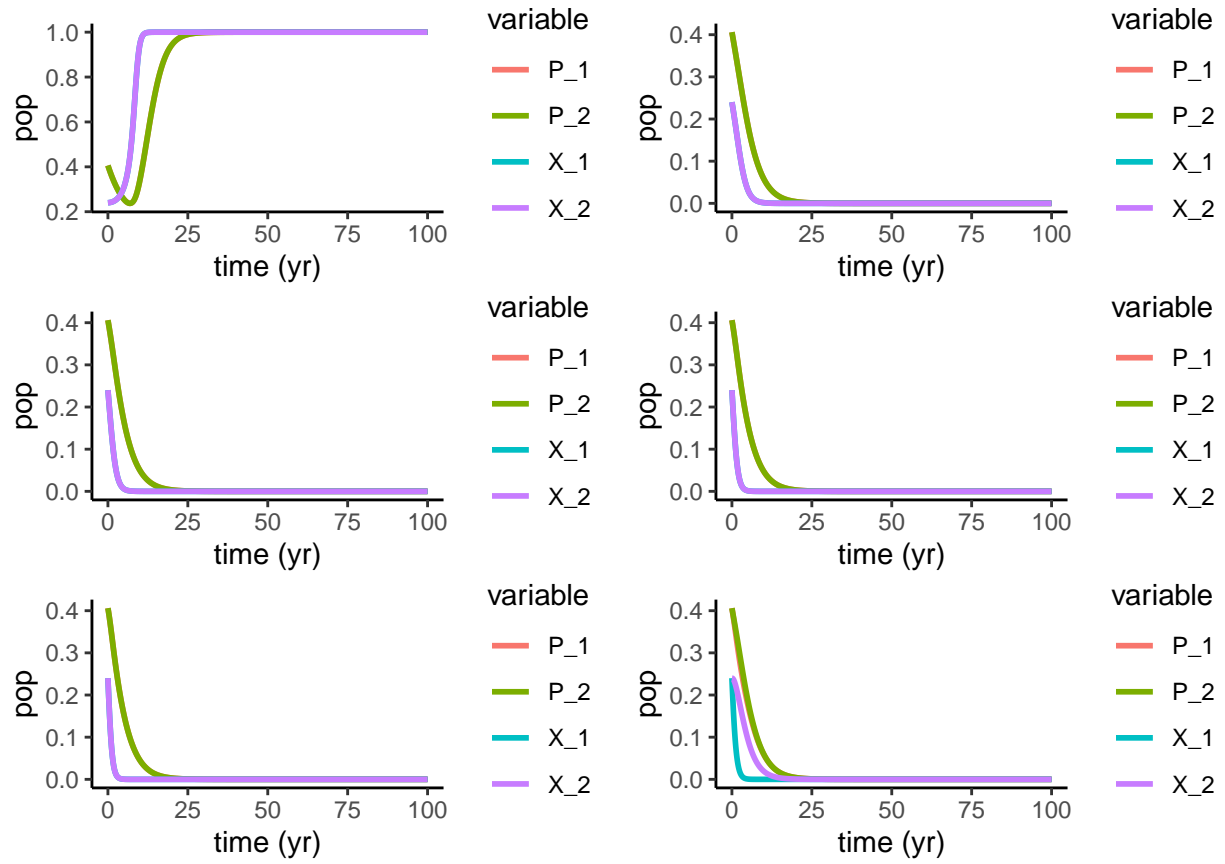


Figure 7: w - conservation costs



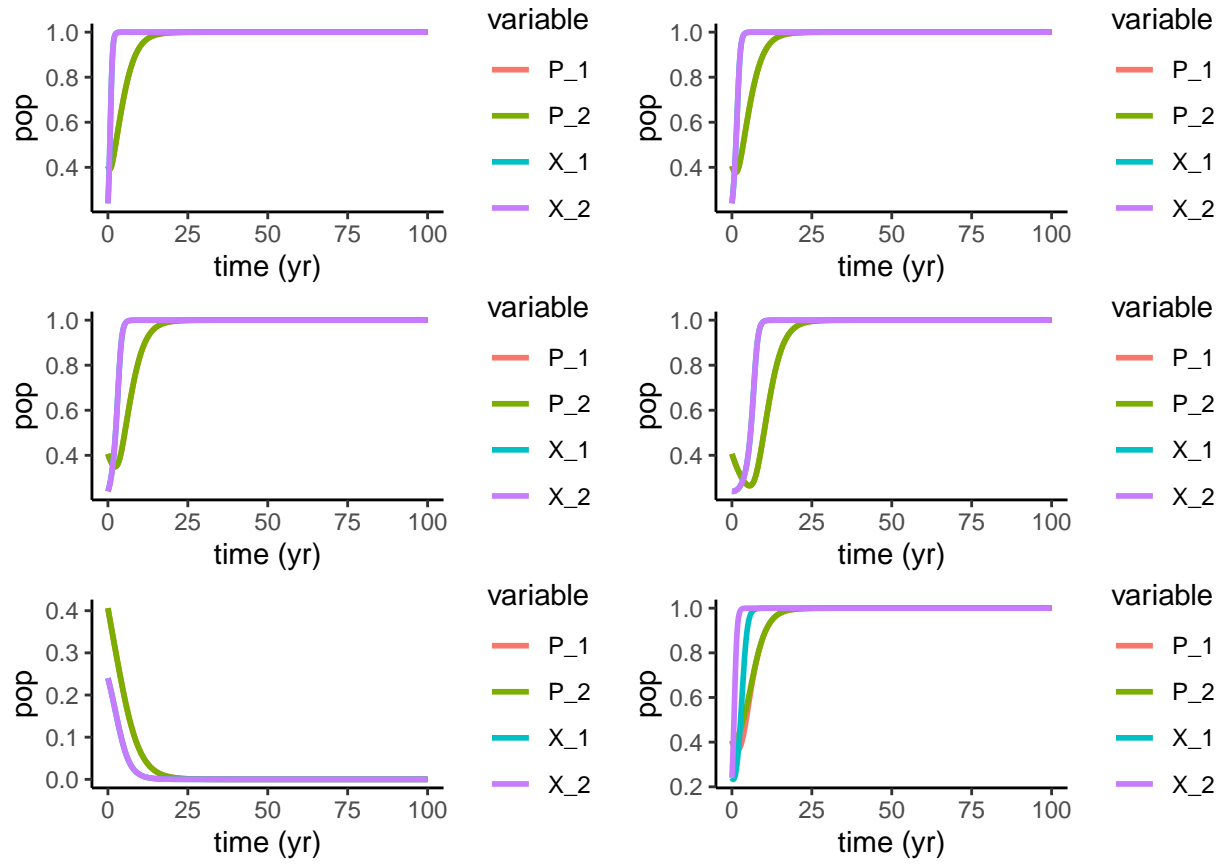


Figure 8: c - rarity valuation param

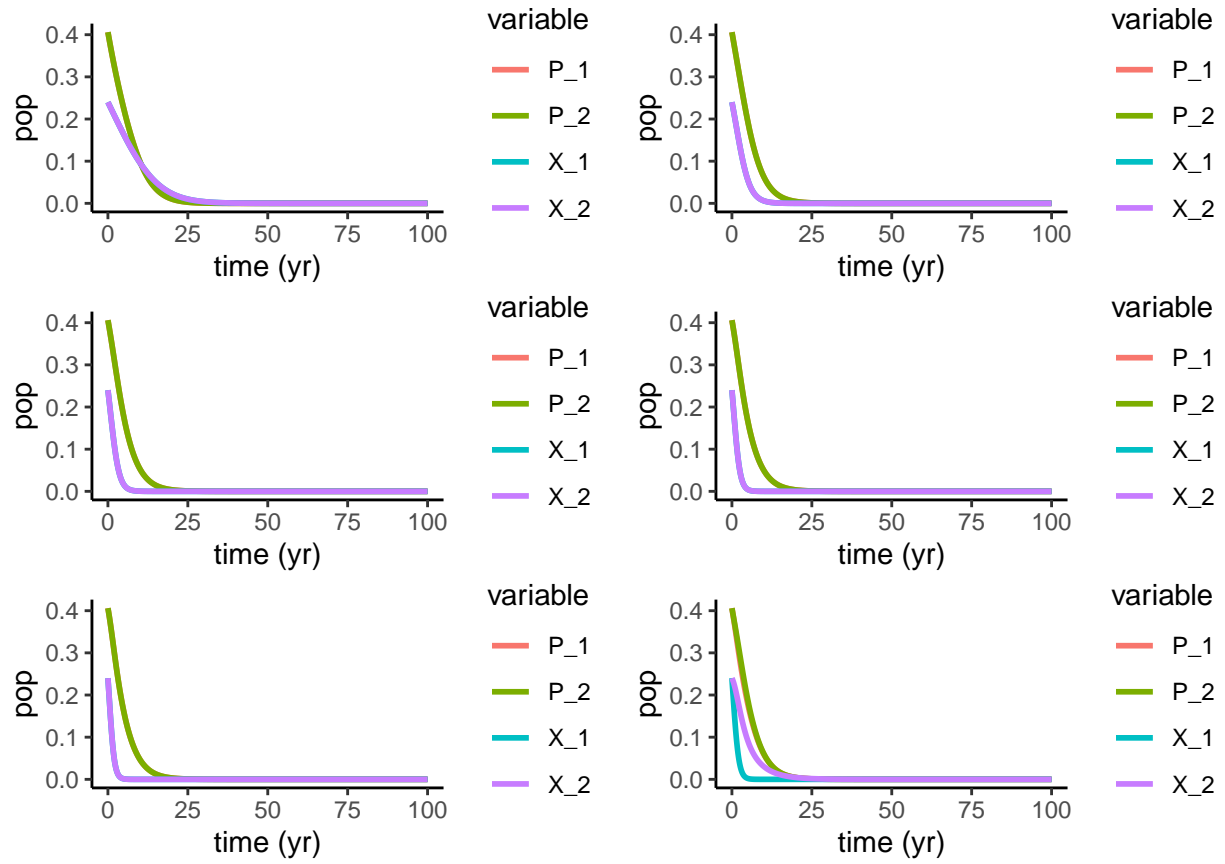


Figure 9: d - social norm strength

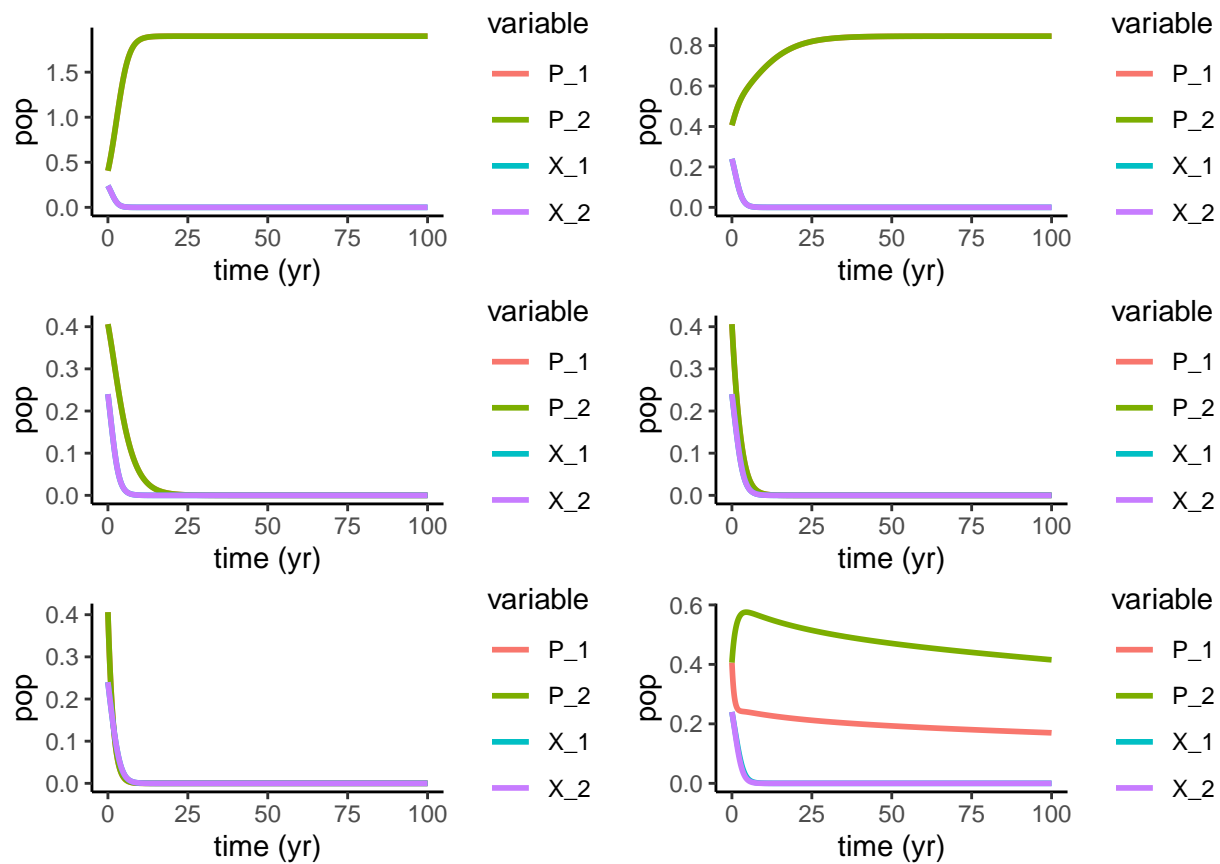


Figure 10: e - fish emigration

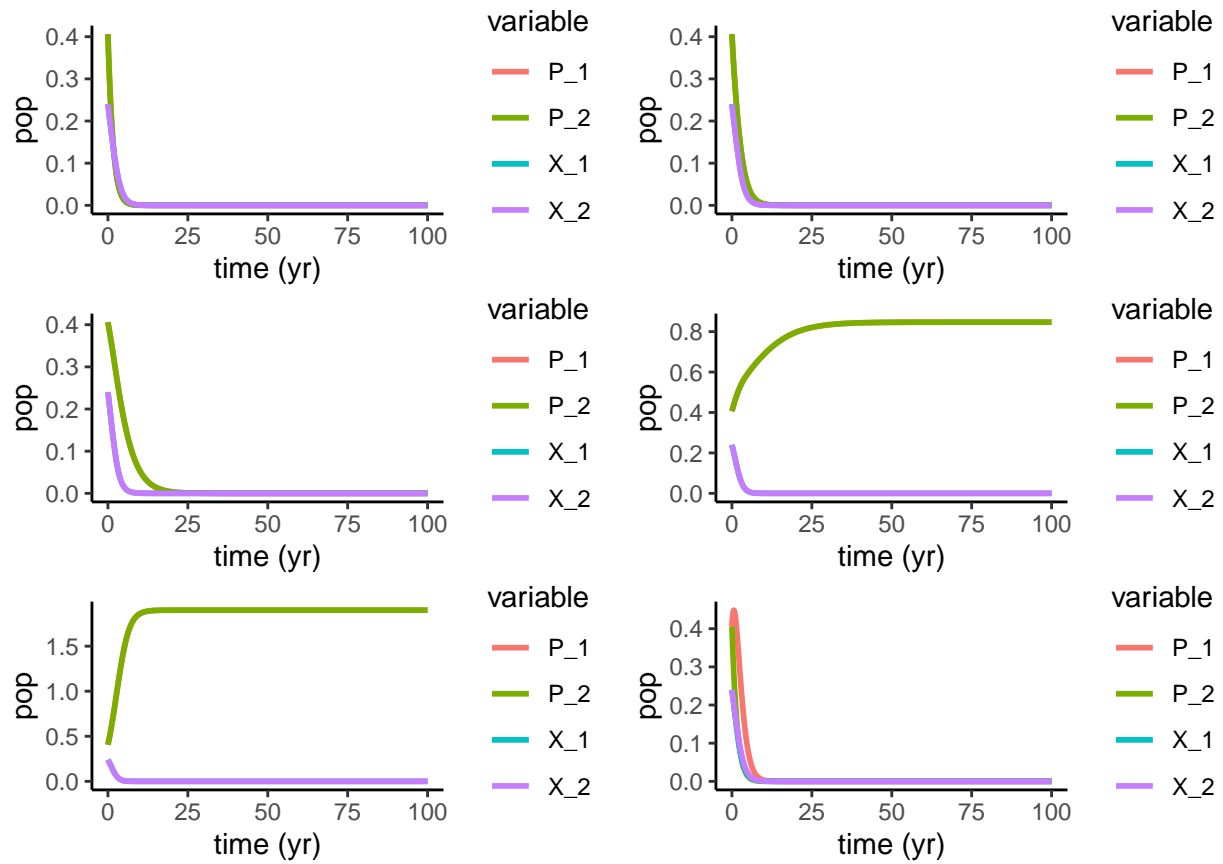


Figure 11: i - fish immigration

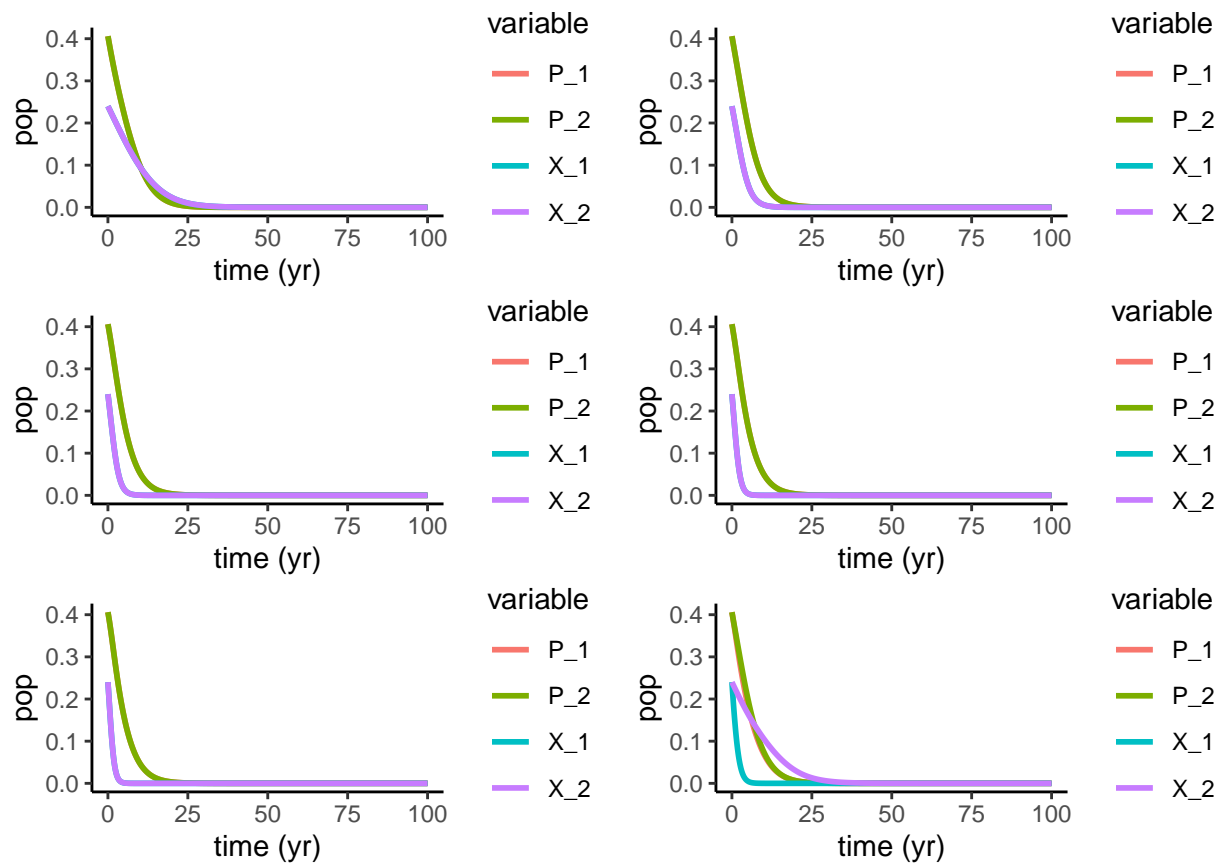


Figure 12: prop - Population influence on the other

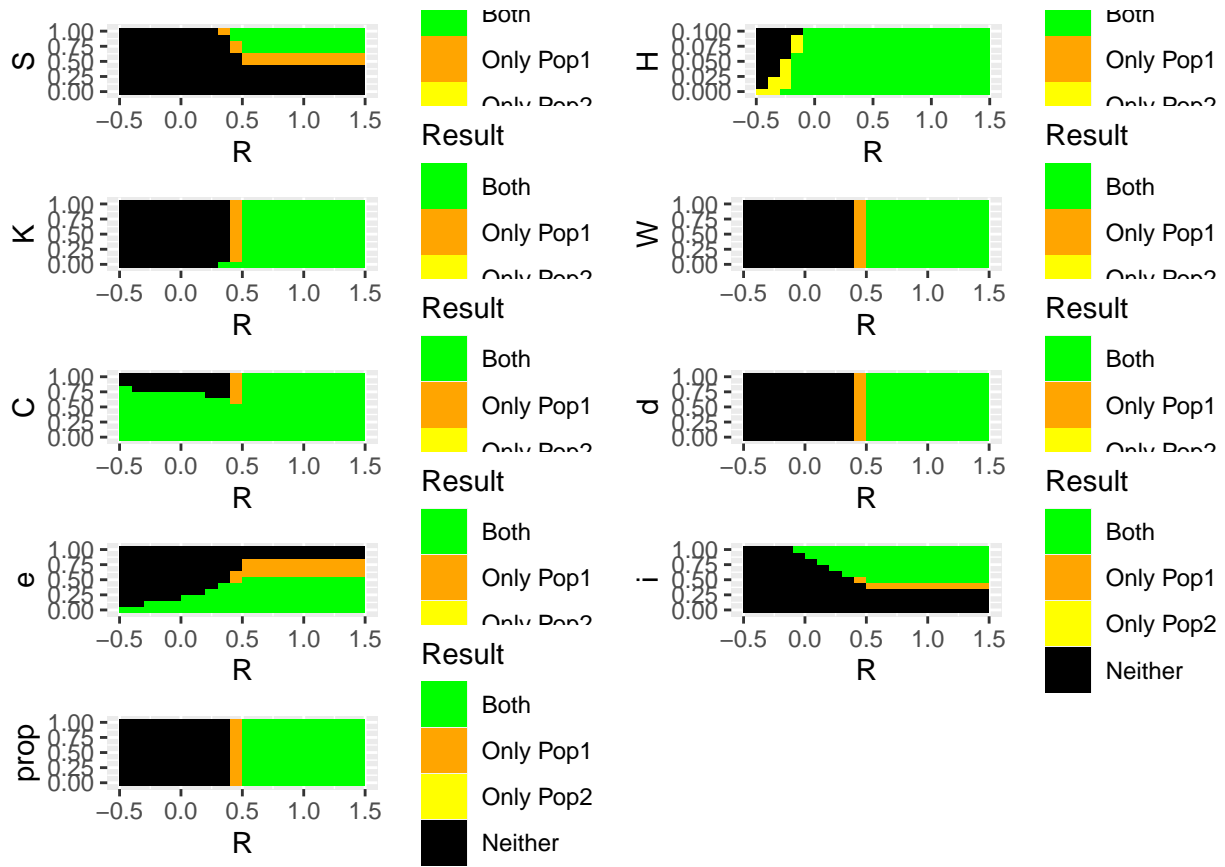


Figure 13: R parameter planes

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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 = 86.2475, R2 = 6.56402e-15
##
## 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 = 86.2475, R2 = 6.56402e-15
##
## 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 = 86.2475, R2 = 5.43723e-15
##
## 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 = 