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SUPPORTING INFORMATION

Community trait overdispersion due to trophic interactions - concerns for assembly process inference

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Appendix 1

Tables

Table S1 Parameter values used in the competitive community assembly (second column) and trophic consumer invasion simulations (third column). Single value denotes constant parameter and ranges denotes parameter space analyzed. Note that parameters associated with predators was not used in competitive community assembly.

Parameter	Competitive community assembly	Trophic consumer invasion
r	1	1
K	300	300
b_{con}	0.005	0.005
m_{con}	0.1	0.1
c_{con}	0.15	0.15
m_{pred}	---	0.1
c_{pred}	---	0.15
w	20-100	25, 100
σ_{cons}	0-2	0.5, 2
C_{pred}	---	0-0.2
σ_{pred}	---	0.2

Figure legends

Figure S1a

Population dynamics for one competitor consumer (a) and the resource community (b) at the invasion of the first consumer. Consumer fitness landscape (c) and trait distribution of the consumer (d) and the resource community (e) at equilibrium after the first consumer has invaded. Simulation was run with consumer niche width = 1 and island width at 90% of the species pool. Other parameters: $r = 1$, $K = 300$, $b_{con} = 0.005$, $m_{con} = 0.1$ and $c_{con} = 0.15$.

Figure S1b

Population dynamics for the two competitive consumers (a) and the resource community (b) after a second competitive consumer invades the system of figure S1a. Consumer fitness landscape (c) and trait distribution of the consumer (d) and the resource community (e) at equilibrium after the second consumer has invaded. Simulation was run with consumer niche width = 1 and island width at 90% of the species pool. Other parameters: $r = 1$, $K = 300$, $b_{con} = 0.005$, $m_{con} = 0.1$ and $c_{con} = 0.15$.

Figure S2a

Assembled reference competitive consumer community of 20 species; fitness landscape (a), consumer abundance and traits (b), and resource abundance and traits (c), before any trophic consumers invaded. Consumer niche width = 1 and island width at 90% of the species pool. Other parameters: $r = 1$, $K = 300$, $b_{con} = 0.005$, $m_{con} = 0.1$ and $c_{con} = 0.15$.

Figure S2b

Population dynamics for two trophic consumers (i.e., predators) (a), the competitive consumer community (b) and the resource community (c) at the invasion of the second predator (green line). Predator fitness landscape (d) and trait distribution (e) at equilibrium after the second predator has invaded. Consumer fitness landscape (f) and trait distributions of the consumer (g) and resource (h) communities at equilibrium after the second predator has invaded. Red X in (g) denotes positions in trait space where a competitive consumer species has gone extinct. Simulation was run with consumer niche width = 1, island width at 90% of the species pool, predator niche width = 0.3 and predator efficiency = 0.03.

Figure S3

Mean consumer community structure (contour) measures as MTD (c,d) and MNTD (e) as a function of niche width (x-axis) and the overlap between resource width in trait space on the island and the trait distribution of competitor species (y-axis). For the 100% scenario all competitive consumers in the species pool have suitable resources on the island and could potentially invade (low degree of habitat filtering) while for the 25% scenario a small proportion could invade (high habitat filtering). Top panels (a, b) show diversity. Simulations with 500 (a, c, e) and 100 (b, d) species in the species pool. Red lines highlight regional in parameter space with unexpected results showing positive relationship between competition and community clustering. The results are based on 50 replicated simulations.

Figure S4

Contour plots of the effect of 1-5 (column panels 1-5) predators on the number of extinctions (row panels 1), change in community MTD (row panels 2), MTD after predator invasion (row panels 3), change in MNTD (row panels 4) and MNTD after predator invasion (row panels 5). Here the reference consumer community has a low degree of clustering (Island width = 100% and Consumer niche width = 2). The results are based on 50 replicated simulations.

Figure S5

Contour plots of the effect of 1-5 (column panels 1-5) predators on the number of extinctions (row panels 1), change in community MTD (row panels 2), MTD after predator invasion (row panels 3), change in MNTD (row panels 4) and MNTD after predator invasion (row panels 5). Here the reference consumer community has a high degree of clustering (Island width = 25% and Consumer niche width = 0.5). Missing data can occur in parts (grid regions) of parameter space as communities with a certain (high) number of invading predators never were obtained in simulations. The results are based on 50 replicated simulations.

Figure S6

Contour plots of the effect of 1-5 (column panels 1-5) predators on the number of extinctions (row panels 1), change in community MTD (row panels 2) and MTD after predator invasion (row panels 3). Here the reference consumer community has a low degree of clustering (Island width = 100% and Consumer niche width = 0.5). Missing data can occur in parts of parameter space (grid region) as communities with a certain (high) number of invading predators never were obtained in simulations. The results are based on 10 replicated simulations.

Figure S7

Contour plots of the effect of 1-5 (column panels 1-5) predators on the number of extinctions (row panels 1), change in community MTD (row panels 2) and MTD after predator invasion (row panels 3). Here the reference consumer community has a high degree of clustering (Island width = 25% and Consumer niche width = 2). Missing data can occur in parts of parameter space (grid region) as communities with a certain (high) number of invading predators never were obtained in simulations. The results are based on 10 replicated simulations.

Figure S8

Contour plots of the effect of 1-3 (column panels 1-3) predators on the number of extinctions (row panel 1) and change in community MTD (row panel 2) in a reference consumer community. Here the reference consumer community has a high degree of clustering (Island width = 25% and Consumer niche width = 2). Note the reduction of parameter space (x- and y-axes ranges) when going from one to multiple invading predators. This is because multiple predators could not co-exist at high predator niche width and efficiency. Predators were only allowed to invade the peripheral parts of consumer trait space. Missing data can occur in parts of parameter space as communities with a certain (high) number of invading predators never were obtained in simulations. The results are based on 10 replicated simulations.

