Full Analysis

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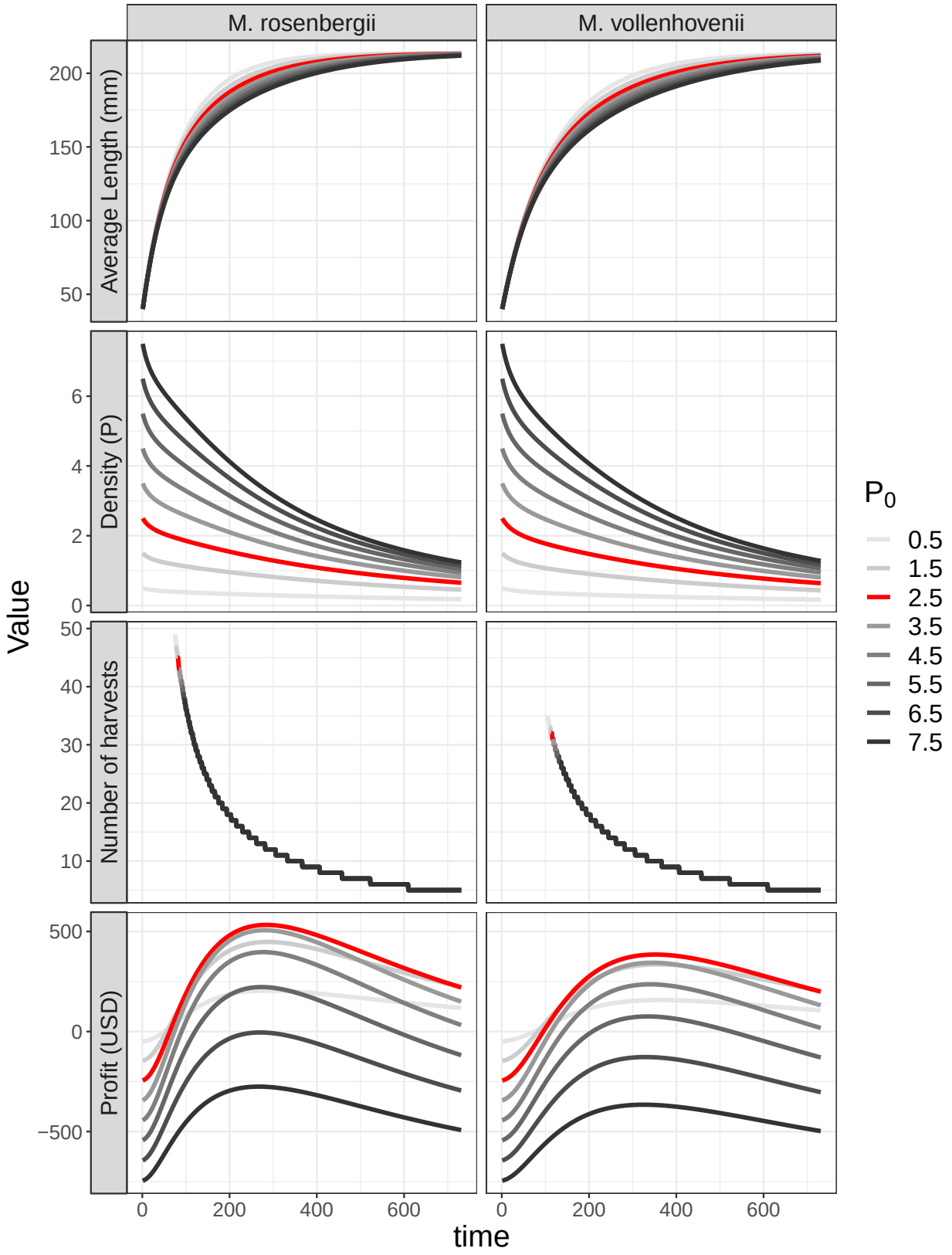
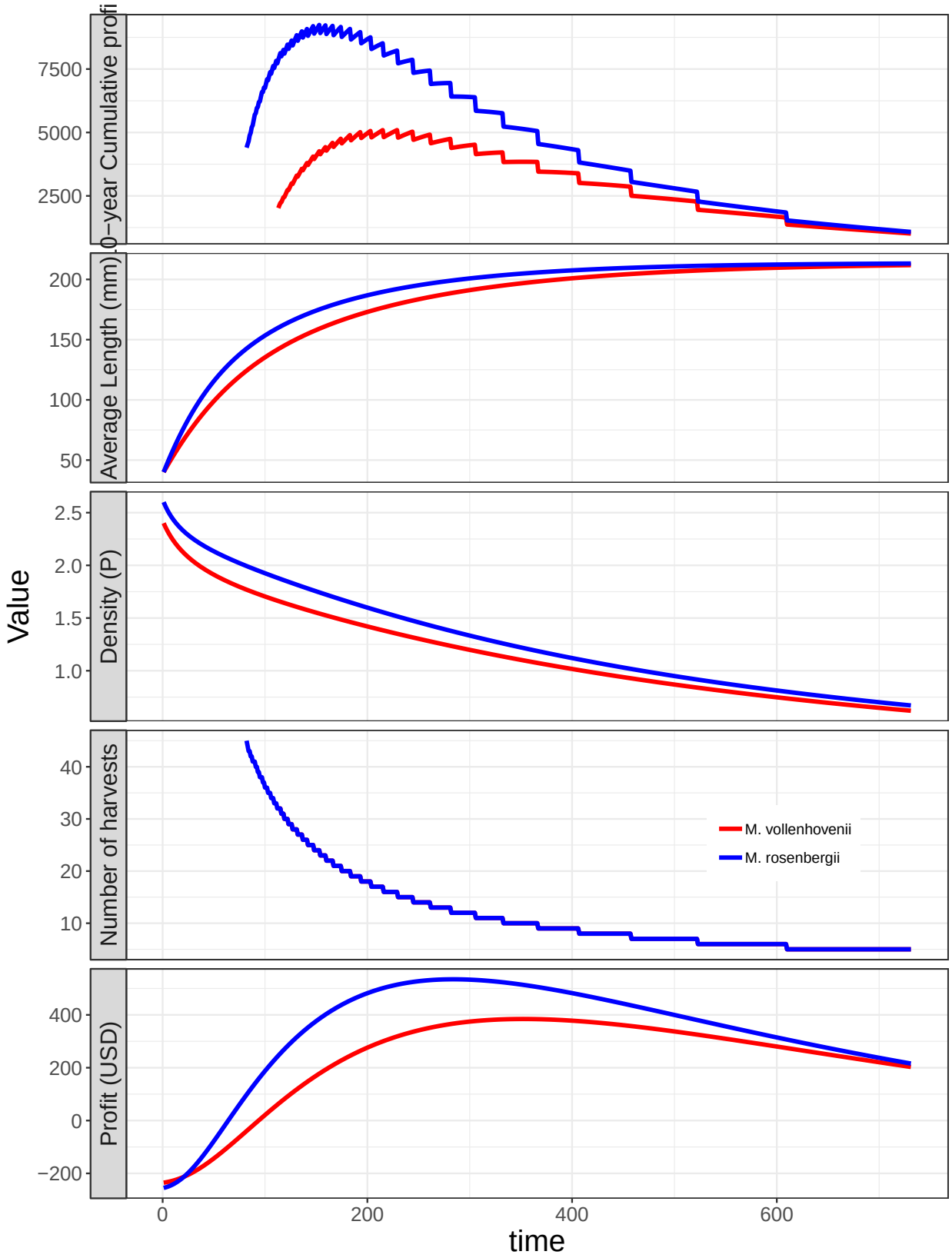
Numeric estimation of max profit