86.2475, R2 = 5.43723e-15
##
## 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 = 86.2475, R2 = 5.43723e-15
##
## 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 = 86.2475, R2 = 4.34652e-15
##
## 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 = 86.2475, R2 = 4.34652e-15
##
## 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 = 86.2475, R2 = 3.60038e-15
##
## 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 = 86.2475, R2 = 3.60038e-15
##
## 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 = 86.2475, R2 = 3.60038e-15
##
## 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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## DLSODA- At current T (=R1), MXSTEP (=I1) steps
##         taken on this call before reaching TOUT
## In above message, I1 = 5000
##
## In above message, R1 = 86.2475
##

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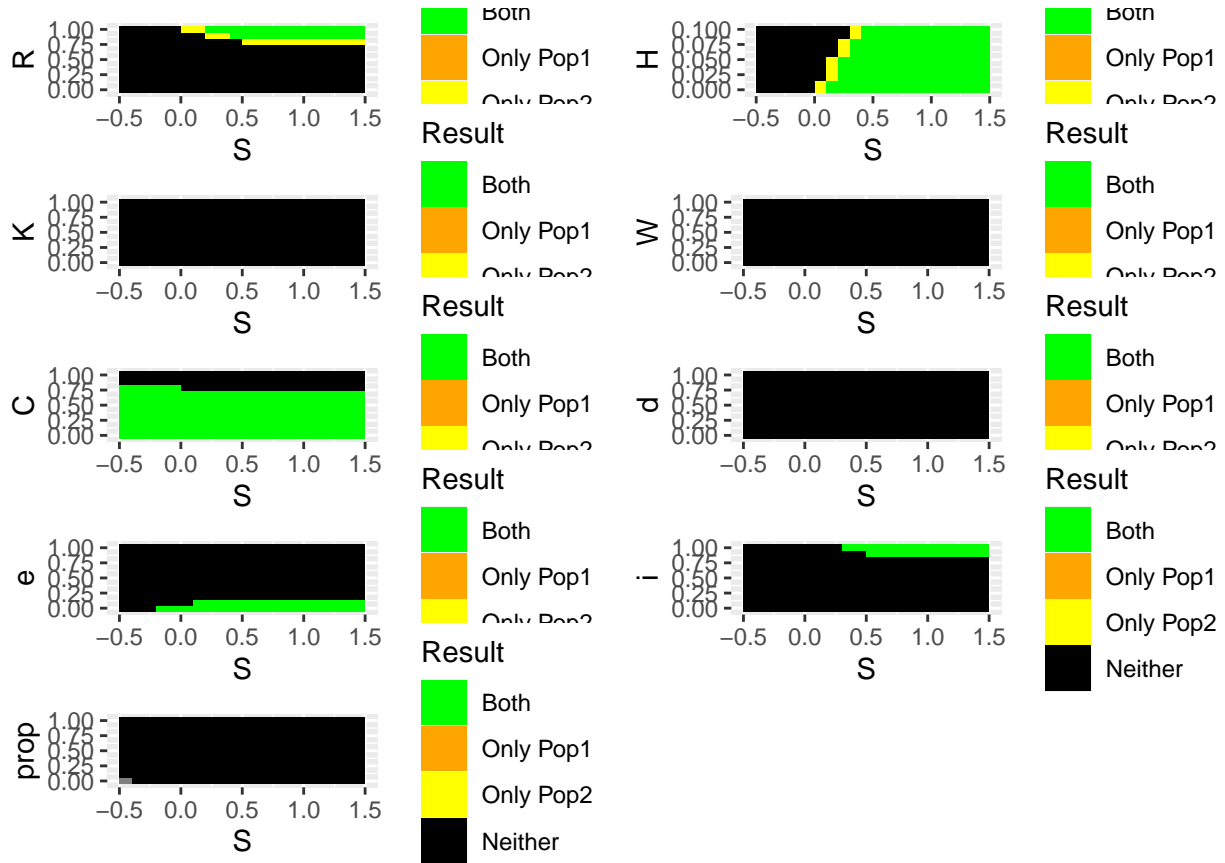


