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| --- | --- | --- |
| Variables and parameters | Meaning | Value |
| nh | level of host/dietary-derived nutrient reserves | - |
| ns | level of symbiont-derived nutrient reserves | - |
| s | symbiont population density | - |
| nh.max | maximum level of nh reserves | 10 |
| ns.max | maximum level of ns reserves | 5 |
| s.max | maximum density of symbiont population | 10 |
| nh.reproduction | minimum level of nh reserves required to reproduce | 4 |
| ns.reproduction | minimum level of ns reserves required to reproduce | 2 |
| nh.critical | minimum level of nh reserves to survive | 1 |
| nh.larva | level of larval nh reserves | - |
| ns.larva | level of larval ns reserves/amount of ns spent on reproduction | - |
| mh | loss from nh reserves due to metabolic expenditure, per time step | 1 |
| ms | loss from ns reserves due to metabolic expenditure, per time step | 1 |
| t | time step | - |
| T | time horizon | 15 |
| N | number of resources acquired per time step | 5 |
| m | slope of fitness as a function of nh.larva (linear) | 1 |
| i | cost of maintaining symbiont population (resources per symbiont state) | 0.2 |
| j | amount of additional symbiont density (symbiont density per resource invested) | 2 |
| k | amount of symbiont density removed (symbiont density per resource invested into regulation) | 2 |
| l | amount of resources produced by symbionts (resource per symbiont density) | 0.5 |
| d | index for decision made by host | - |

Model\_3a: **Dynamic Programming with for loops**

Functions:

nh.larva = 0.6\*(nh – mh) (60%)

ns.larva = 0.6\*(ns – ms) (60%)

Bh = m\*nh.larva -m\*(nh.reproduction - mh)\*0.6 (linear)

Bs = 0 if ns < ns.reproduction, 1 otherwise (step)

B = Bh\* Bs

in.survival = 0 if nh < nh.critical, 1 otherwise (step)

ex.survival = 1 – 1/36

Pr(S) = in.survival\*ex.survival

maintenance = s\*I (linear)

s(t+1) = s(t) + number of resources invested\*j (investment, linear)

s(t+1) = s(t) – number of resources invested\*k (regulation, linear)

production = s\*l (linear)