For each prawn species, shows trajectories of length, density, harvestable biomass, and profit over time over a range of stocking densities


M. rosenbergii
M. vollenhovenii
Average Length (mm)
Density (P)
Number of harvests
Profit (USD)
Value
time
P_0
0.5
1.5
2.5
3.5
4.5
5.5
6.5
7.5

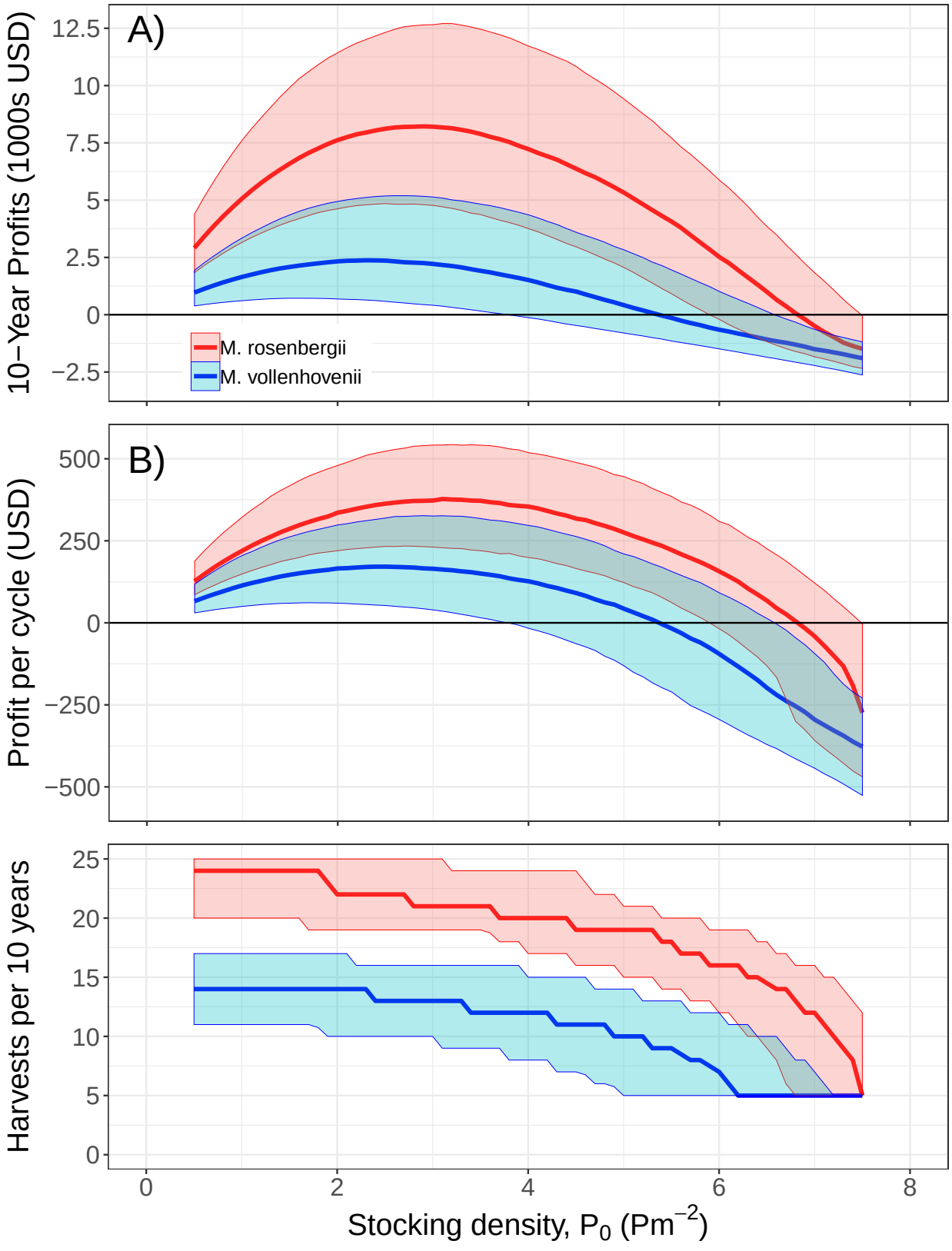
Example cycle

Figure showing prawn aquaculture dynamics through time


10−year Cumulative profi
7500
5000
2500
Average Length (mm)
200
150
100
50
Density (P)
2.5
2.0
1.5
1.0
Number of harvests
40
30
20
10
M. vollenhovenii
M. rosenbergii
Profit (USD)
400
200
0
−200
Value
0
200
400
600
time

Eumetric curves

We want to add estimates of uncertainty to the eumetric curve in addition to the eumetric curve generated by point estimates of all parameters (above). We'll use the same parameter sets from the latin hypercube generated for the PRCC sensitivity analysis to run the model over all tested stocking densities


A)
B)
10−Year Profits (1000s USD)
Profit per cycle (USD)
Harvests per 10 years
M. rosenbergii
M. vollenhovenii
12.5
10
7.5
5
2.5
0
−2.5
500
250
0
−250
−500
25
20
15
10
5
0
0
2
4
6
8
Stocking density, P_0 (Pm^{-2})

Optimal management table

Also want a table showing set of parameters and outputs from "optimal management". Two approaches here: can either take uncertainty

Table 1: Estimates of M. vollenhovenii optimal management (uncertainty during optimization)

P_nought	2300
Cum_profit_med	2374.808
harvest_time_sum	260 (228 - 365)
harvest_mass_sum	22.91 (16.11 - 30.52)
harvest_length_sum	169.62 (162.45 - 177.62)
harvest_number_sum	815.23 (591.61 - 1036.37)
profit_cycle_sum	170.36 (55.89 - 311.42)
roi_sum	0.93 (0.33 - 1.8)
n_harvest_sum	14 (10 - 16)
cum_profit_sum	2374.81 (640.69 - 5117.8)

Table 2: Estimates of M. vollenhovenii optimal management (uncertainty during optimization)

P_nought	2900
Cum_profit_med	8218.367
harvest_time_sum	173 (146 - 192)
harvest_mass_sum	38.39 (30.74 - 46.95)
harvest_length_sum	167.66 (161.02 - 175.09)
harvest_number_sum	1505.14 (1315 - 1702.93)
profit_cycle_sum	371.89 (232.09 - 540.08)
roi_sum	1.63 (0.97 - 2.46)
n_harvest_sum	21 (19 - 25)
cum_profit_sum	8218.37 (4802.95 - 12645.21)

Table 3: Estimates of M. vollenhovenii optimal management (parametric uncertainty)