Figure 14: S parameter planes



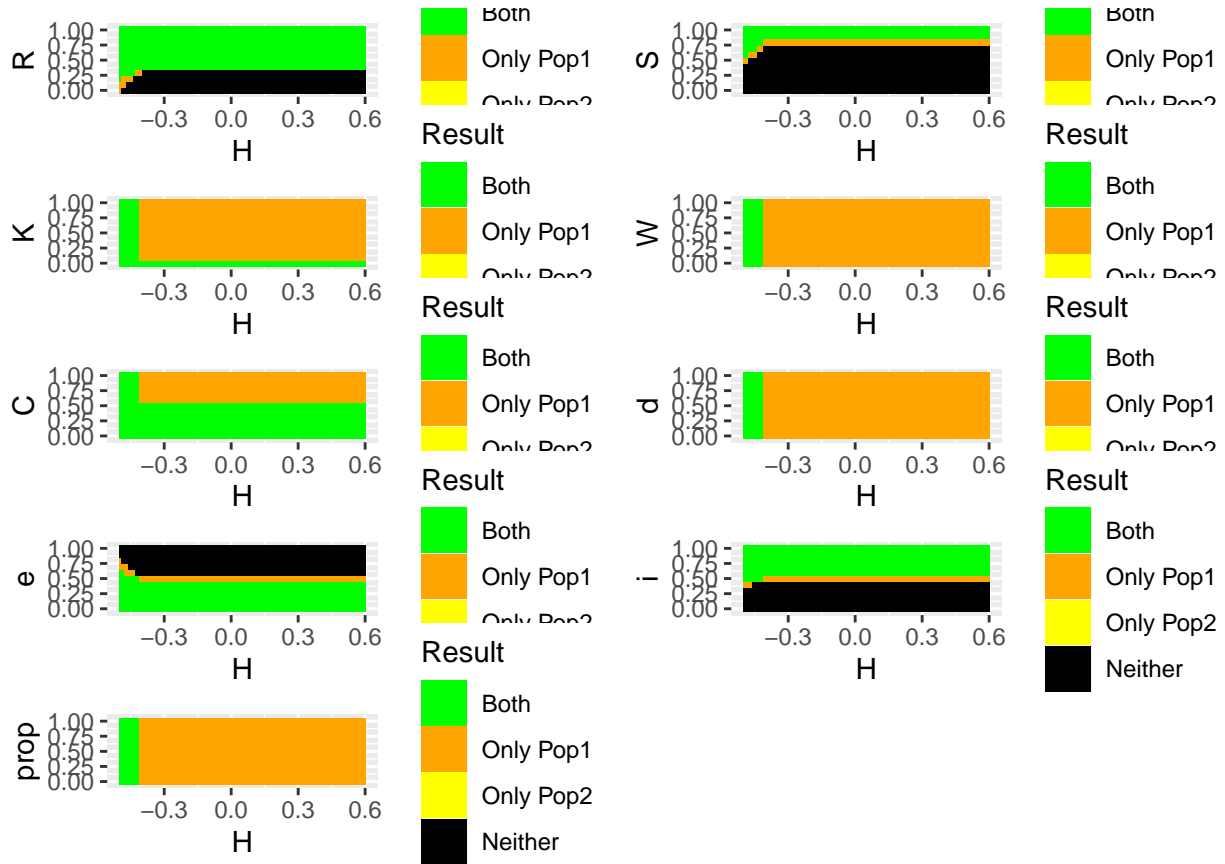


Figure 15: h parameter planes

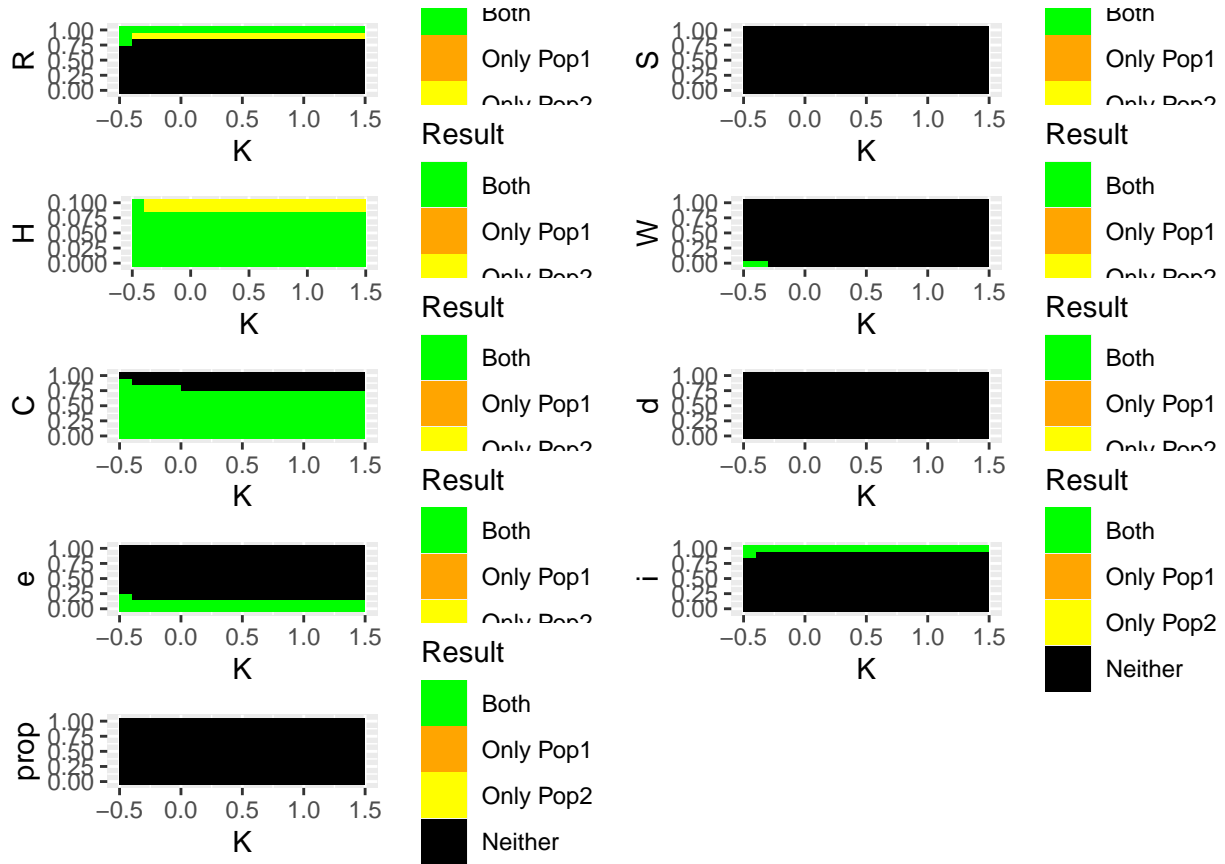


Figure 16: K parameter planes ranging from 0-1

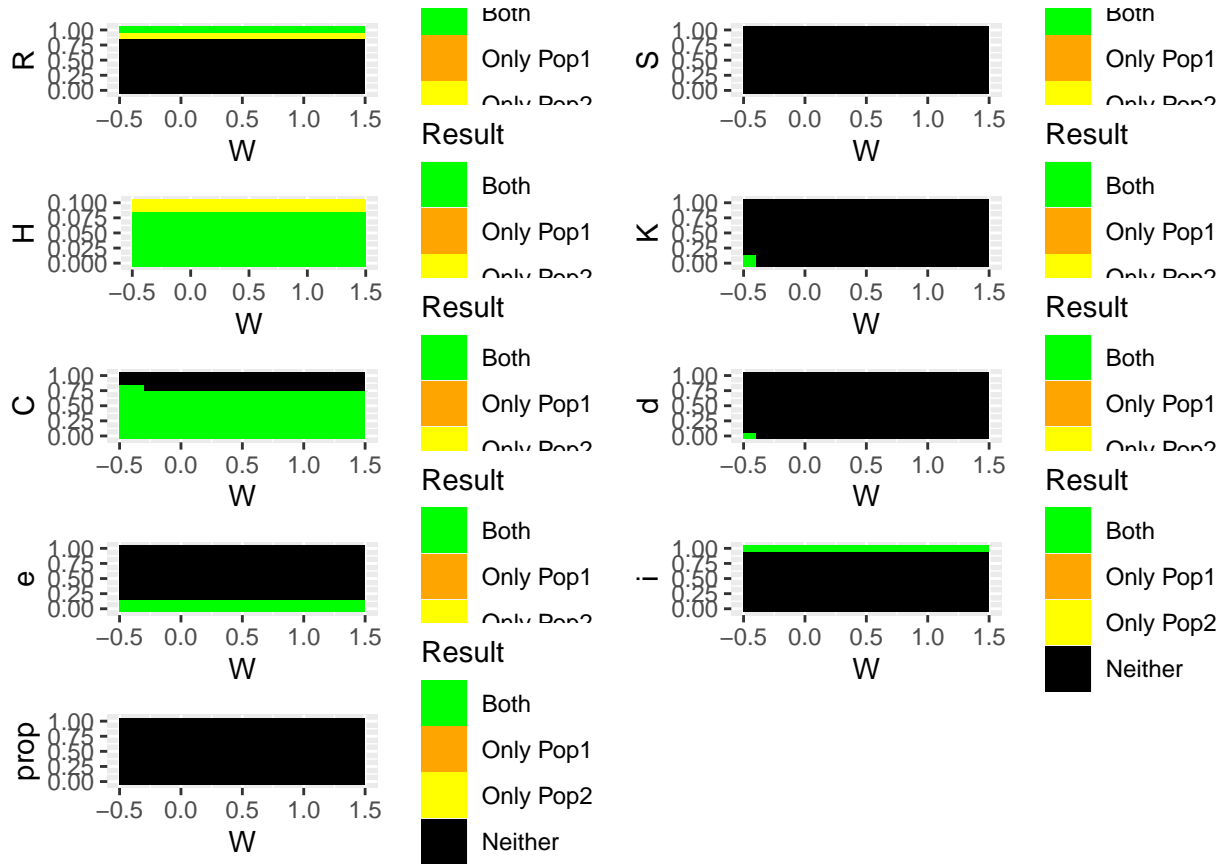


Figure 17:  $w$  parameter planes

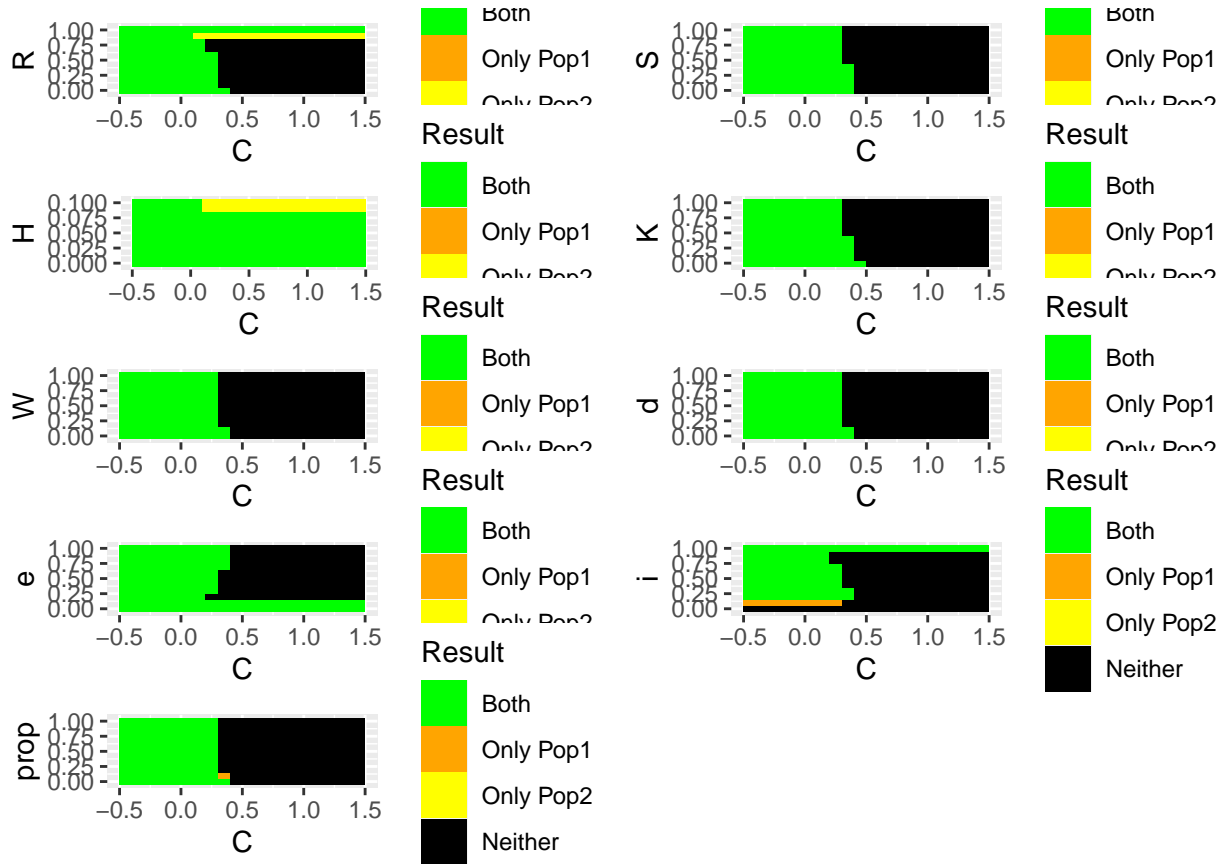


Figure 18: c parameter planes

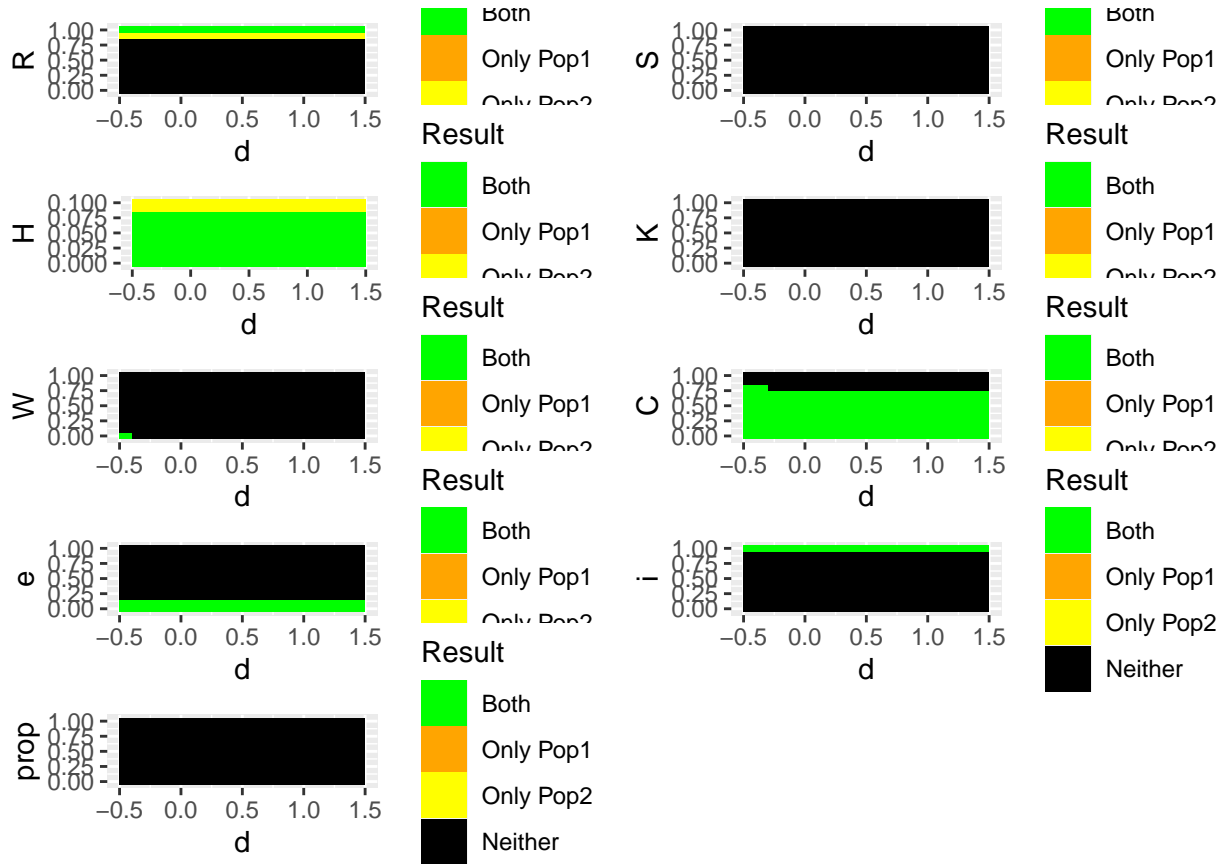


