The three models here are identical except for one parameter. The harvesting rate of lionfish by grouper, ($h_{L,G}$ in the differential model) is treated as constant parameter in order to ascertain the approximate harvesting rate needed for the coral-fish population growth to behaved as it did before the arrival of lionfish (*locally asymptotically stable*). We observed that coral-fish population behavior change form periodic to $l.a.s$ with larger values of $h_{L,G}$. This meant that at some value of $h_{L,G}$ the behavior changed, and we varied $h_{L,G}$ in order to find that threshold. We observed that the change from periodic to $l.a.s$ occurred at very near .35 [Figure 1]. To test the validity of our threshold rate we decreased $h_{L,G}$ by .01 (to .349) [Figure 3] and noticed the long term behavior unchanged from Figure 1. Further, we increased our assumed threshold by .0025 (to .3525)[Figure 2] and observed a decreasing amplitude of the solution. Plots done over thousands of months showed that Figure 2 converged and Figure 1 did not. Thus, our harvesting threshold was valid.

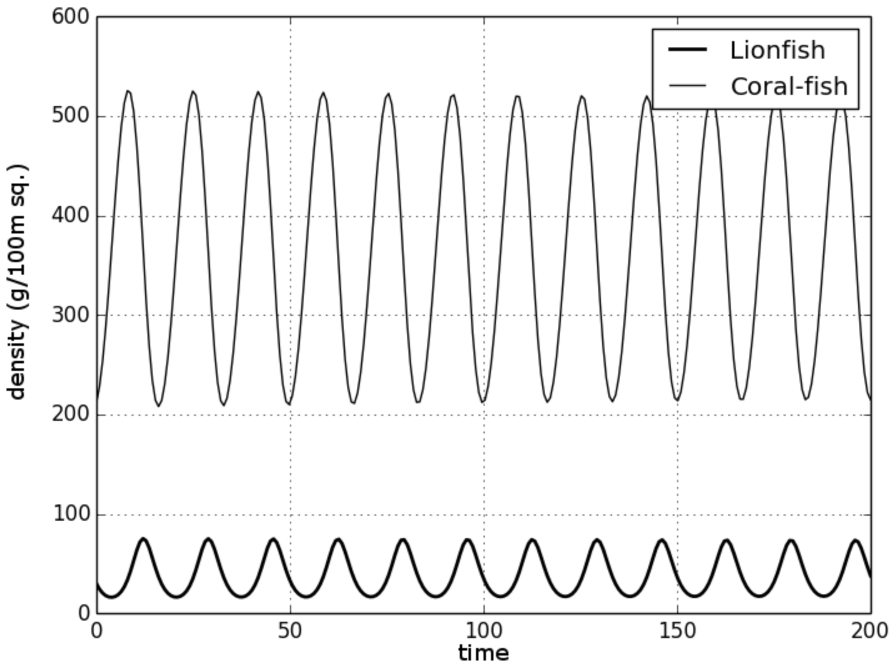

Figure 1: C0= 212 L0= 5 K= 800 RC= .447 dl = 0.3 bl= 0.1 hCL= 8.6/240 hLG= .35 Instability

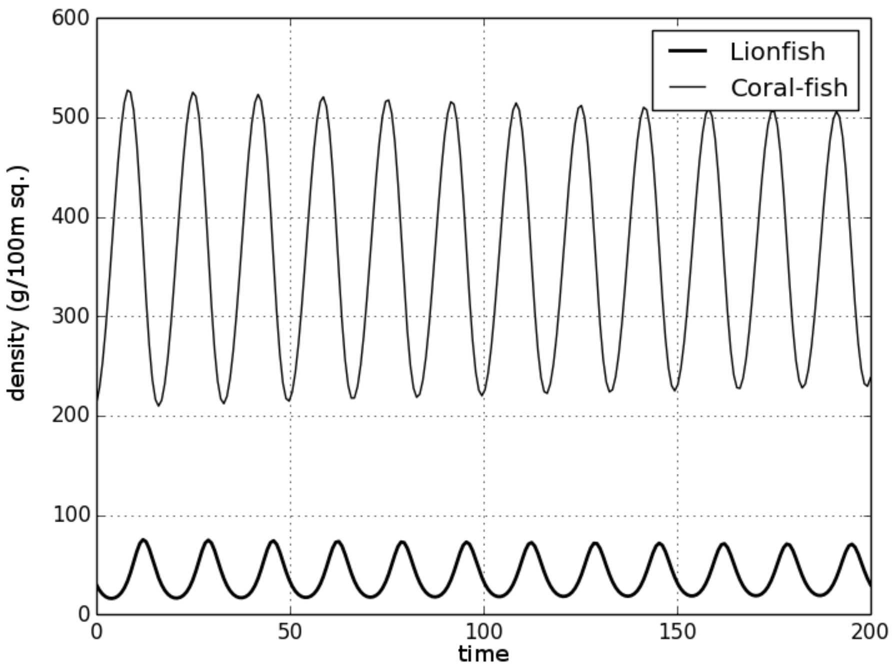

Figure 2: C0= 212 L0= 5 K= 800 RC= .447 dl = 0.3 bl= 0.1 hCL= 8.6/240 hLG= .3525 .35 seems to be the threshold for stability. Next will show 3.49 to show instability

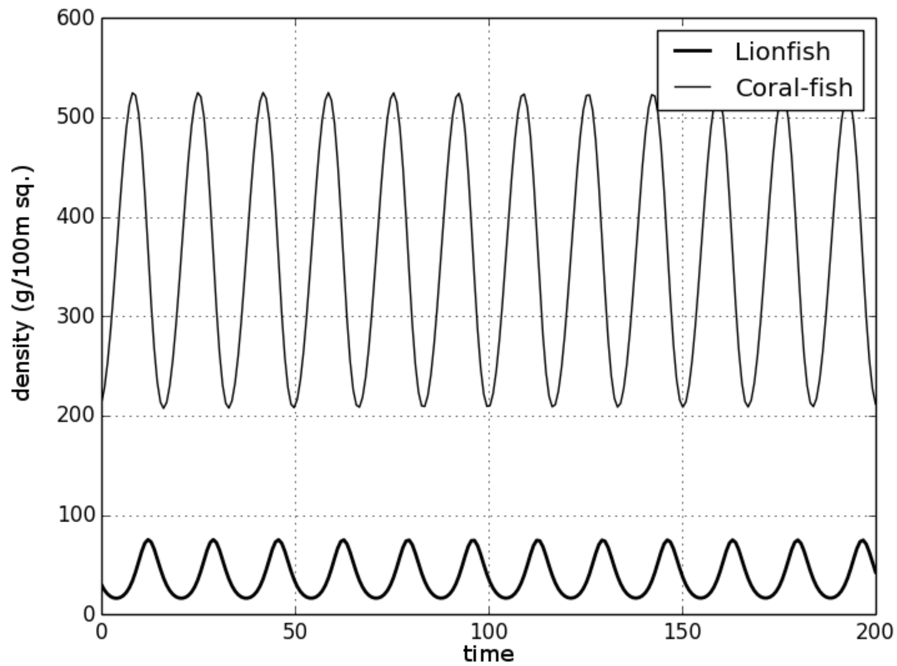

Figure 3: C0= 212 L0= 5 K= 800 RC= .447 dl = 0.3 bl= 0.1 hCL= 8.6/240 hLG= .349 Yep. .35 is the threshold as .349 looks unstable, further with a longer time frame..