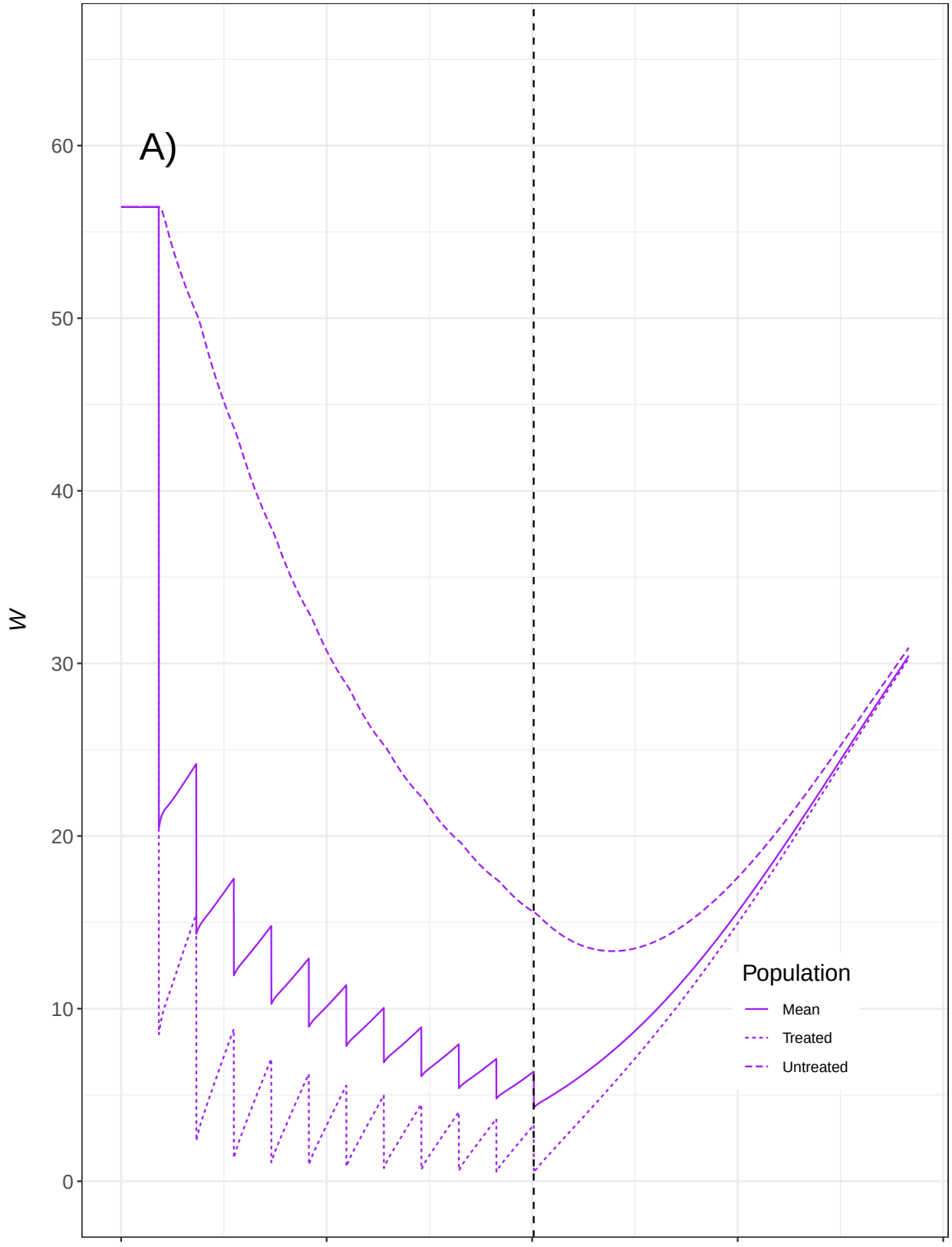
P_nought	2400
L_nought	40
harvest_time_med	280 (228 - 365)
harvest_mass_med	23.57 (16.59 - 31.36)
harvest_length_med	169.82 (162.42 - 177.77)
harvest_number_med	846.26 (611.96 - 1074.91)
profit_cycle_med	171.19 (54.07 - 315.4)
roi_med	0.89 (0.3 - 1.75)
n_harvest_med	13 (10 - 16)
cum_profit_med	2369.91 (618.51 - 5157.65)

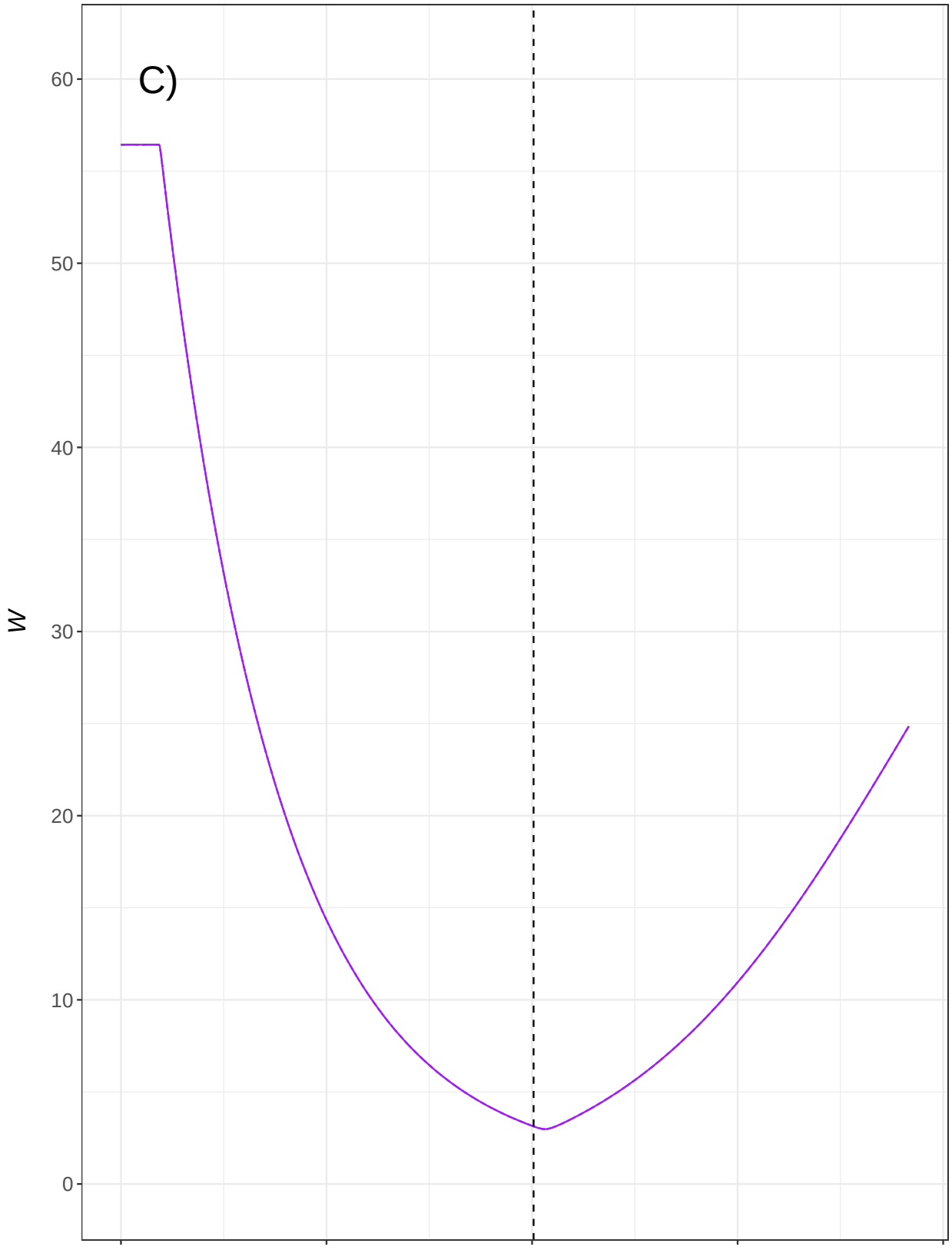
Table 4: Estimates of M. rosenbergii optimal management (parametric uncertainty)

