**Dispersal Simulation Notes 10/03/2013**

Total colony food, which is group productivity or individual fitness for each member of the colony

Total food = total instar in colony scaled by –(ax+b)2 + c → this is a completely symmetrical function. Perhaps not that realistic?

c: defines where the maximum lies

By deciding what these numbers are will scale the size of the colonies:

Max colony size: 50? Therefore with this exactly symmetrical scaling function dx/dy = 0 at x=25

Other options is basically : modified from Aviles 1999

f(N)= a Nd e-cN where a is a scaling factor denoting the maximum up the y-axis, d is > 1 and denotes how skewed the graph is and c is kinda the group carrying capacity. For the minute N will be total instar.

Maximum x = d/c

Maximum value for food is e-d (d/c)d

Scale function by maximum value to get 1 as the maximum value

Proportion of food:

Scaled function: e(d-cN) (CN/d)d  with d as the amount of skew

Combining the equations for food: although I don’t want to combine with the food allocation equation

Food to each spider from colony food

Scaled by relative size compared to others within the colony. So it is just relative size multiplied by total colony food. This is pure scramble competition, everyone gets the same amount compared to their size. I need to think about how to model contest competition.

Growth to individual size

Need maximum growth per time step: need to think about it in terms of an individual growth rate and obviously has to be a function of their current size.

Simplest could be purely linear function with a maximum – do I need a maximum?

Growth = m \* individual food

No- negative growth which can result in death

Easist just to say that –ve growth = death for the minute?

Better growth rate equation from Stearns and Koella (1986) s=A(1-Be-kx) where a is the limited size, b is the fecundity of mature organism (not sure how this fits into the growth function, 1-b is the size at birth) and k is the rate of growth, perhaps changing k in relation to how much food you get?

But I would change it to x being total amount of food and s still being size. Yay! That works well.

AND I can make A one so the limiting size is one, which will work out very well! And 1-B is the intercept so set B between 0 and 1

Make it the discrete case and change k depending on how much food the individual gets.

St+1 = k St e-k

The equation for change in ‘time’ given only previous weight

S(new) = 1+ (-S(old) -1) e-k∆t

Lomincki book p49: rate of growth W(t)= W(0) ert but exponential growth rate seems silly

Increasing instar levels: set instar list for the predefined sizes to reach next instar level.

Need: offspring producing class

What determines how many offspring a female has?

All spiders are in a colony, even if it is just them.

Offspring are added to the colony the female is in.

Number of offspring produced is proportional to size of female and random element.

* I’ll start by having every female reproducing when they get to adult hood and taking out the dependence on the size of the female and stochasticity when reproducing

Newly produced offspring has everything equal to zero!

Scramble vs contest comp

Scramble comp: Enough for everyone to grow equally BUT how much should size matter compared to instar? If you are smaller then you won’t need so much food to grow your maximum amount.

Perhaps instead of a

From Roff book Fecundity = a + b(body size) p 93