Figure S9

Contour plots of the effect of 1-3 (column panels 1-3) predators on the number of extinctions (row panel 1) and change in community MTD (row panel 2) in a reference consumer community. Here the reference consumer community has a low degree of clustering (Island width = 90% and Consumer niche width = 2). Note the reduction of parameter space (x- and y-axes ranges) when going from one to multiple invading predators. This is because multiple predators could not co-exist at high predator niche width and efficiency. Predators were only allowed to invade the peripheral parts of consumer trait space. The results are based on 10 replicated simulations.

Figures

Figure S1a

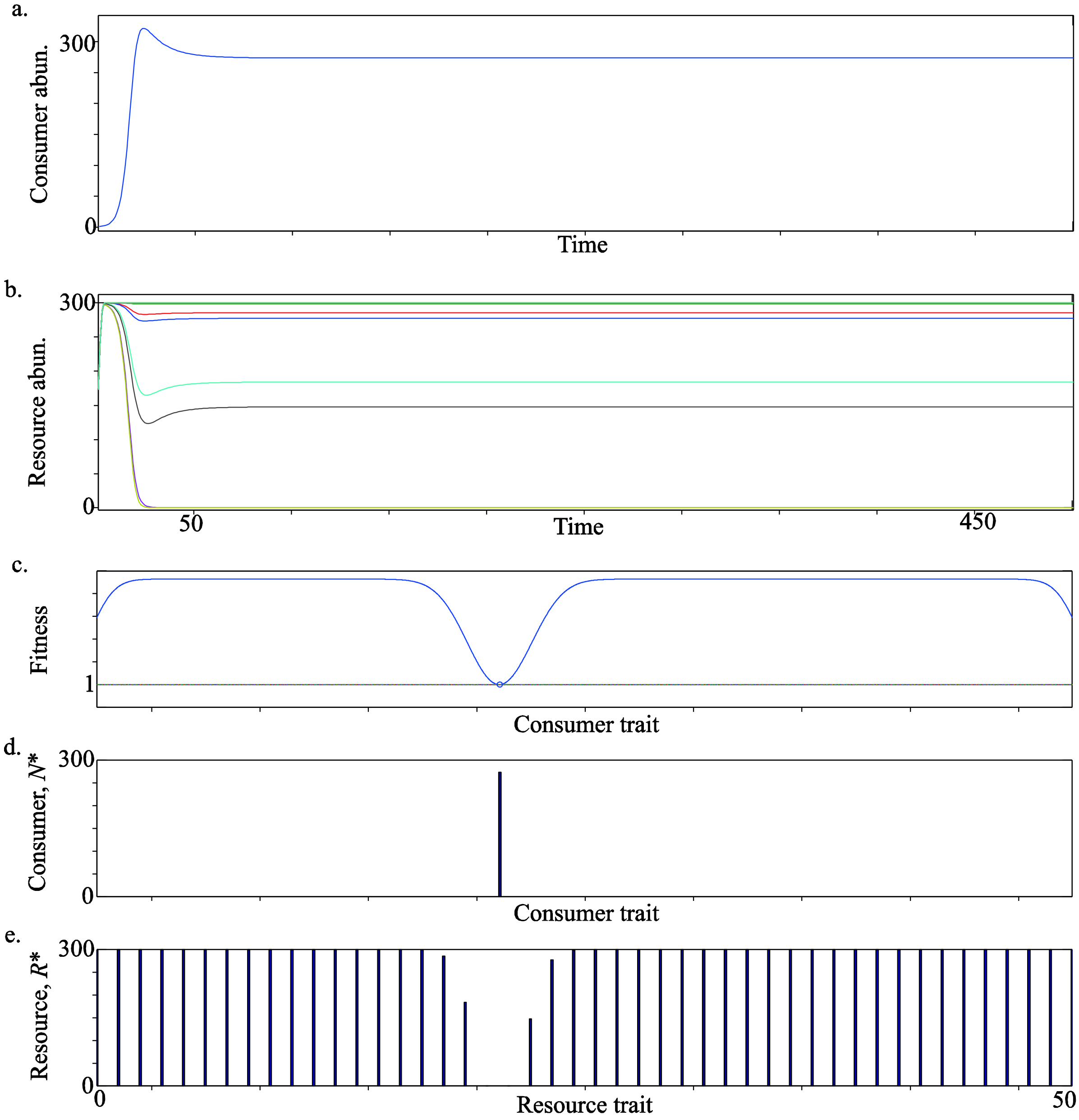


Figure S1b

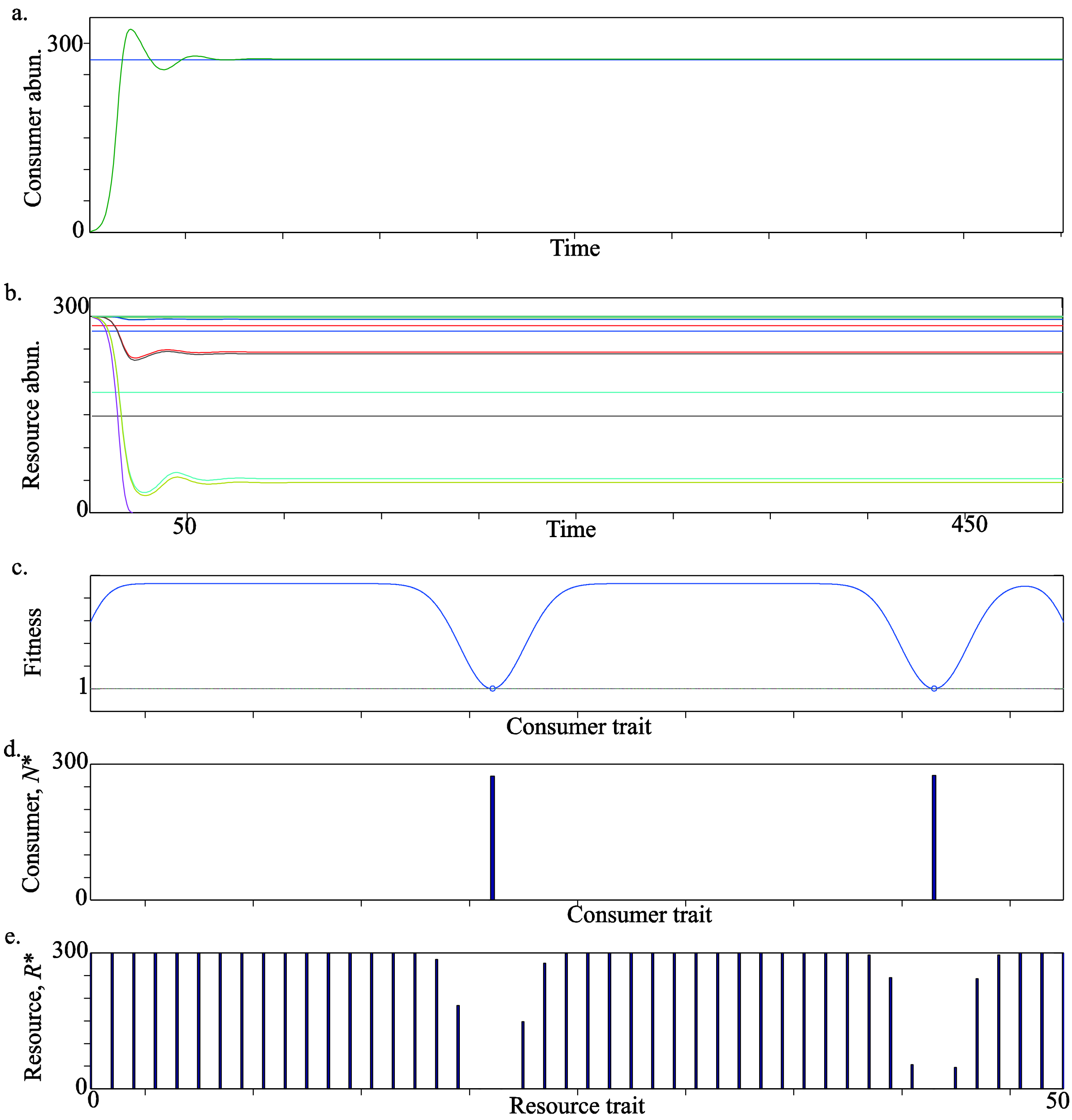

a.
300
0
Consumer abun.
Time
b.
300
0
Resource abun.
50
Time
450
c.
Fitness
1
Consumer trait
d.
300
0
Consumer, N*
Consumer trait
e.
300
0
Resource, R*
0
Resource trait
50