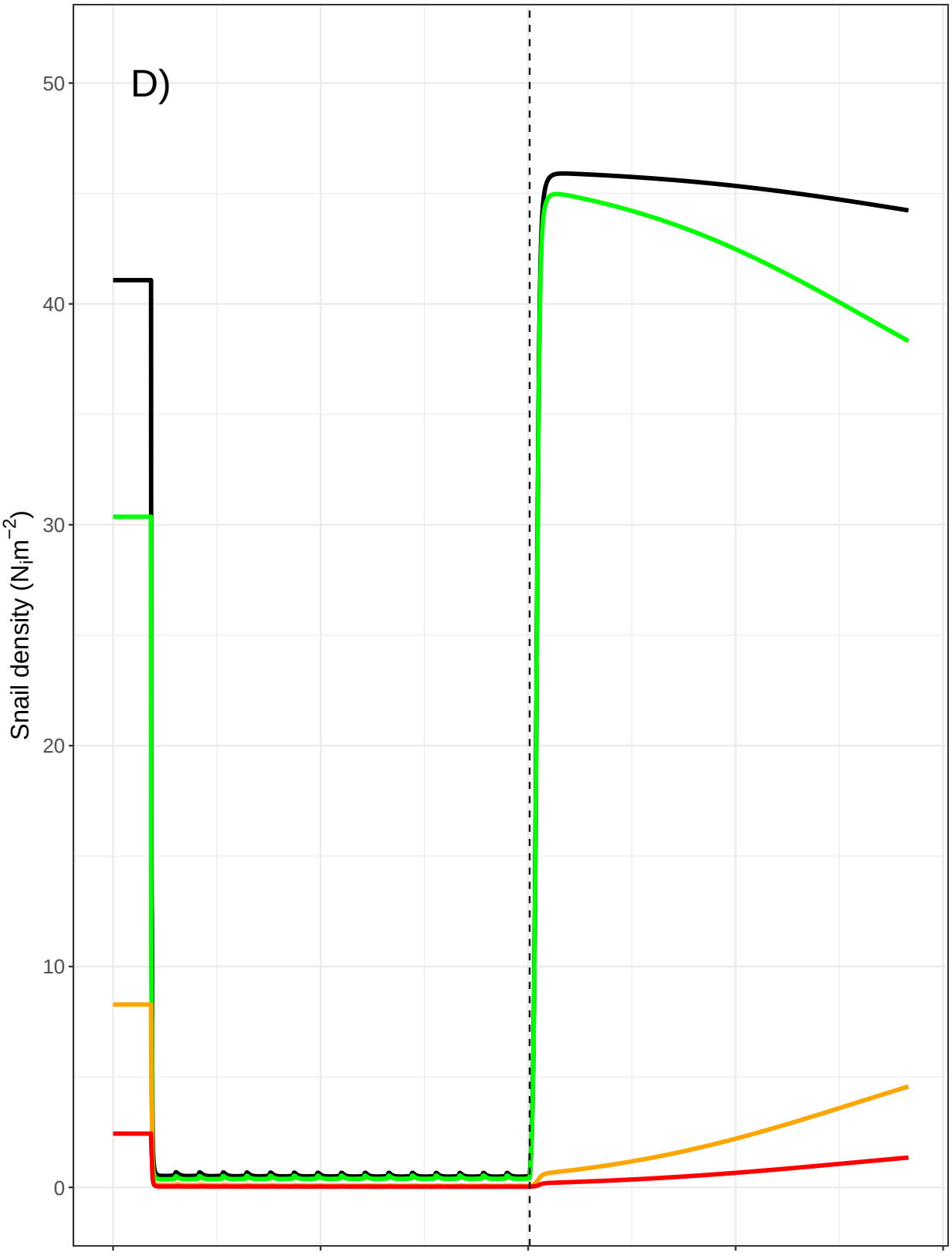
P_nought	2600
L_nought	40
harvest_time_med	165 (146 - 192)
harvest_mass_med	36.37 (29.3 - 44.94)
harvest_length_med	168.06 (160.86 - 175.34)
harvest_number_med	1365.39 (1198.27 - 1543.09)
profit_cycle_med	366.46 (232.58 - 528.41)
roi_med	1.8 (1.08 - 2.69)
n_harvest_med	22 (19 - 25)
cum_profit_med	8171.43 (4821.01 - 12459.85)

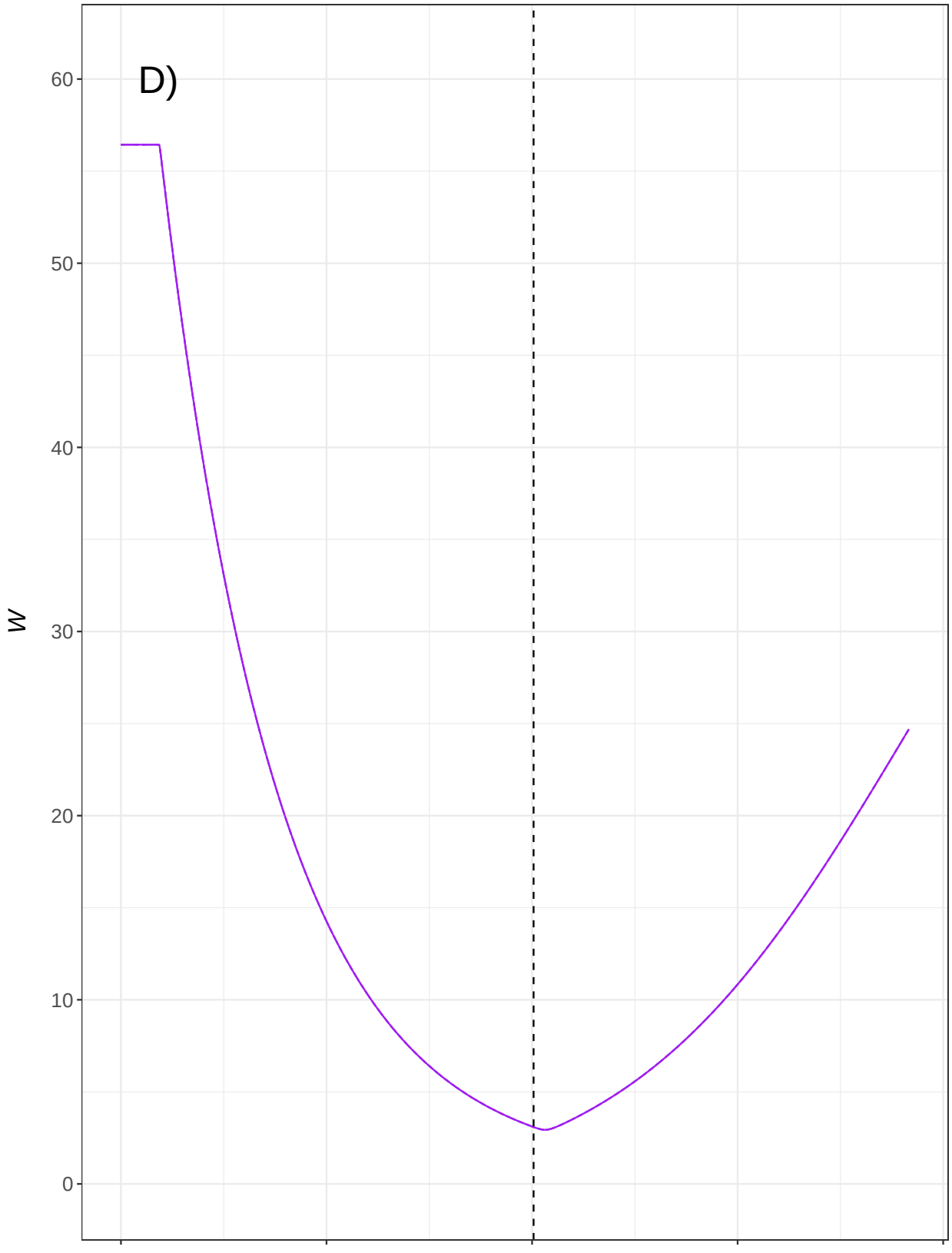
Parameter	**Definition**	*M. vollenhovenii*	*M. rosenbergii*
${P_0}_{opt}^{sp}$	Optimal stocking density	2.4 Pm^{-2}	2.6 Pm^{-2}
L_0	Mean length at stocking	40 mm	40 mm
$\Omega(t_0)$	Total biomass at stocking	kg $k	g$
T_{opt}^{sp}	Optimal harvest time	$days$	$days$
$Y(T_{opt}^{sp}, {P_0}_{opt}^{sp})$	Commercial yield	kg $kg	$
$L(T_{opt}^{sp})$ Mean length at	harvest kg	kg	

