**Dispersal Simulation Notes 19/03/2013**

**Total colony food: could be interpreted as group productivity**

Modified function from Aviles 1999

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

N is total instar, which takes into account that smaller instars will be less productive than older instars

Maximum N = dn/dx=0 =d/c

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

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

Total food =

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

**Food to each spider from colony food: scramble and contest competition**

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. (modified from Lomnicki book)

If = m Sr + c

Sr is individual’s size relative to the rest of the colony, m and c are constants that define the amount of scramble competition

Max If = m + c (when Sr =1)

TotalColonyFood = c - 1/2 m =

**Individual growth**

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?

S= 1-Be-kt where your increase in t depends on how much food individual gets

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

S(new) = 1+ (-S(old) -1) e-k∆t

k affects the amount of food that is needed to grow

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

As the maximum size is 1, easy to define instar list. Say 0.8 is adult? Then the adult can grow a bit

**How many offspring are produced?**

**BUT remember that females can only reproduce once, when do the females decide to reproduce? As soon as they reach adulthood or do they decide to wait until they are larger?**

What determines how many offspring a female has?

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!

From Roff book Fecundity = a + b(body size) p 93 if adult is when size 0.8 – can continue growing for a bit.

with a can be negative as births will only take place when adult.

**Mortality**

Risk of mortality decreases with size:

Prob of death = a e-µ m S , where S is size , a is prob scaling factor, m is scaling factor to make sure S is out of zero.

m = - ln (ymin/a)

So far I think that all adults die when the reach a certain age.

**Dispersal**

**How to define and calculate fitness?**