Figure S2a

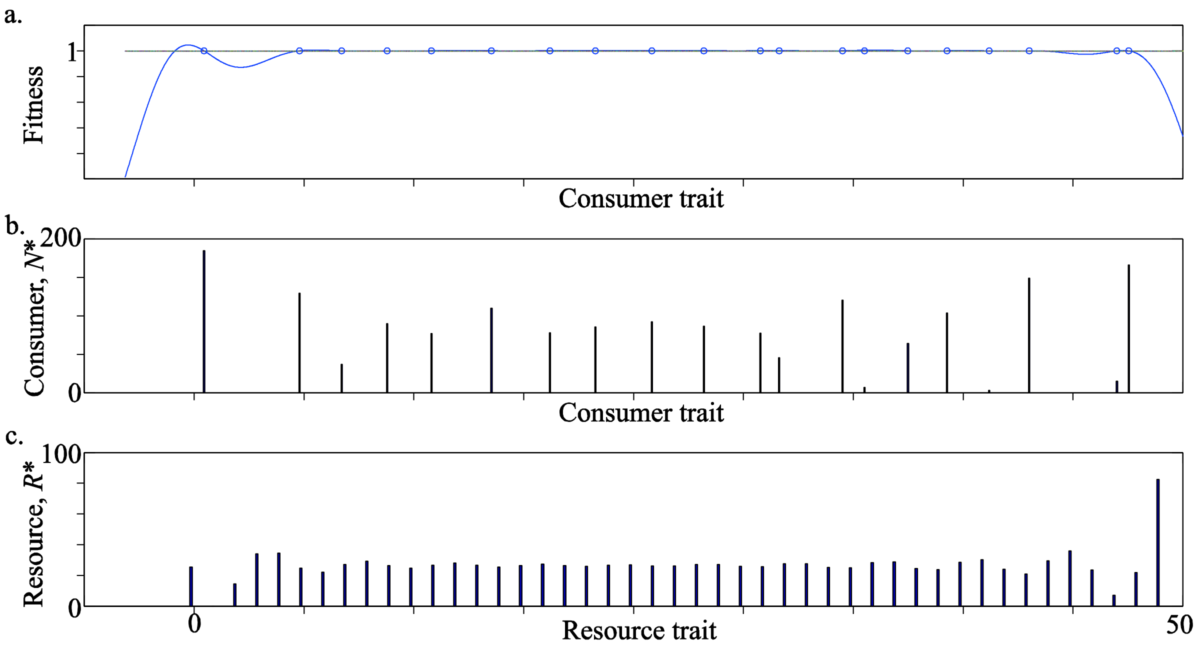
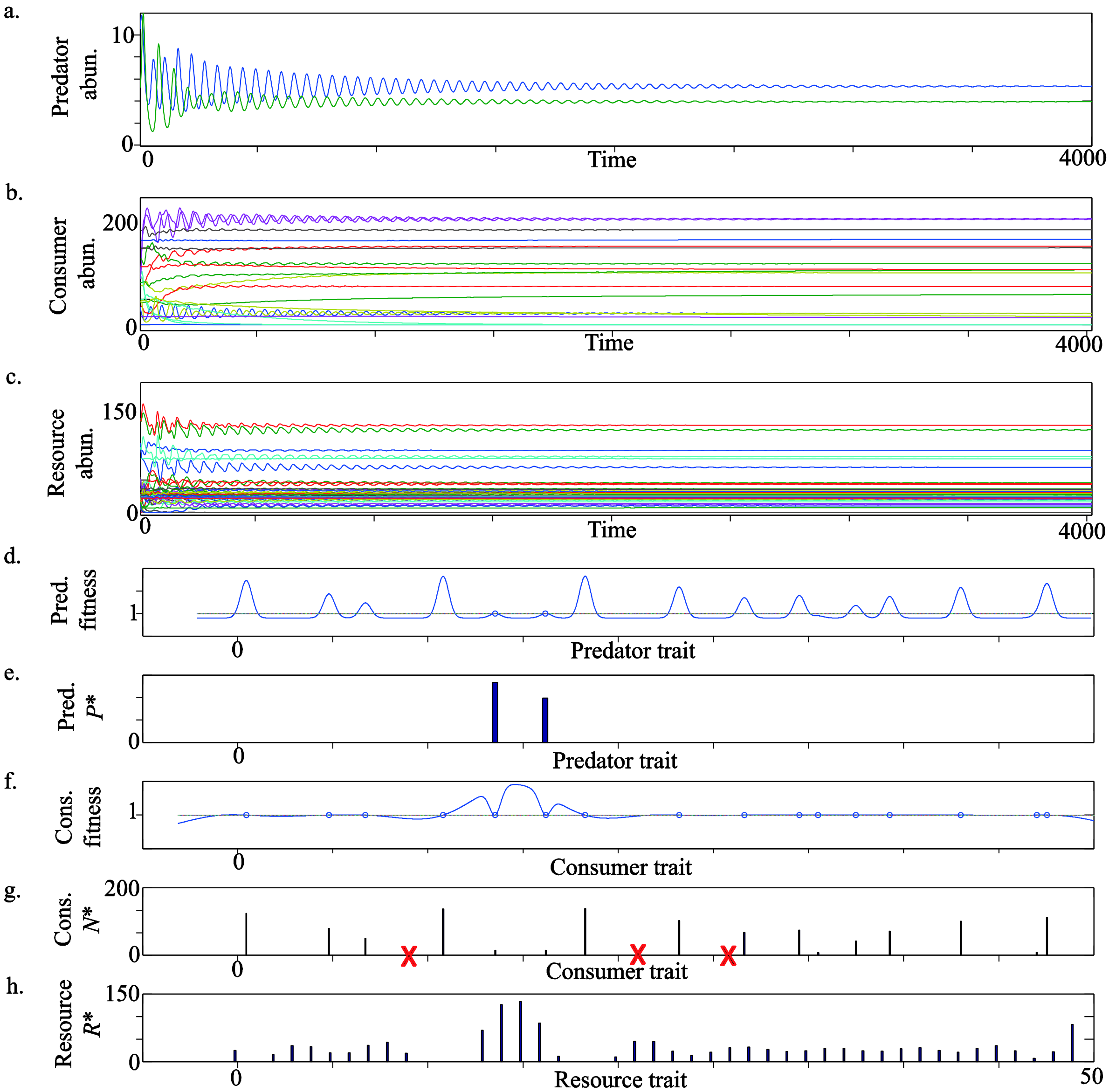

a.
Fitness
1
Consumer trait
b.
Consumer, N*
200
0
Consumer trait
c.
Resource, R*
100
0
0
50
Resource trait

Figure S2b



a.
Predator abun.
10
0
0
Time
4000
b.
Consumer abun.
200
0
0
Time
4000
c.
Resource abun.
150
0
0
Time
4000
d.
Pred. fitness
1
0
Predator trait
e.
Pred. P*
0
0
Predator trait
f.
Cons. fitness
1
0
Consumer trait
g.
Cons. N*
200
0
0
Consumer trait
h.
Resource R*
150
0
0
Resource trait
50