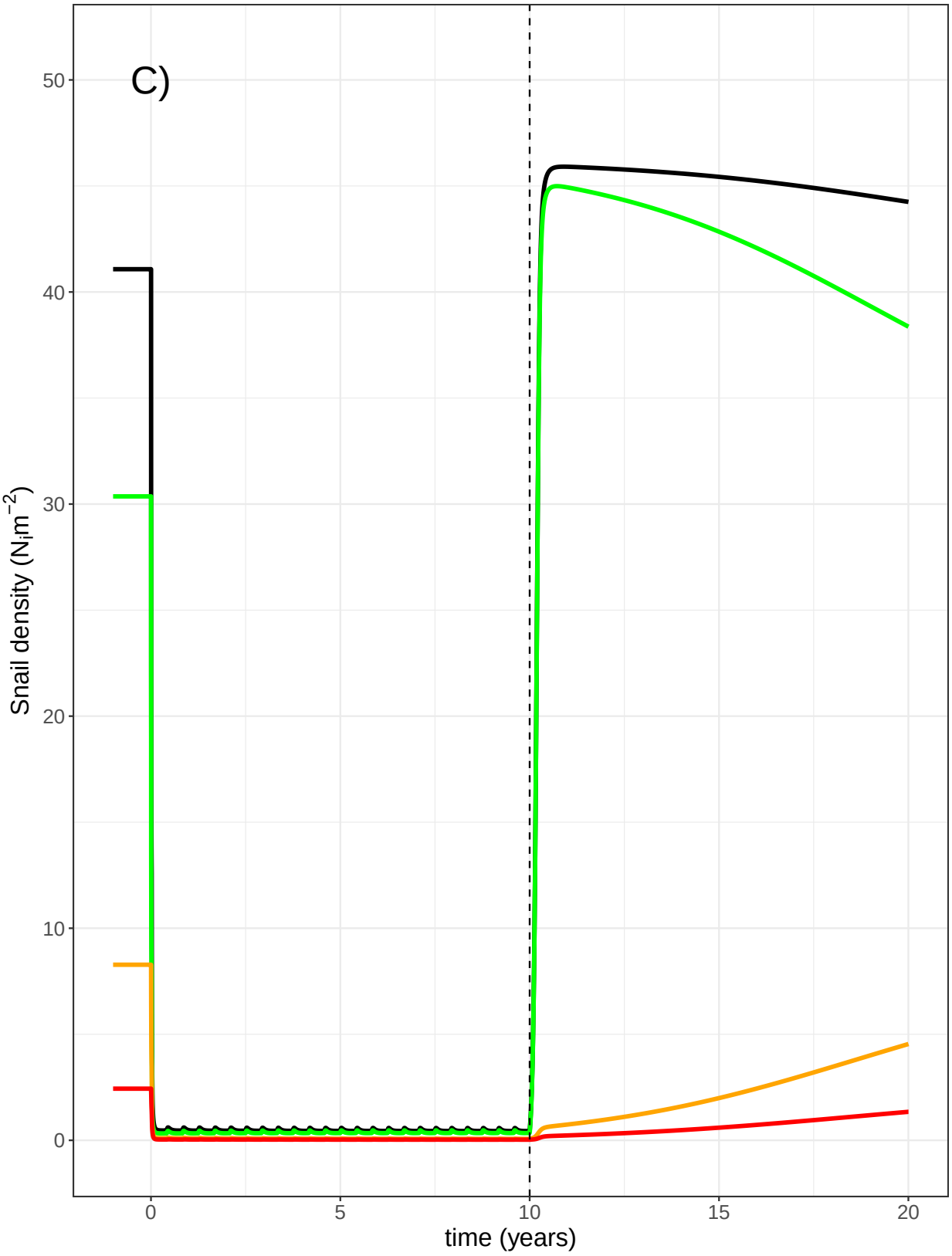
Epi simulations

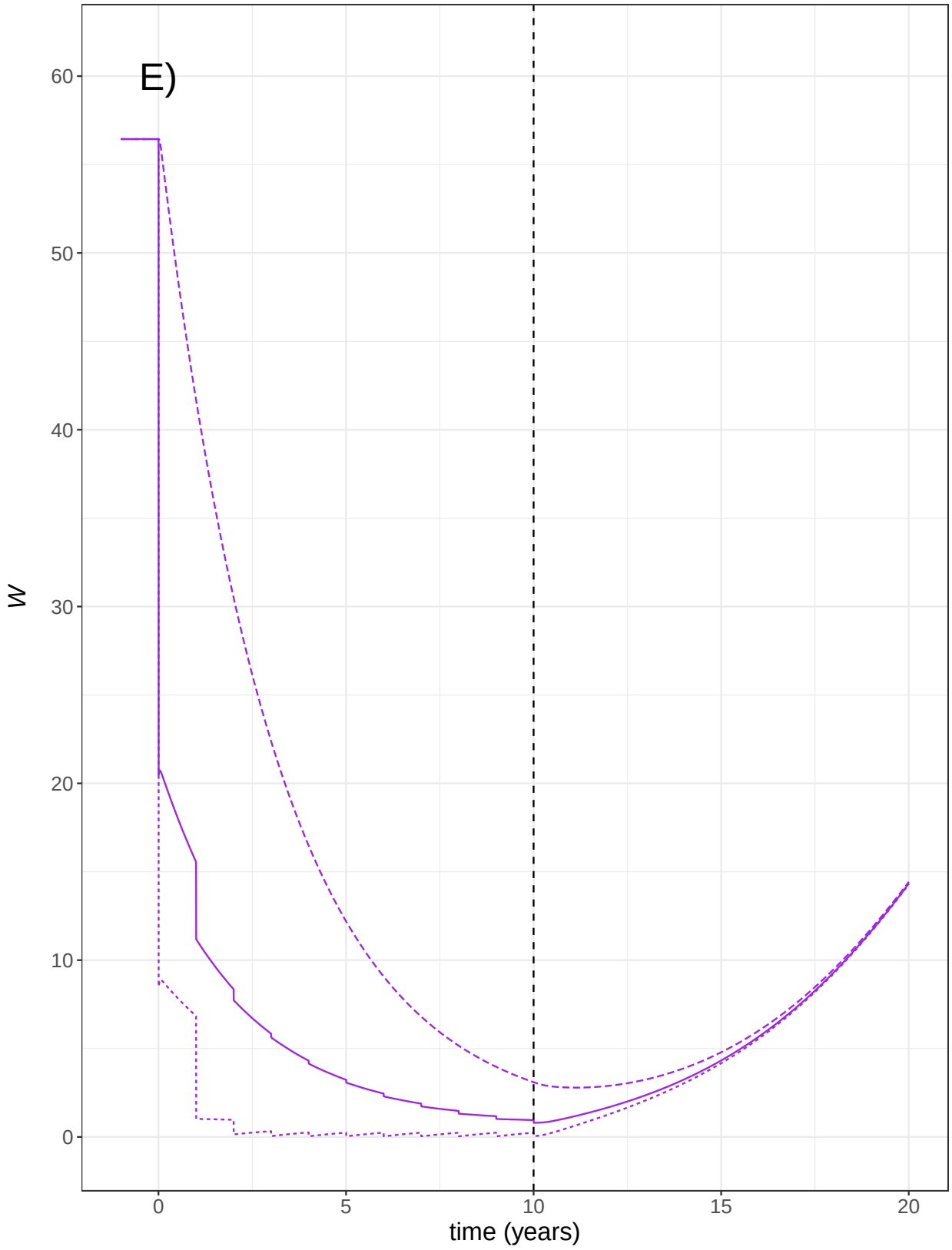


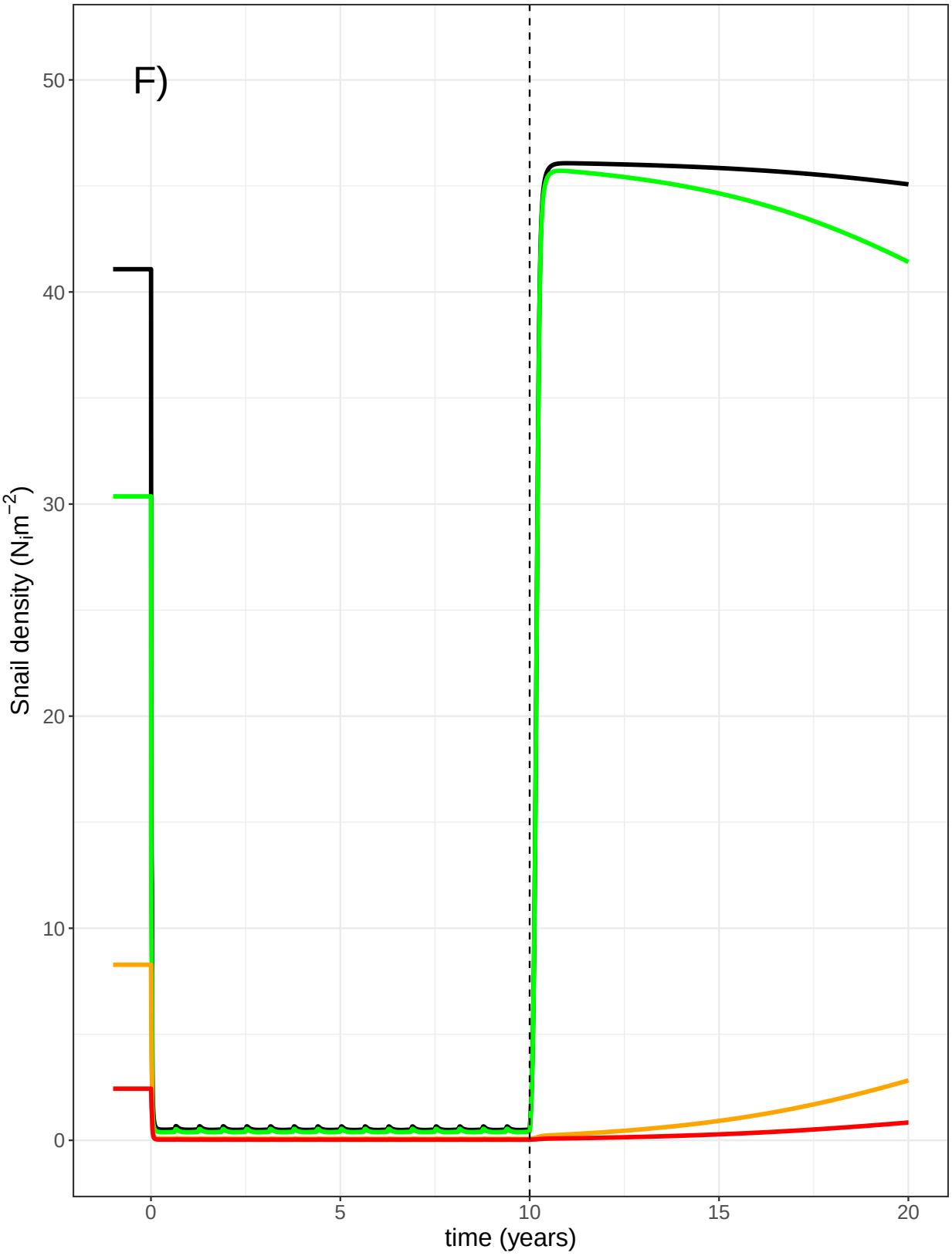