Figure 19:  $d$  parameter planes

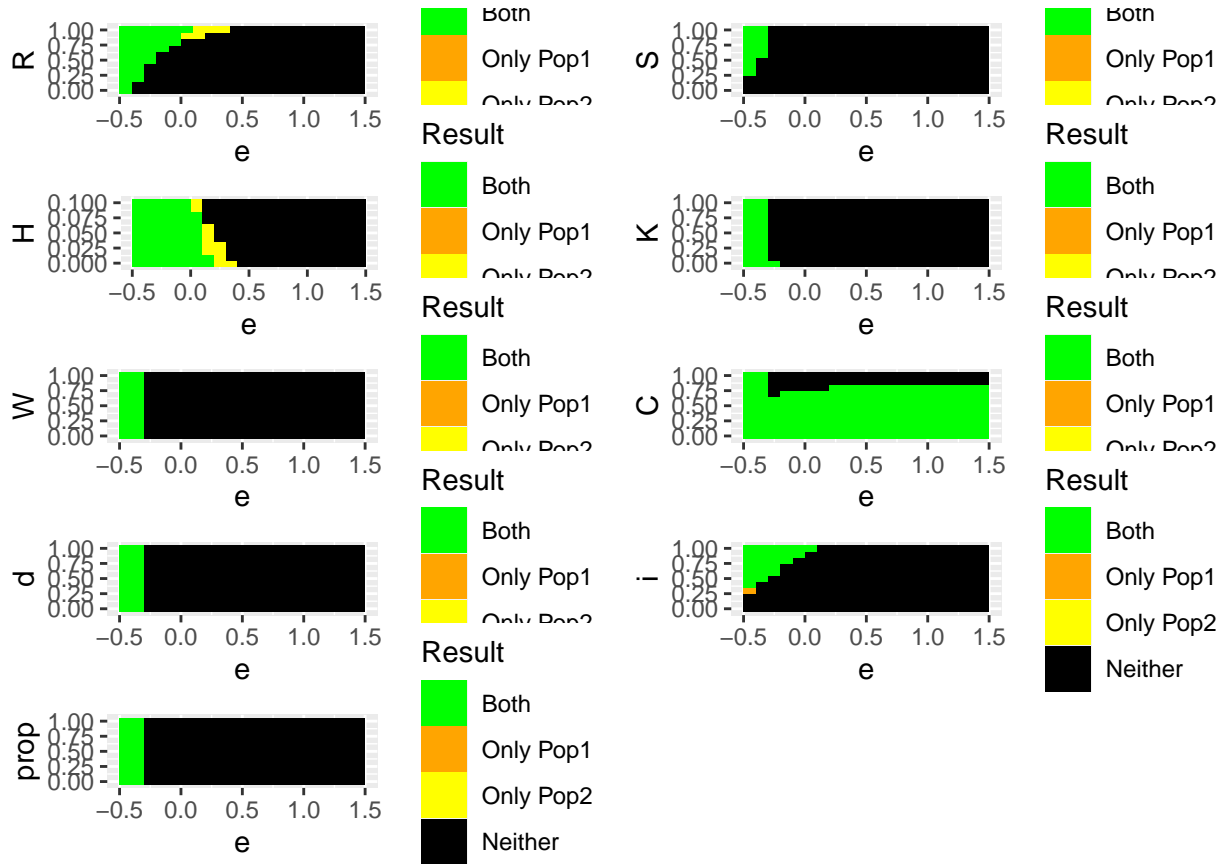


Figure 20: e parameter planes

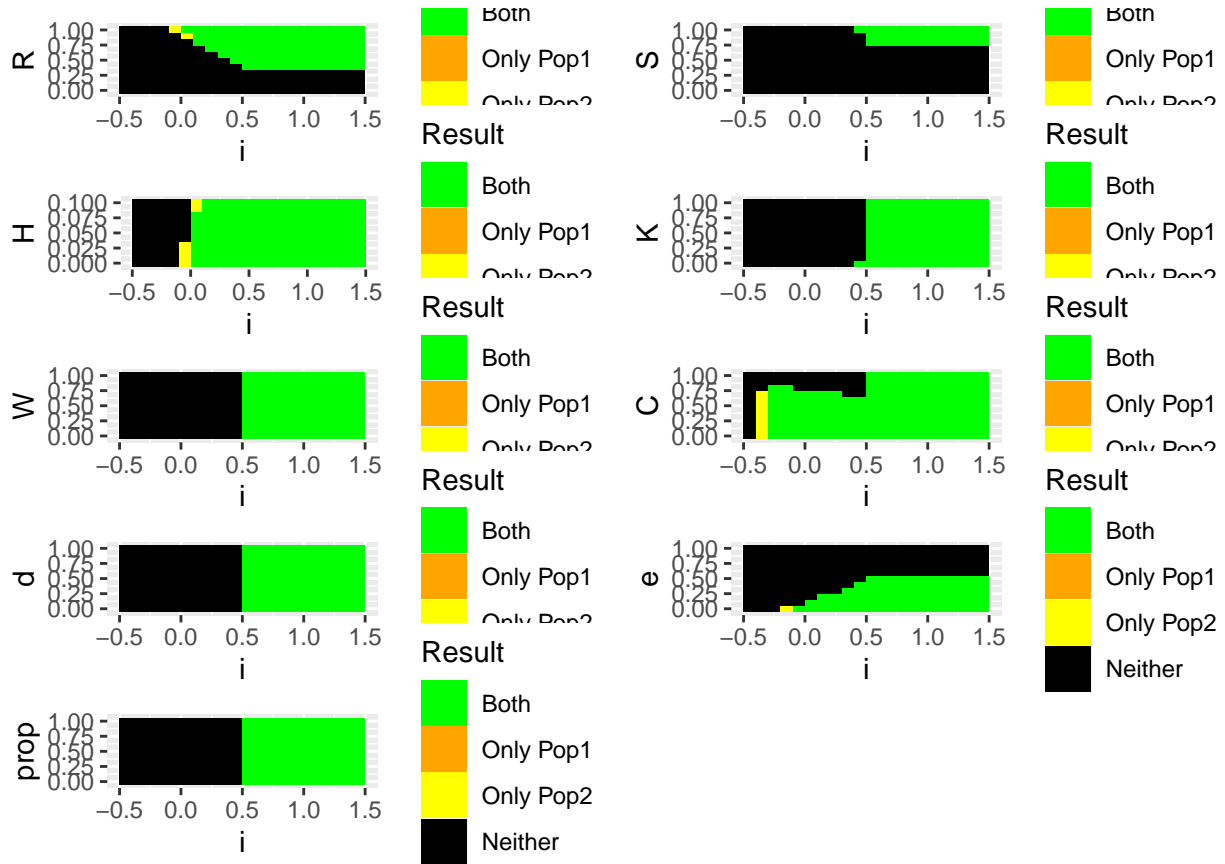


Figure 21:  $i$  parameter planes

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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 = 86.2475, R2 = 6.56401e-15
##
## 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 = 86.2475, R2 = 6.56401e-15
##