Figure S3

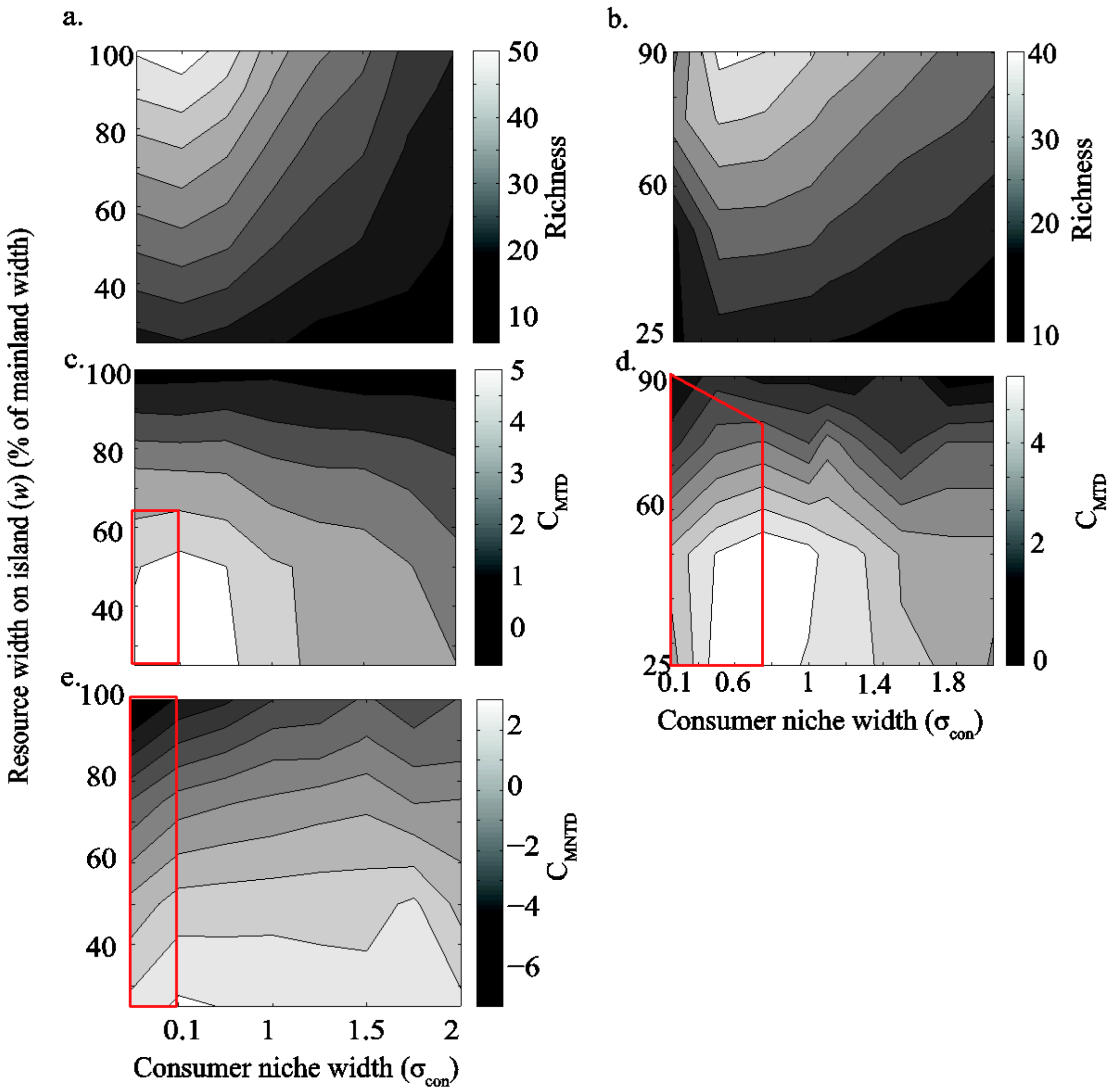