C)
60
50
40
30
20
10
0
W

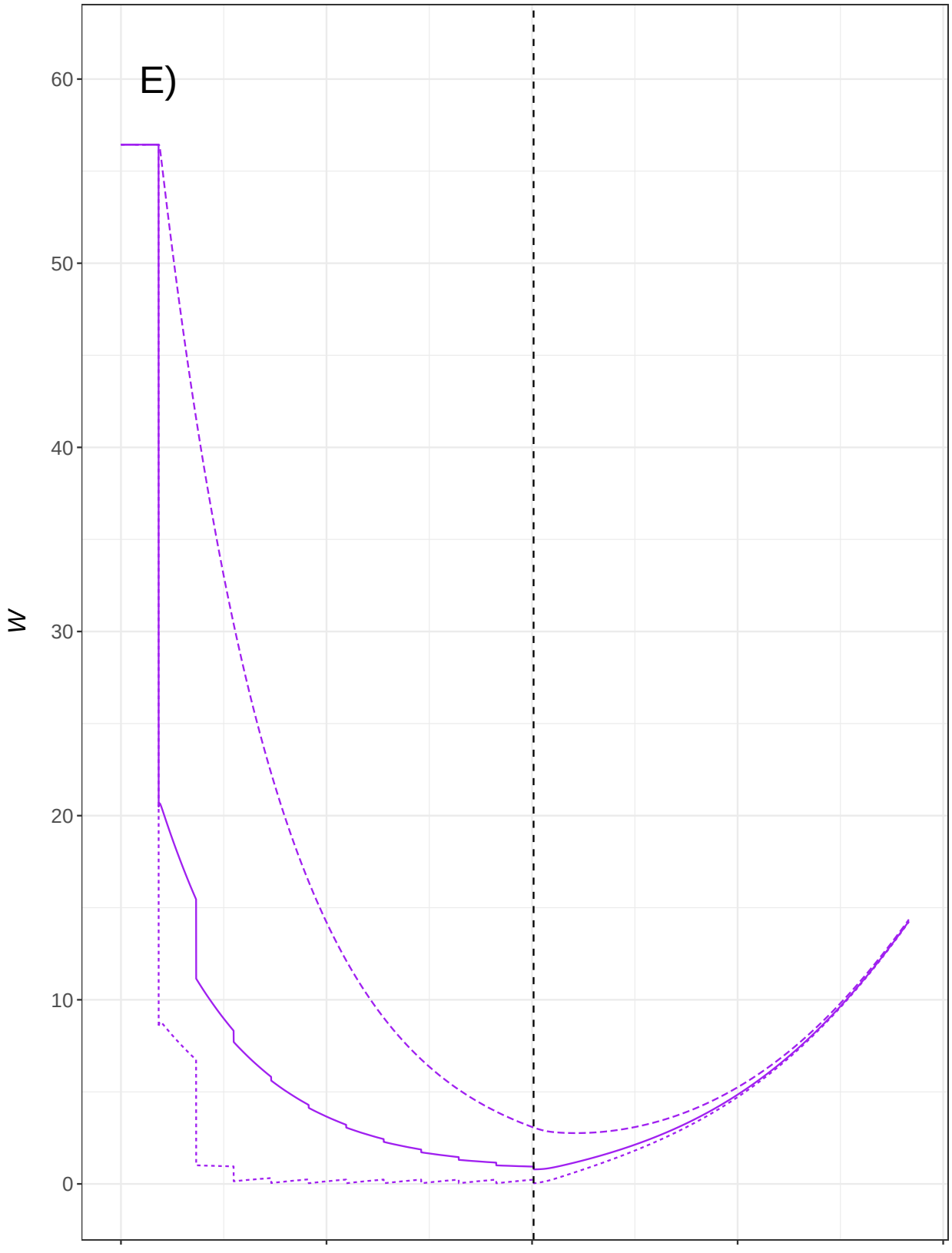

D)
50
40
30
20
10
0
Snail density (N$_i$m^{-2})