## 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 = 86.2475, R2 = 5.43722e-15
##
## 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 = 86.2475, R2 = 5.43722e-15
##
## 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 = 86.2475, R2 = 5.43722e-15
##
## 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 = 86.2475, R2 = 4.34651e-15
##
## 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 = 86.2475, R2 = 4.34651e-15
##
## 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 = 86.2475, R2 = 3.60038e-15
##
## 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 = 86.2475, R2 = 3.60038e-15
##
## 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 = 86.2475, R2 = 3.60038e-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 = 86.2475
##

```

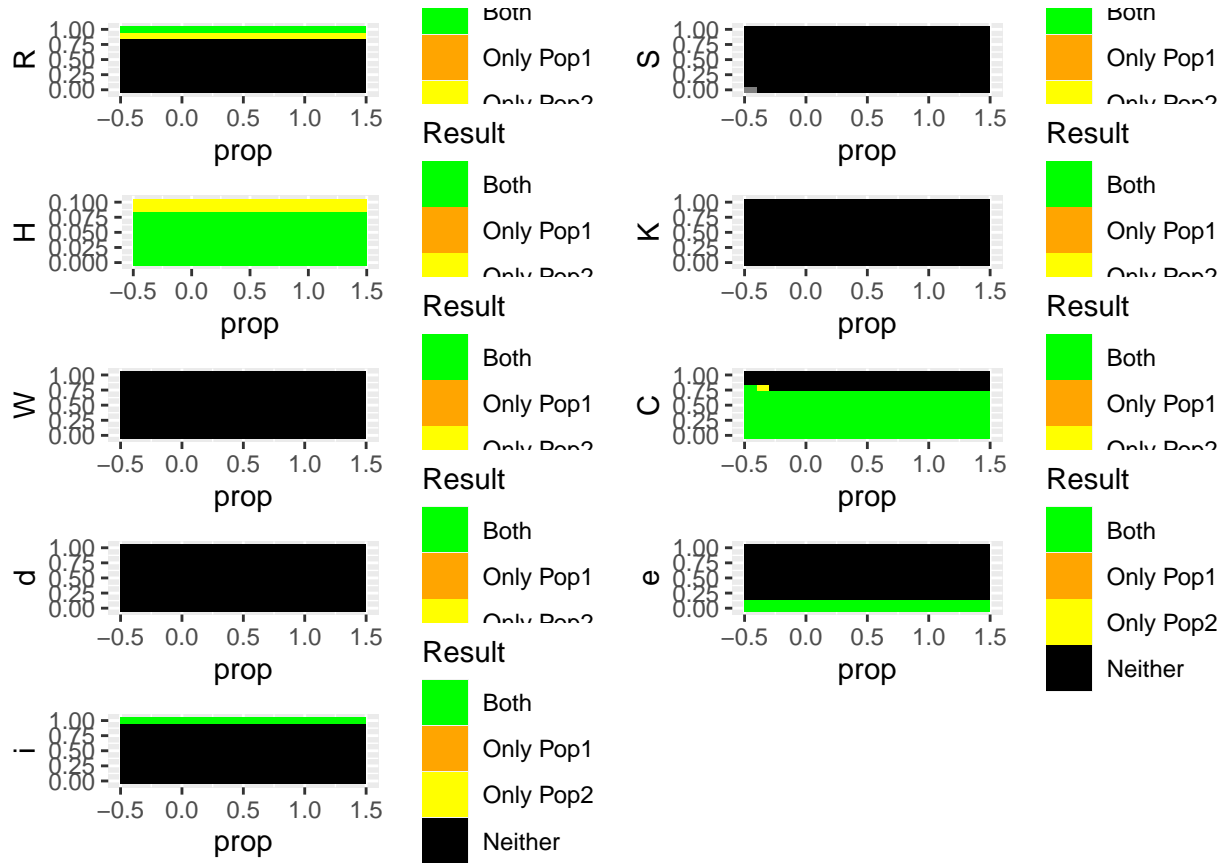