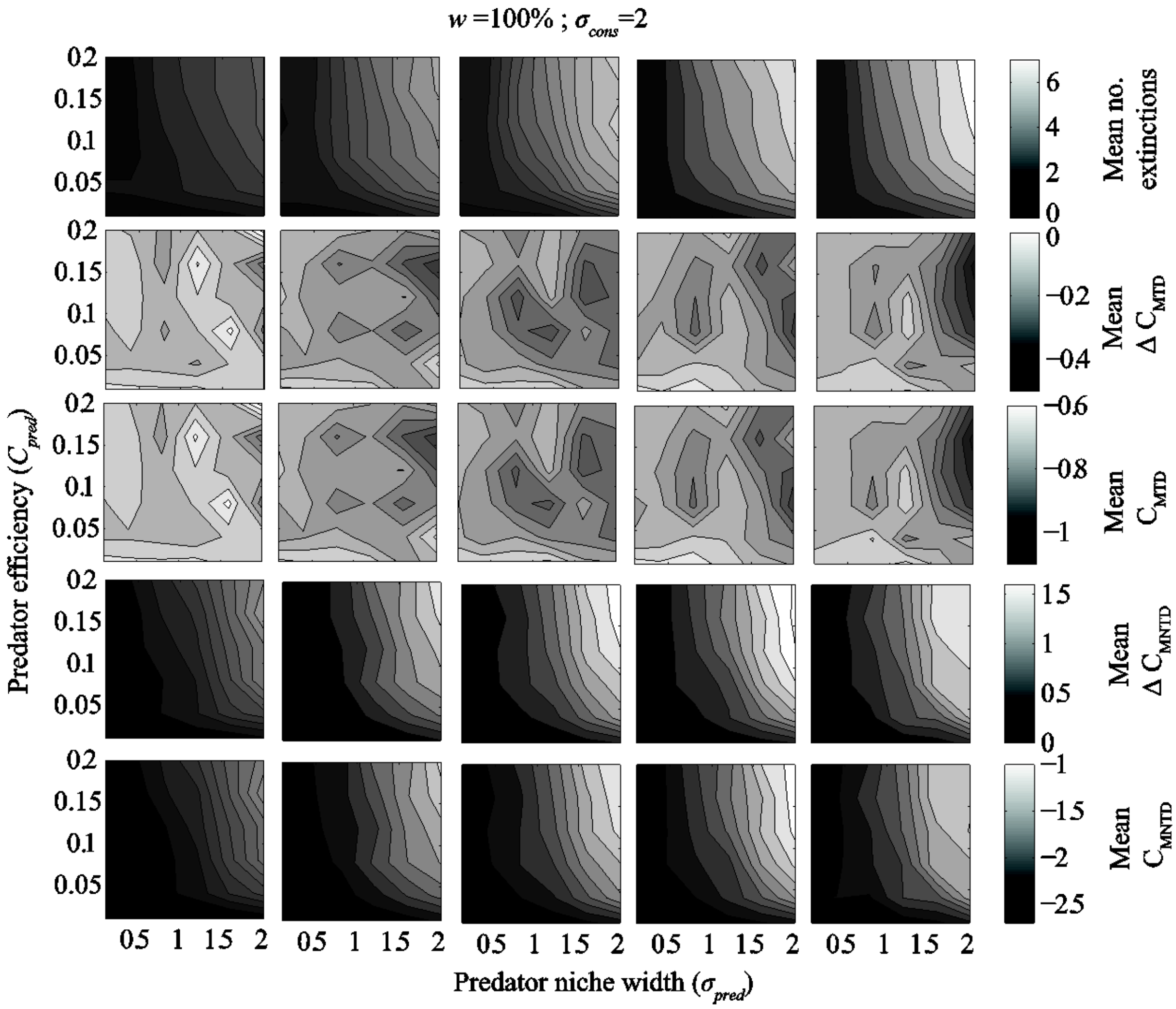
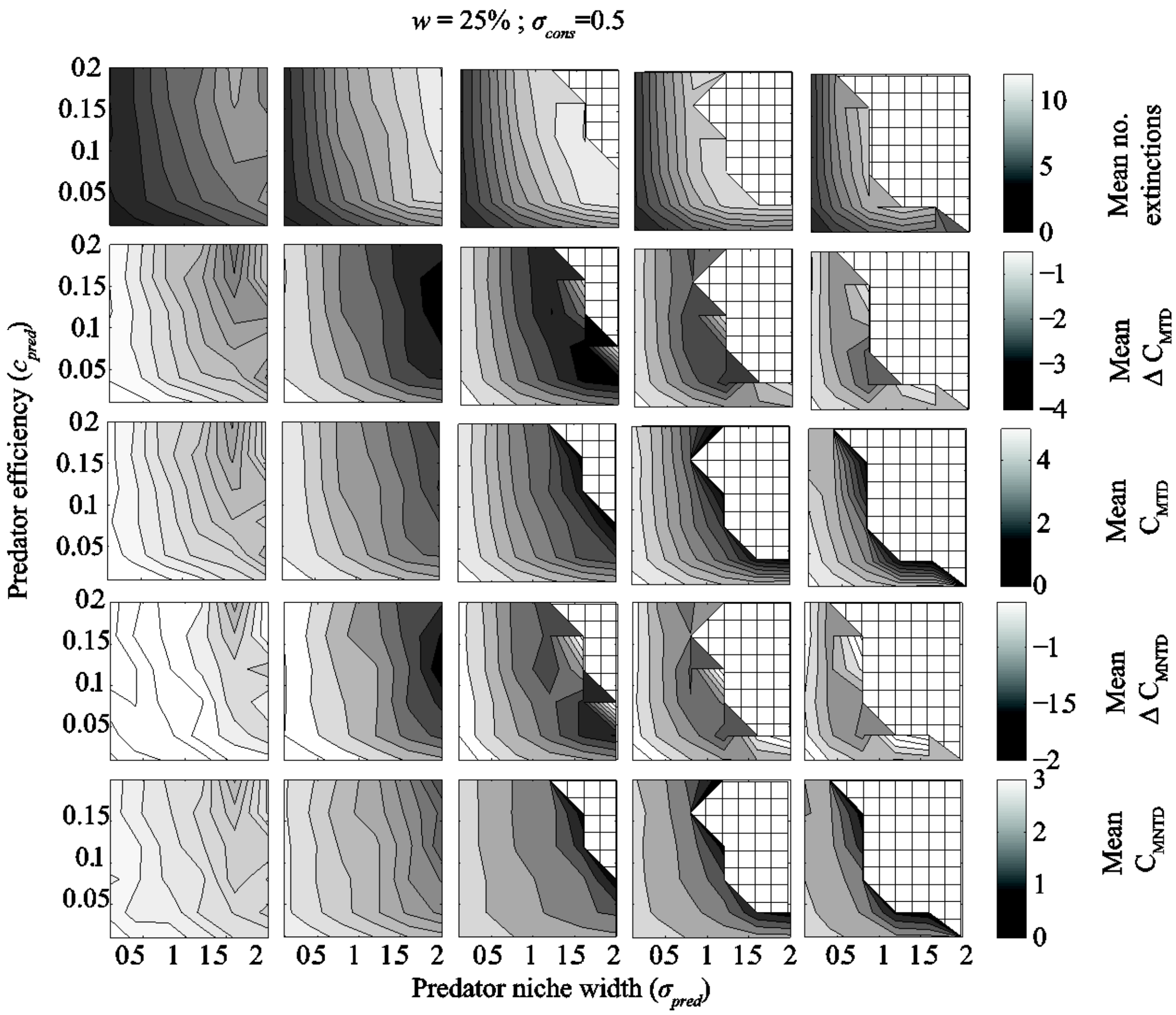

