Mysis modeling brainstorm:

Variables:

Time	$=$	t
Average solar radiation	$=$	a
Thermocline's distance from surface	$=$	d
Calories (c)	$=$	if migrating: $+\omega$
		else: $-\epsilon$

Migrate Desire Model equations:

Mysis engrained desire to migrate:	$M(t) =$	C_1 (assuming resolution of a single day)
Pressure not to migrate from light levels:	$L(a) =$	$C_2 \log(a)$
Pressure " " from thermocline depth:	$D(d) =$	$C_3(d)$
Hunger:	$H(c) =$	$c_4 e^c$

Total Mysis model:

Migrate or Not	$=$	$MoN(t, a, d, c) = M(t) - L(a) - D(d) + H(c)$
If ($MoN(t, a, d, c) > \alpha$ for day)	$=$	migrate

A large number of Mysis will be initialized with randomly permuted starting conditions and run through an arbitrary amount of time (say a year). Their migration patterns will be visualized, from this visualizations patterns in migration will be come apparent.

Light Intensity Equation

$$I_x = I_o e^{-kx}$$

$$I_{x,o} = \text{intensity at depth x and surface respectively (in lux)}$$

$$k = \text{extinction coefficient (or water clarity)}$$

So to solve for distance to threshold we find..

$$
\begin{aligned}
\frac{I_x}{I_o} &= e^{-kx} \\
ln(\frac{I_x}{I_o}) &= -kx \\
ln(I_x) - ln(I_o) &= -kx \\
ln(I_o) - ln(I_x) &= kx \\
\tfrac{1}{k}(ln(I_o) - ln(I_x)) &= x
\end{aligned}
$$

We set the threshold (I_x) to be 10^{-2} lux (per Boscarino 2007) and the extinction coefficient (k) to be 0.15 (per Jenson 2006). This turns the function into one of current light level at surface (I_o) in the form of:

Distance of light threshold: $\quad f(I_o) = \frac{1}{k}(ln(I_o) - ln(I_x))$
or
$$f(I_o) = \frac{1}{0.15}(ln(I_o) + 6.9)$$

Note: make sure to plot the different parameter values for this equation later. Maybe make an interactive visualization of it.

For nightime light intensity I am currently going off of a fishing website's un-cited figure. This will need to be updated to a more legitimate source when I am on the UVM network.
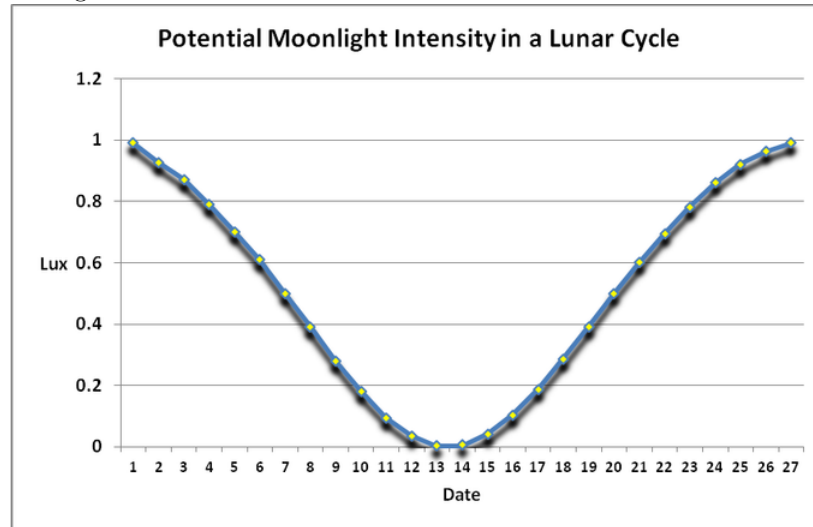
After running all of this through the r program we get a nice output for a given 30 day lunar cycle of ...