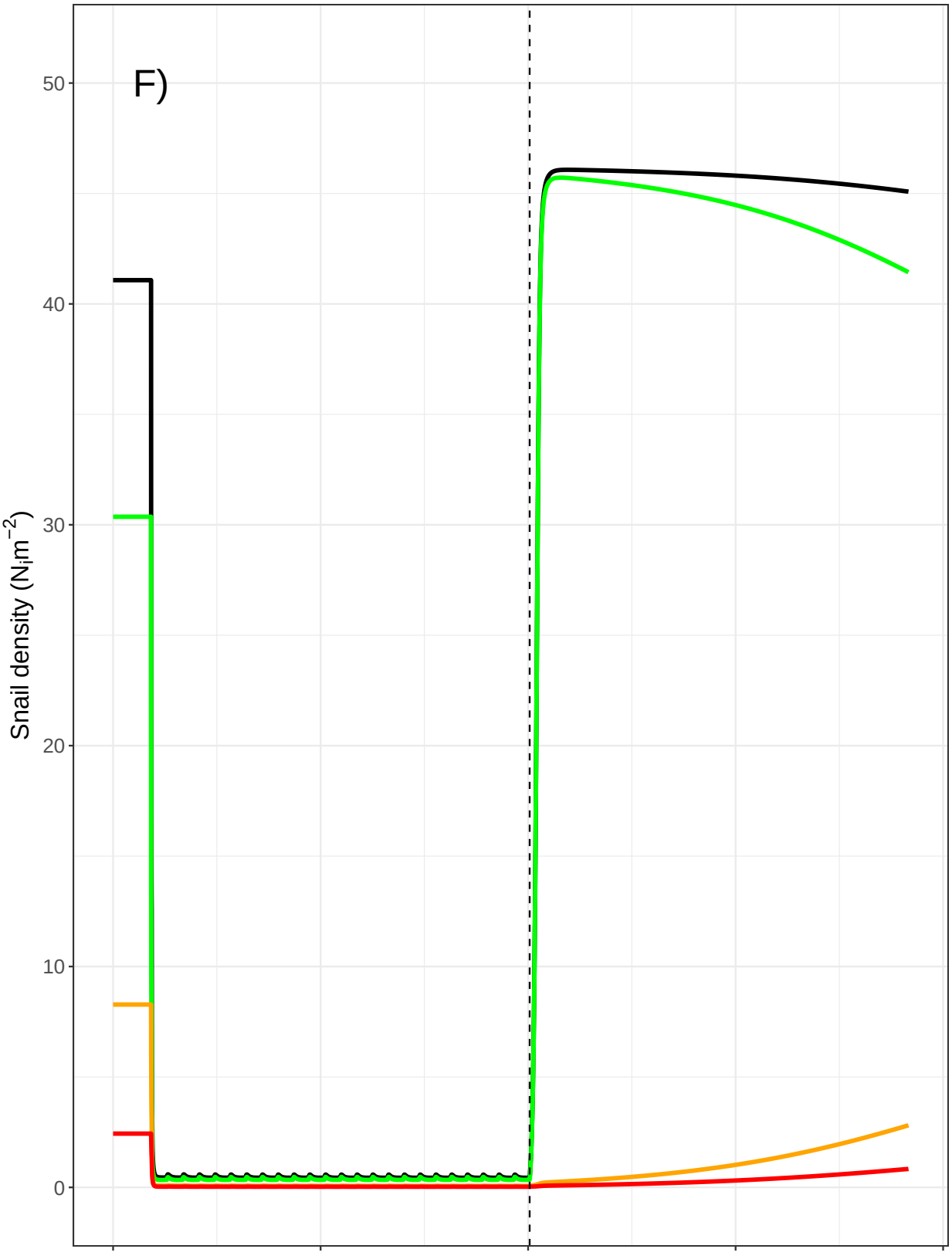

D)
60
50
40
30
20
10
0
W

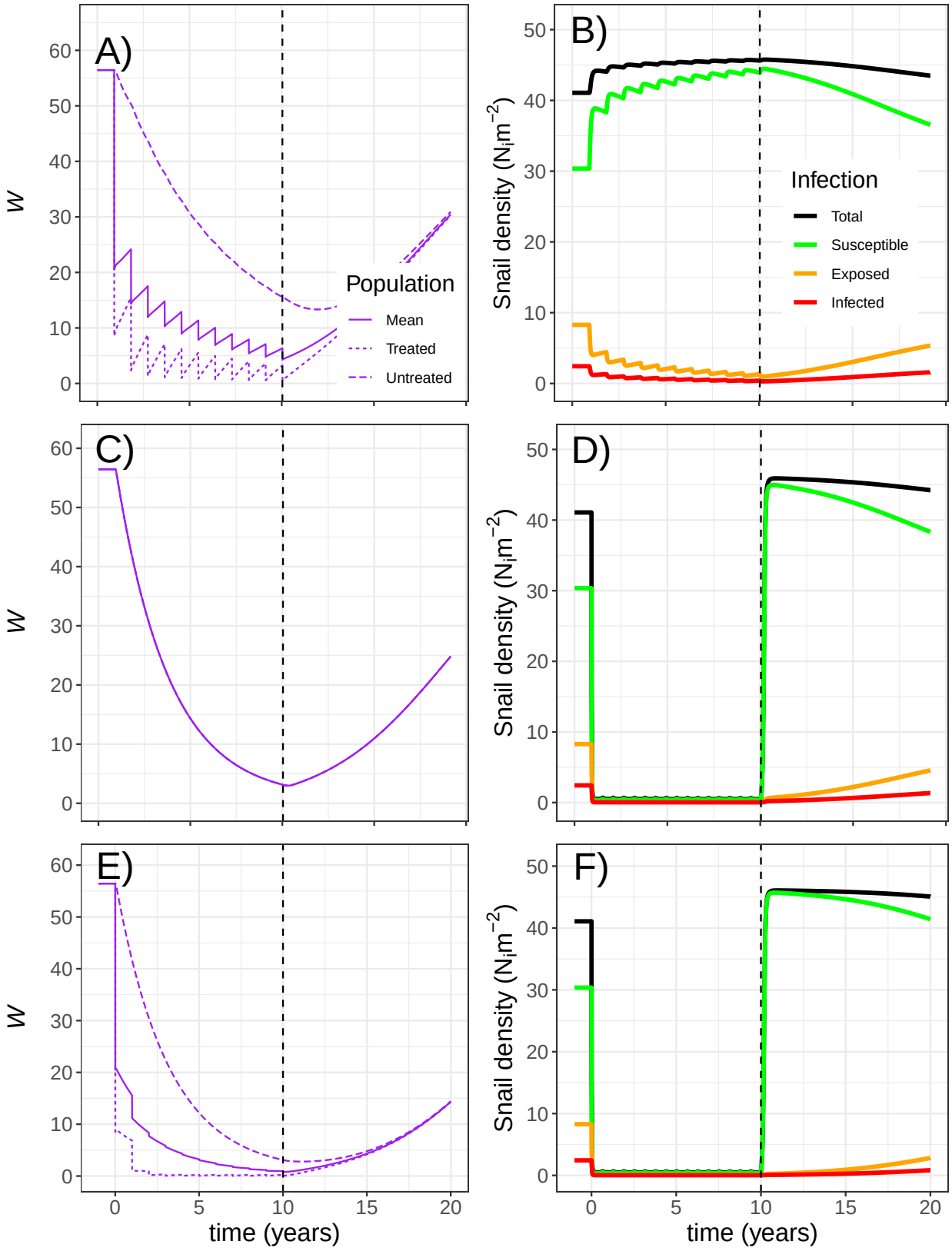

C)
50
40
30
20
10
0
Snail density ($N_i m^{-2}$)
0
5
10
15
20
time (years)

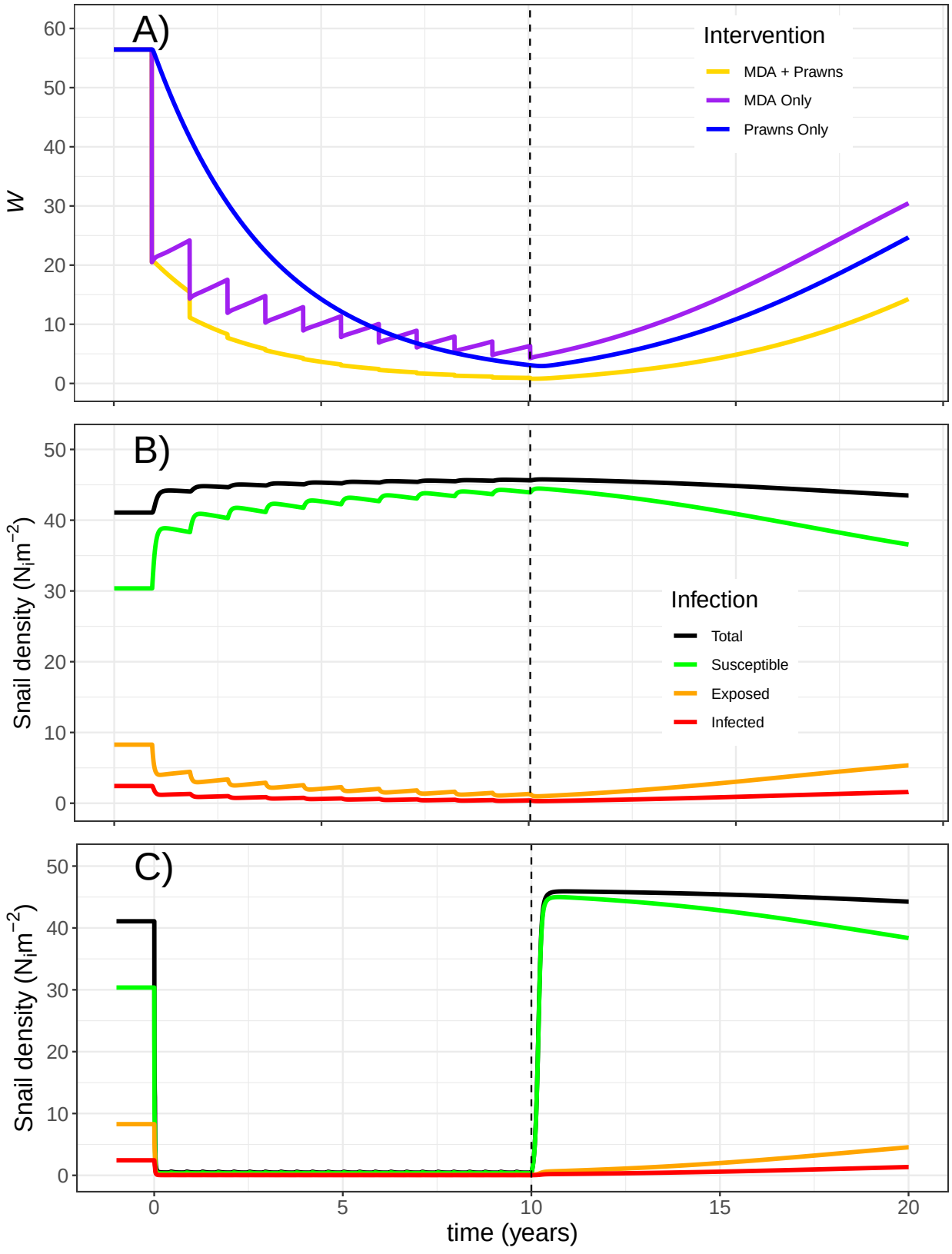

E)
60
50
40
30
20
10
0
W
0
5
10
15
20
time (years)


F)
50
40
30
20
10
0
Snail density ($N_i m^{-2}$)
0
5
10
15
20
time (years)


E)
60
50
40
30
20
10
0
W


F)
50
40
30
20
10
0
Snail density (N$_i$m^{-2})


A)
B)
C)
D)
E)
F)
W
Snail density ($N_i m^{-2}$)
time (years)
Population
Mean
Treated
Untreated
Infection
Total
Susceptible
Exposed
Infected


A)
Intervention
MDA + Prawns
MDA Only
Prawns Only
W
B)
Infection
Total
Susceptible
Exposed
Infected
Snail density ($N_i m^{-2}$)
C)
Snail density ($N_i m^{-2}$)
time (years)

Sensitivity analysis