Figure 22: prop parameter planes

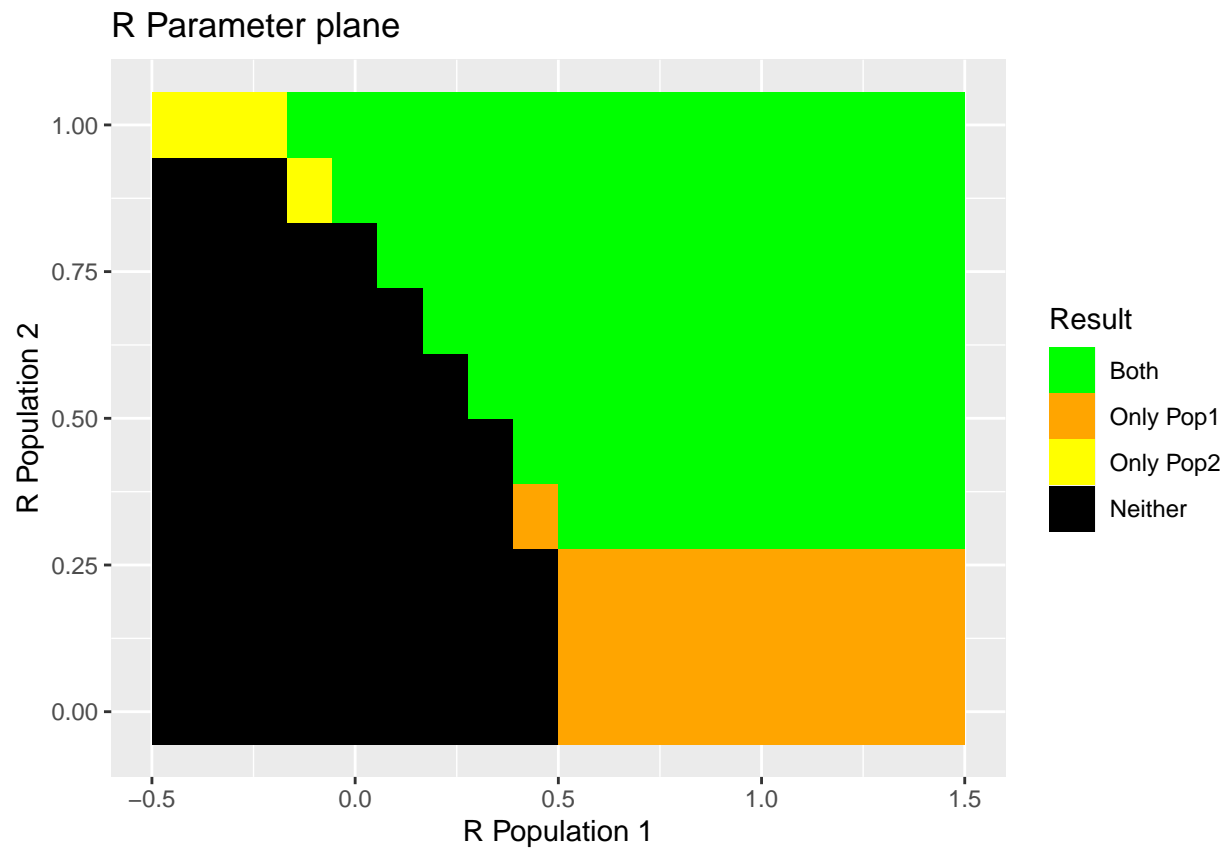


Figure 23: r population planes

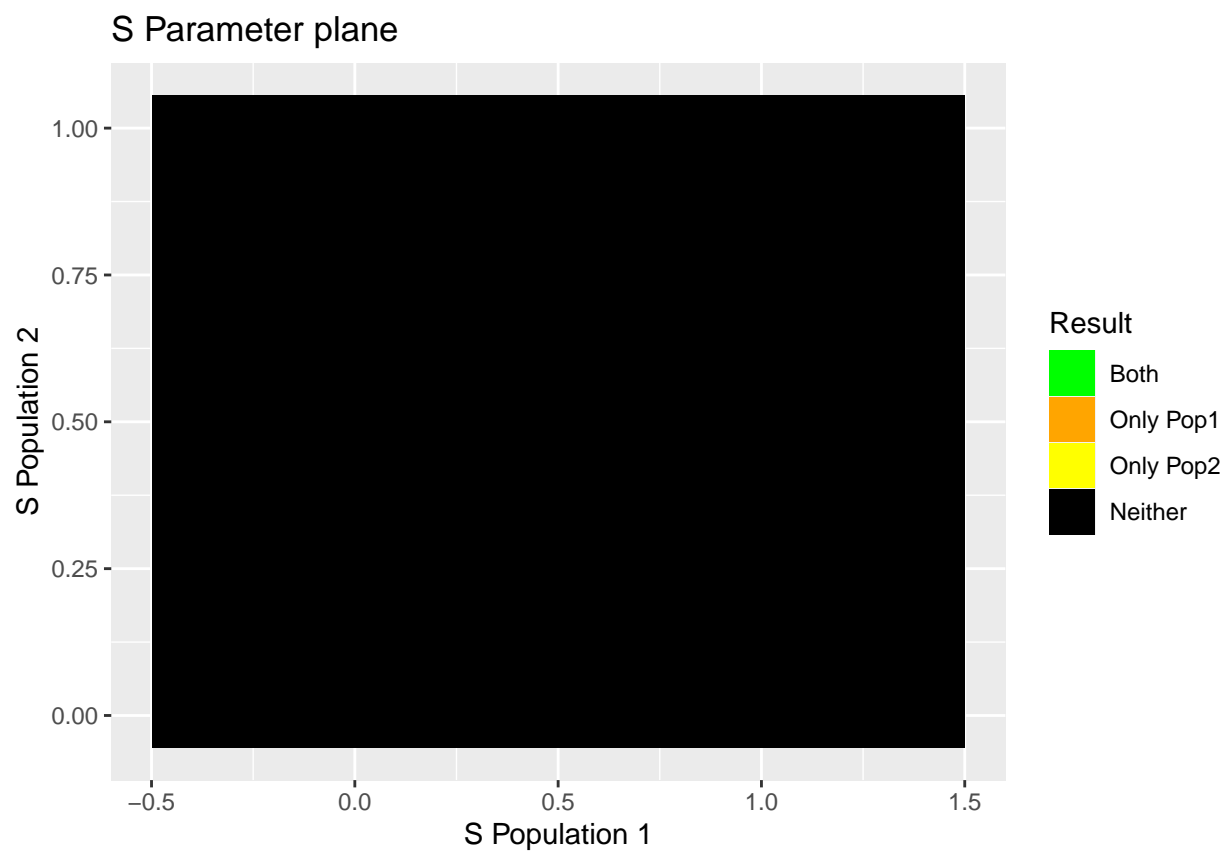


Figure 24: s population planes

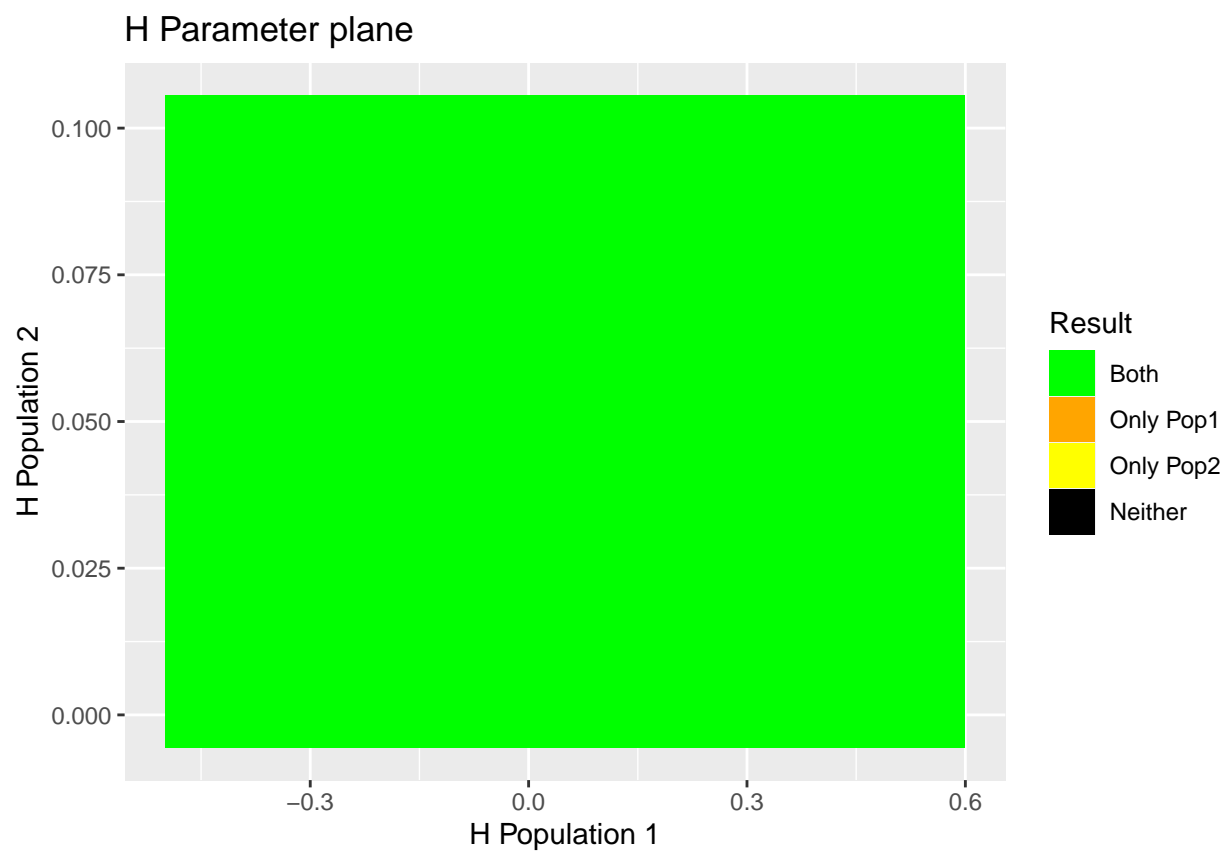


Figure 25: h population planes

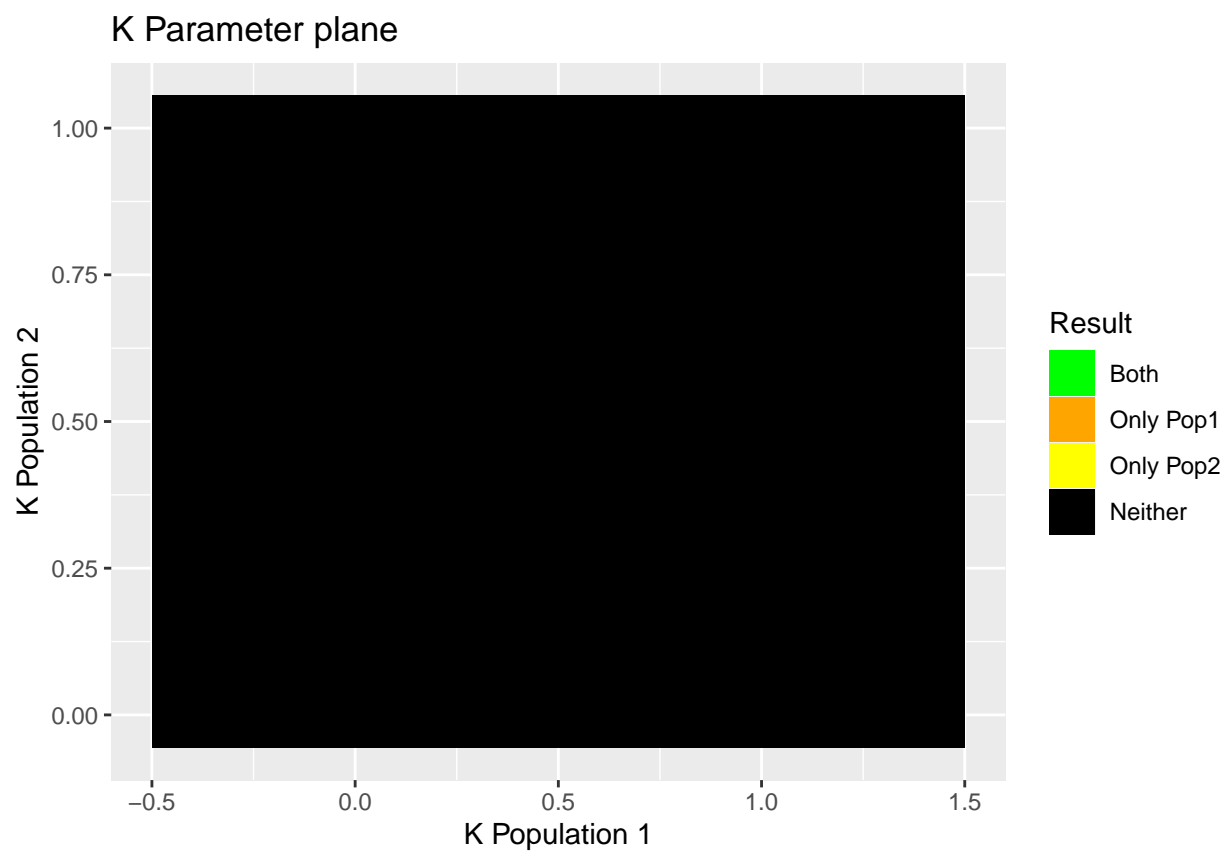


Figure 26: k population planes 0 to 1

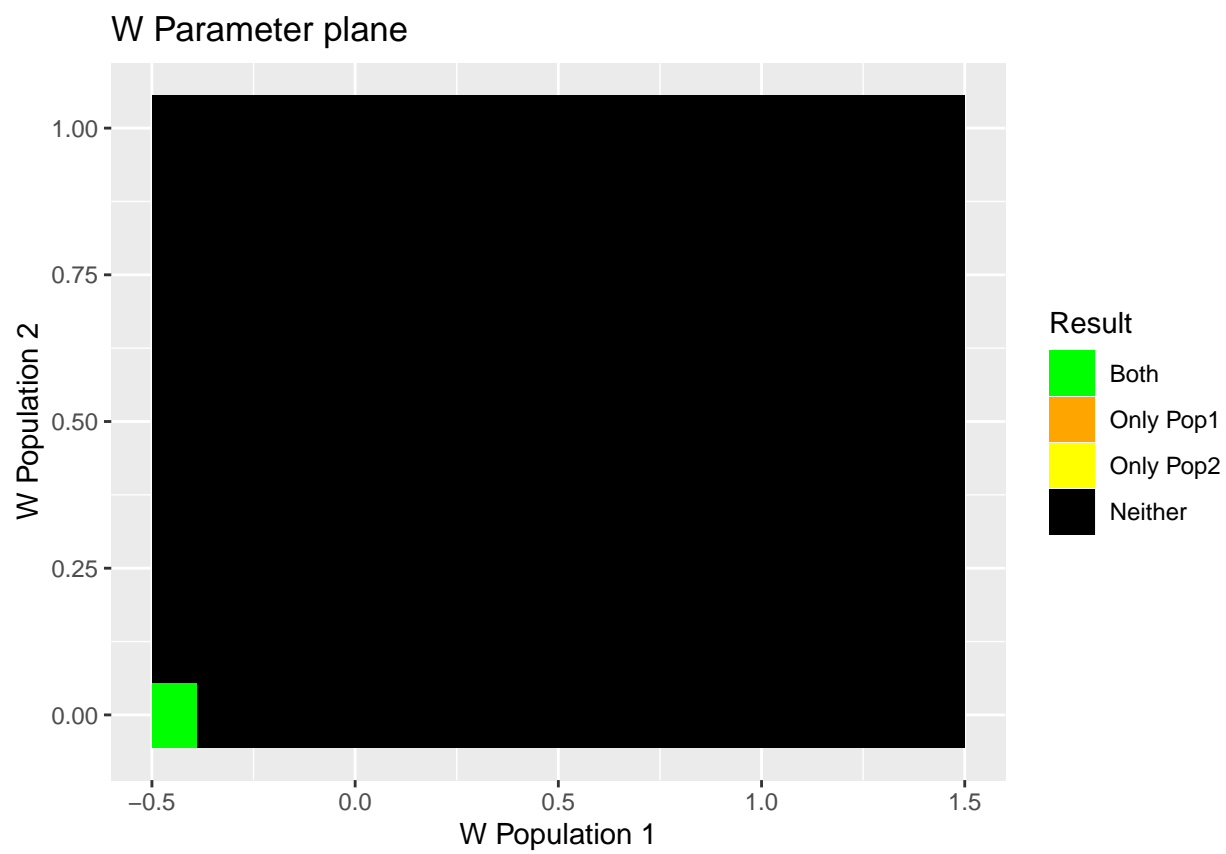