a.
b.
c.
d.
e.
Resource width on island (w) (% of mainland width)
Richness
Richness
C_{MTD}
C_{MTD}
C_{MNTD}
Consumer niche width (σ_{con})
Consumer niche width (σ_{con})

Figure S4



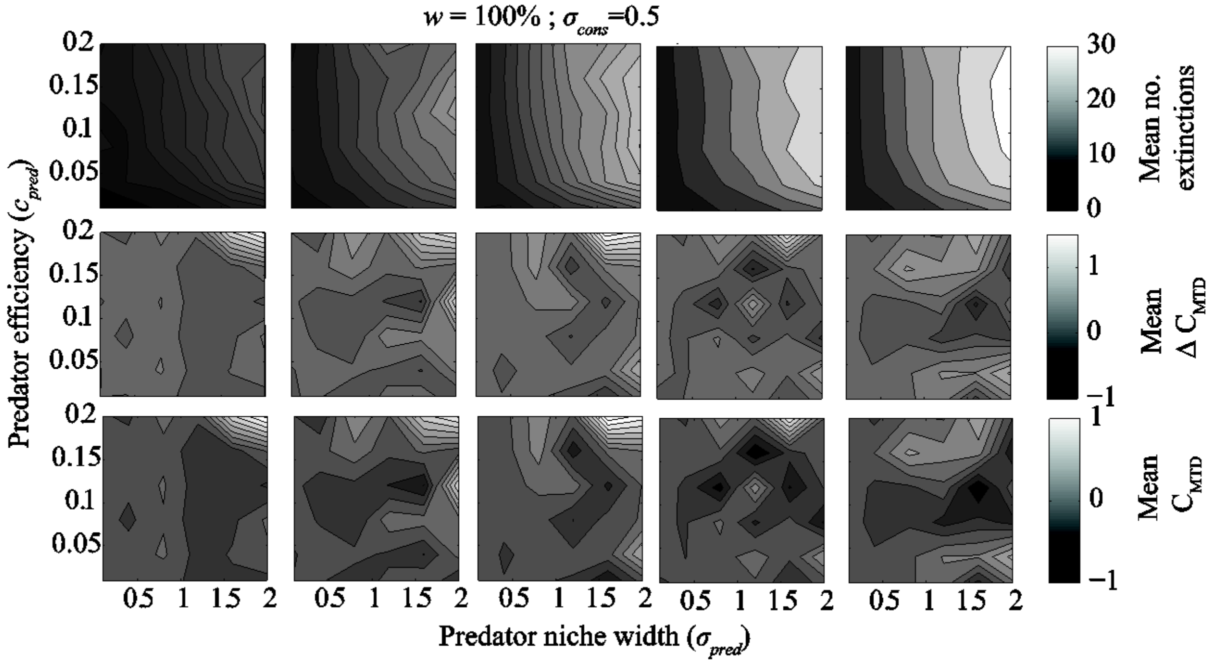
w =100% ; σcons=2
Mean no. extinctions
Mean Δ CMTD
Mean CMTD
Mean Δ CMNTD
Mean CMNTD
Predator efficiency (Cpred)
Predator niche width (σpred)

