Statistic log (parameter estimation):

Starting on April 29th , 2019. Some parameter estimation has already begun.

1. Estimate chlorophyll (chl) and ammonium (nh4) simultaneously:

Where C1 is the constant loss of nh4 to air and C2 is the constant nh4 lost to nitrate. These are estimated in “nutrient\_air.R”.

Parameters to be estimated are *t,h,v,s* and *death*.

is the growth rate of chl based on nh4 availability, written as a saturating curve based on nh4 in the system and is multiplied by chl because growth is proportional to how much algae is in the system.

is the uptake rate of nh4, written as a saturating curve based on nh4 in the system and is multiplied by chl because uptake is proportional to how much algae is in the system.

May 5, 2019

Added density dependent function for death based on looking at graph from nls.feeding where the change in algae was dependent on how much algae was present. Struggling to get the ode to fit with 2 latent parameters.

May 30, 2019

Changed death term of chlorophyll to a quadratic density dependent death

Death = death1 \* chl + death2\*chl2

Re-parameterized saturating functions so now read:

Changed constant of loss of ammonium to one number- still found in “nutrient\_air.R”- because now there is a slope over time which is a rate- it appears to be fairly constant with starting value (so this is what I have assumed). It must be multiplied by *Nh4* because it isn’t constant loss but proportional loss. So equation now reads

April 30, 2019

Work on daphnia lifetime parameter fits (daph\_lifetime\_params.R). All the experiments have constant food.

1. I fit daily fecundity (lifetime divided by days as an adult) to a saturating curve and a sigmoidal curve- both with and without individuals who died quickly (thus had less than 1 baby). The two curves (sigmoidal and saturating) look similar- sigmoidal just means the very first increases in chlorophyll from 0 aren’t the biggest change in rate of daily birth – which makes sense because no food to a tiny bit of food shouldn’t be where the biggest gains in reproduction occur. Used nls() to fit data. The output of the model should just be the parameter for ode.
2. Set up to fit adult death parameters. Fit saturating curve to days from adulthood to death. Want 1/saturating curve for death rate per day.
   1. Forced the intercept through 0- makes an extremely sharp increase in death rate between my lowest chl measured and 0 chl, which may not be good. Will likely need starvation data from literature