Figure 27: w population planes

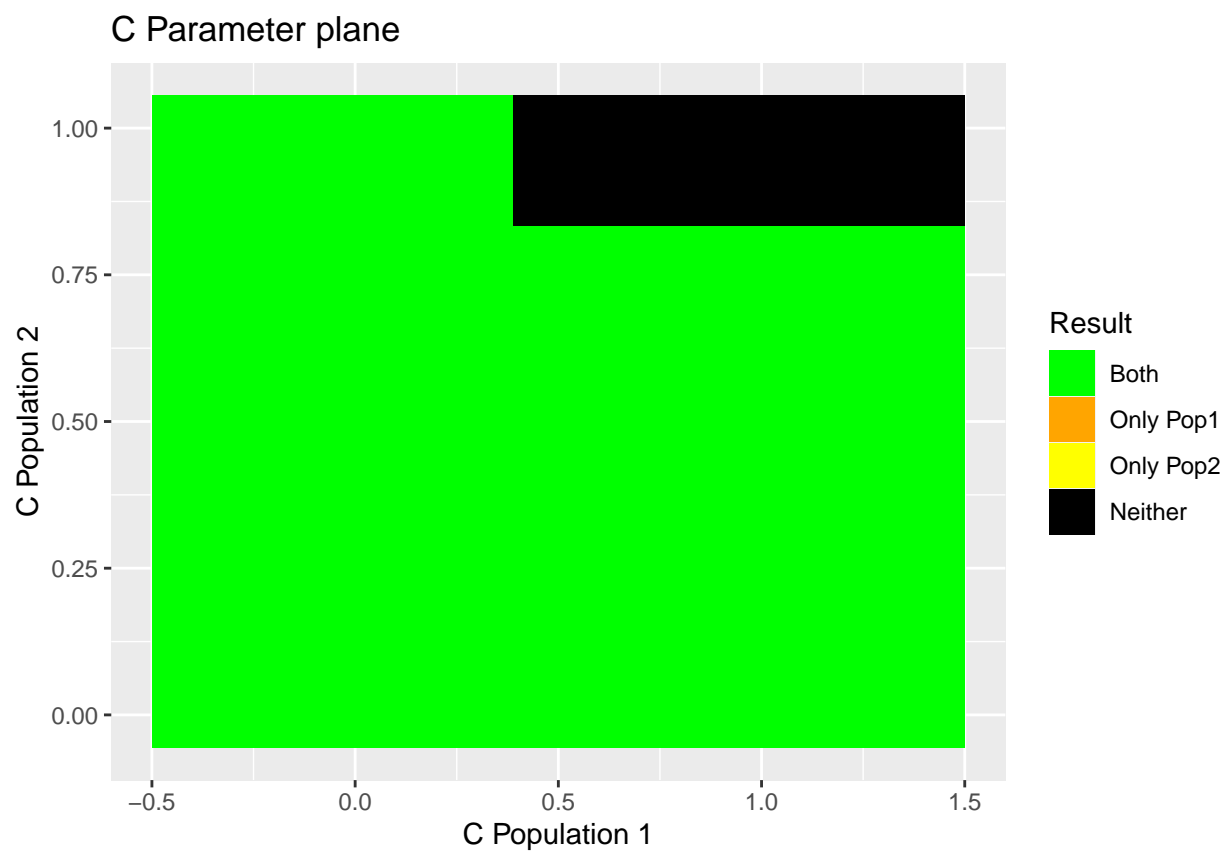


Figure 28: c population planes

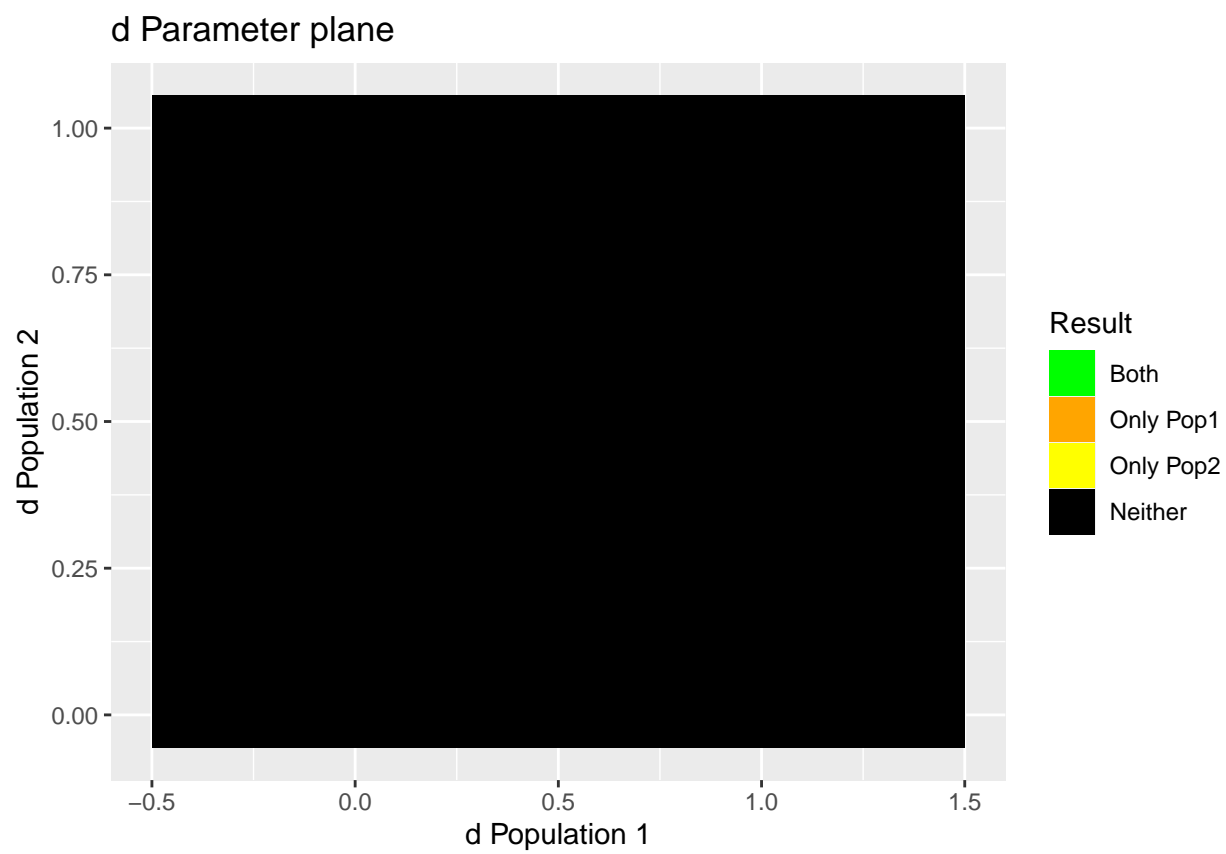


Figure 29: d population planes



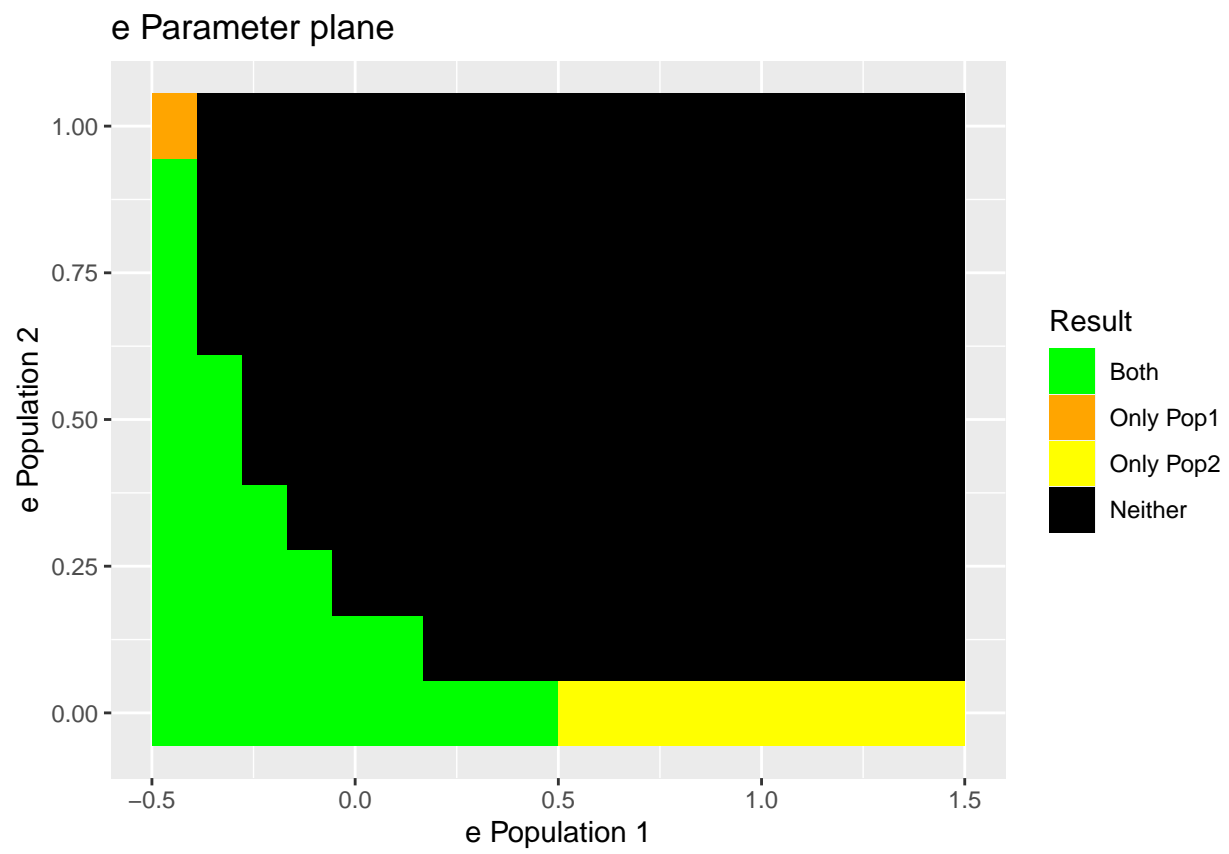


Figure 30: e population planes

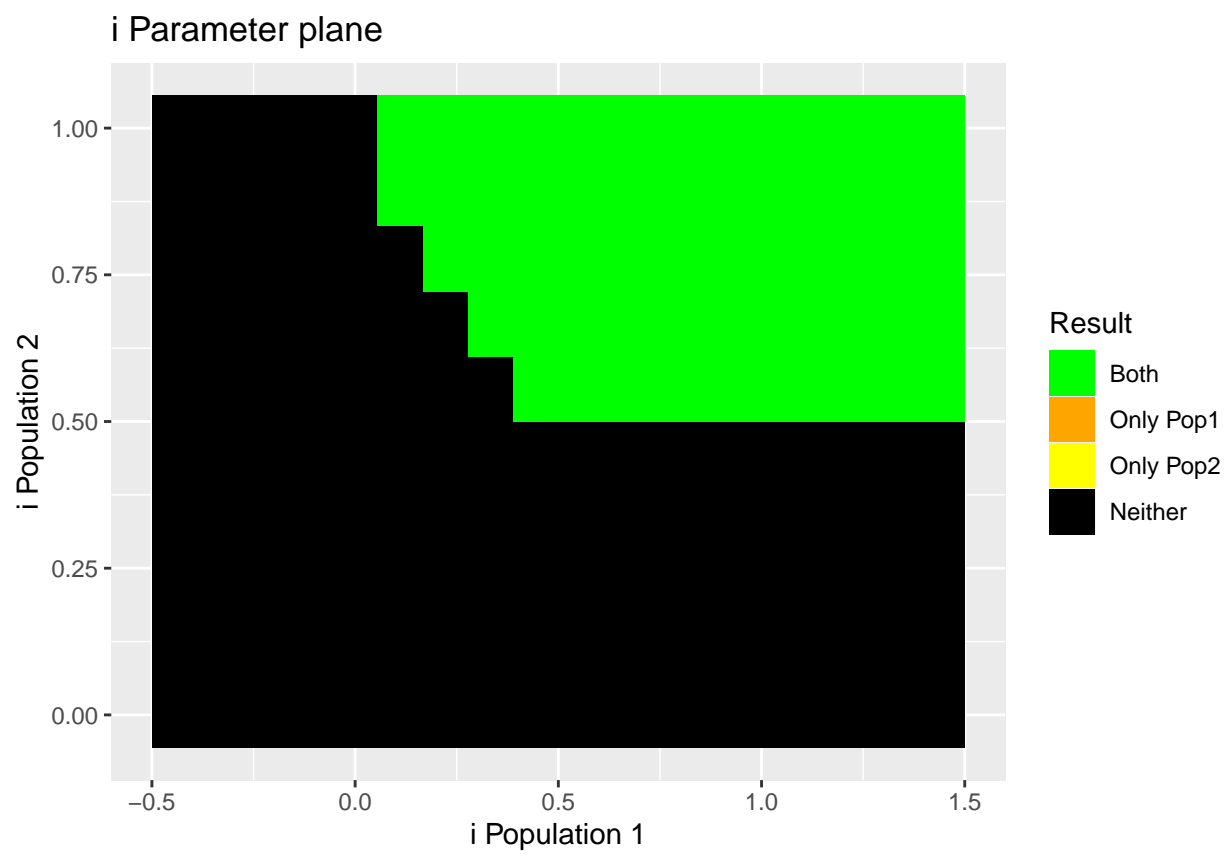


Figure 31: i population planes

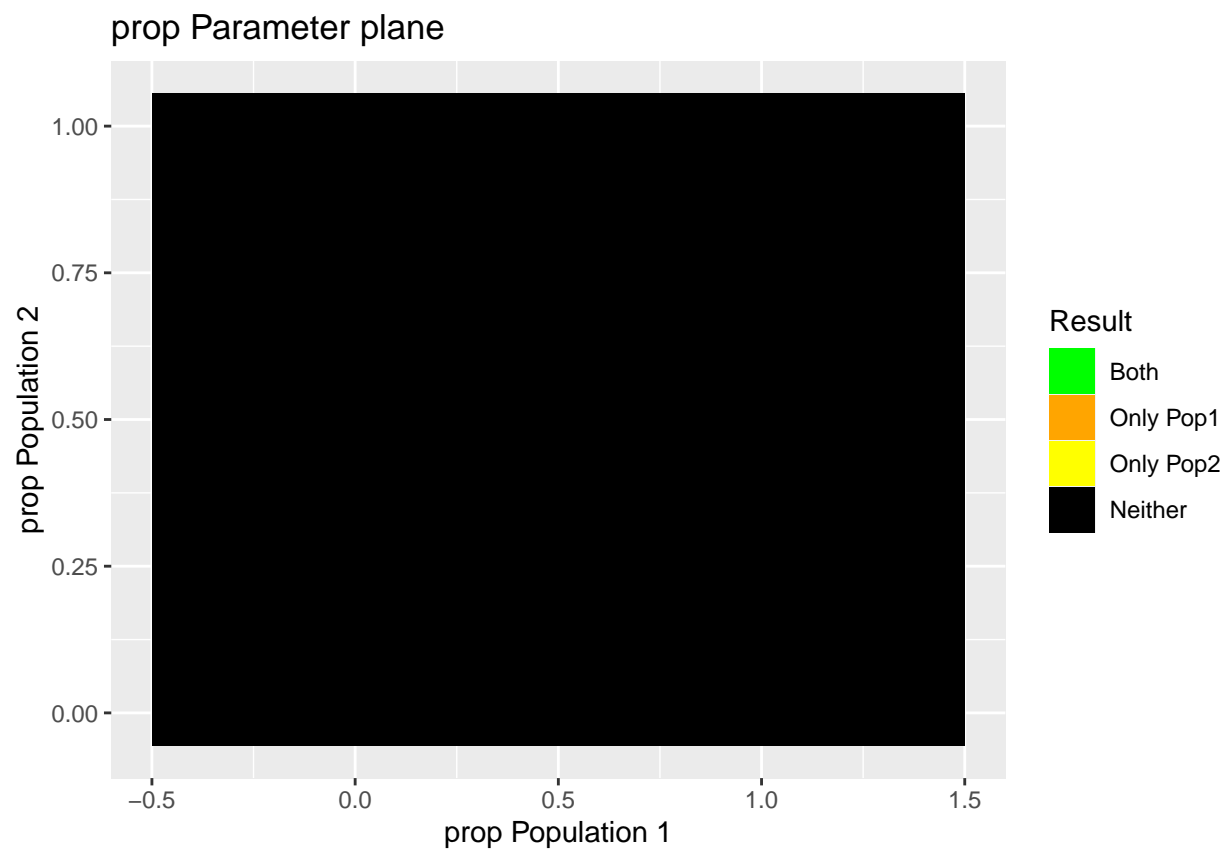


Figure 32: prop population planes