Figure S5



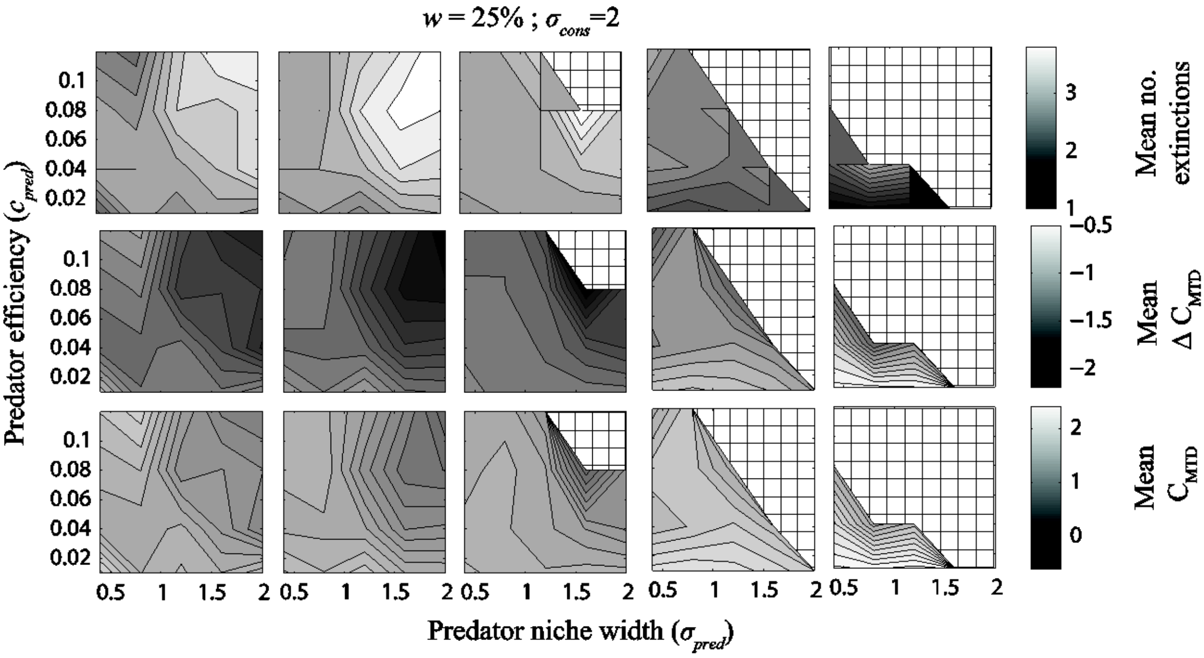
w = 25% ; σ_cons=0.5
Predator efficiency (c_pred)
0.2
0.15
0.1
0.05
Predator niche width (σ_pred)
0.5
1
1.5
2
Mean no. extinctions
10
5
0
Mean Δ C_MTD
−1
−2
−3
−4
Mean C_MTD
4
2
0
Mean Δ C_MNTD
−1
−1.5
−2
Mean C_MNTD
3
2
1
0

Figure S6



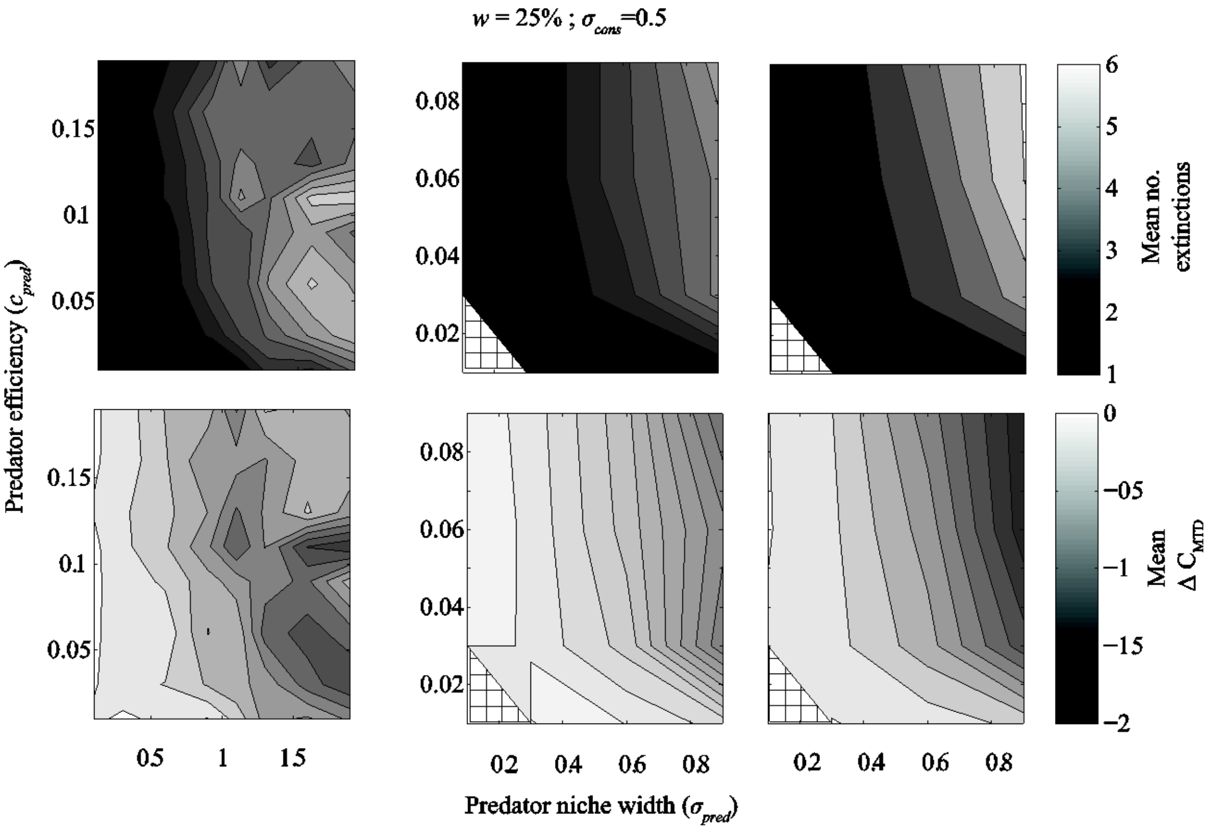
w = 100% ; σcons=0.5
0.2
0.15
0.1
0.05
Predator efficiency (cpred)
30
20
10
0
Mean no. extinctions
1
0
−1
Mean Δ CMTD
Mean CMTD
0.5
1
1.5
2
Predator niche width (σpred)

Figure S7



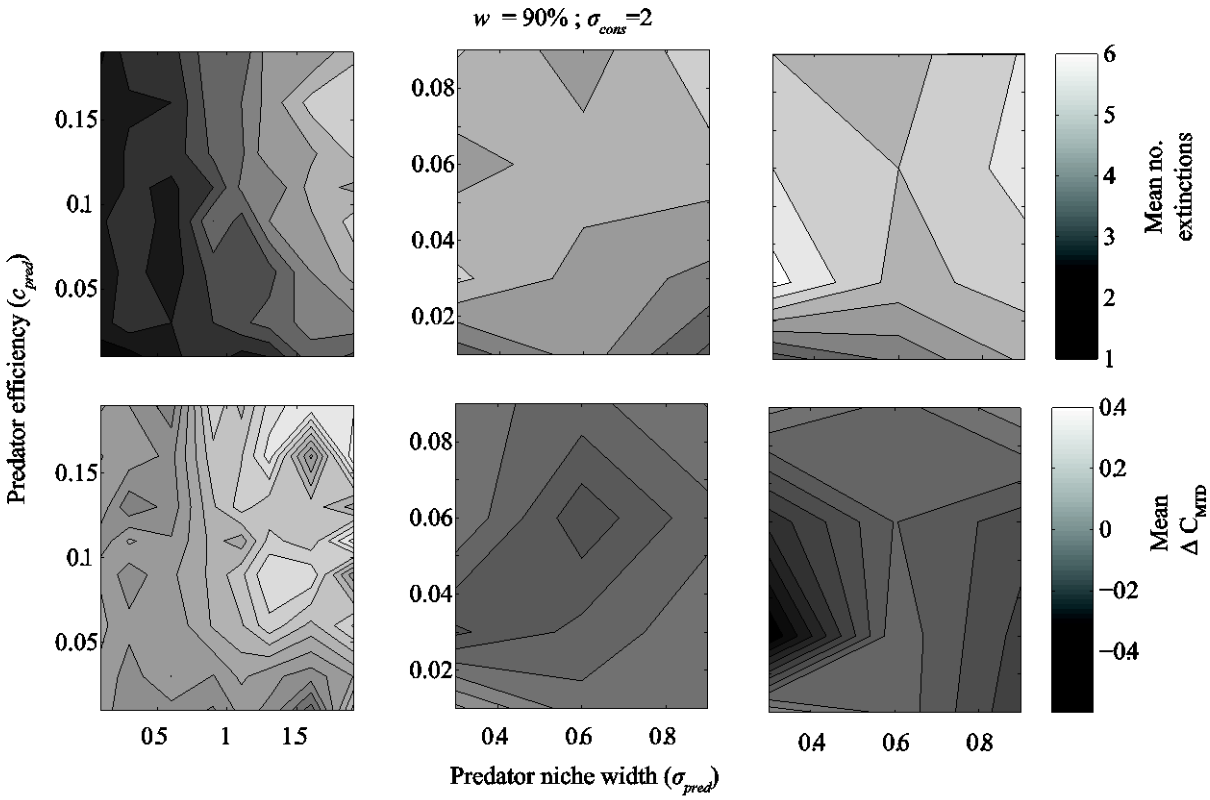
w = 25% ; σcons=2
Predator efficiency (cpred)
0.1
0.08
0.06
0.04
0.02
Predator niche width (σpred)
0.5
1
1.5
2
Mean no. extinctions
Mean Δ CMTD
Mean CMTD

Figure S8



w = 25% ; σcons=0.5
0.15
0.1
0.05
0.08
0.06
0.04
0.02
6
5
4
3
2
1
Mean no. extinctions
0
−05
−1
−15
−2
Mean
Δ CMTD
Predator efficiency (cpred)
05
1
15
02
04
06
08
Predator niche width (σpred)

Figure S9



w = 90% ; σcons=2
0.15
0.1
0.05
0.08
0.06
0.04
0.02
Predator efficiency (cpred)
6
5
4
3
2
1
Mean no. extinctions
0.4
0.2
0
−0.2
−0.4
Mean Δ CMTD
0.5
1
1.5
0.4
0.6
0.8
Predator niche width (σpred)