BIOL 152

Lab 10 - Trophic Chains Dynamics, 1

- *Appendix E due homework practice calculations (p. 97, 10 pts)
- *Notebook check pre-lab (p. 64, 5 points) do at beginning of class

Next week (week of Apr 2)

*Term project progress report presentations (10 points)

This lab exercise provides students with opportunities to design experiments, within some boundaries, that test predictions about population dynamics and regulation in a simple microcosm. Students are expected to complete a "pre-lab" in which they view a couple of YouTube videos (linked in the course website under Lab Resources – Trophic Chain Dynamics), and then write down the steps involved in the experimental procedure in their lab notebook. Check notebooks during the first five minutes of class to ensure this has been completed. Students should not require much – if any – introduction to the exercise if they have completed their homework.

Student groups are expected to design their experiments prior to setting them up. This will involve completing a form (appended) and bringing it to you for approval. Groups will have access to six 100 ml vials to establish their ecosystems, as well as a brine shrimp culture and an algal culture of unknown density (you will need to provide them with that information). They choose initial densities of algae and shrimp, and predict where things will end up after a couple of weeks. They should articulate a hypothesis that is appropriate for their predictions.

Explain to students that the lab involves setting up experimental micro-ecosystems with just two species. They will vary the number of consumers or producers in the ecosystem, and observe the effect on final densities of both.

There are several dynamics at play – one is the consumption of algae by brine shrimp. If there are too many brine shrimp, they will eat all the algae and die, or they may die for other density-related reasons (e.g., disease, waste, etc.). Brine shrimp, however, are not expected to increase in density during the time of the experiment. On the other hand, *Platymonas* algae readily divide mitotically, and so the density of algae may reasonably be expected to increase in density, especially if brine shrimp density is low. On the other hand, the ability of algal density to increase is not unlimited – they also are expected to experience density-dependent regulation due to disease, waste or other resource limitation. Of course, algal density may be regulated by predation by brine shrimp as well. Thus, students should consider these multiple interacting dynamics when designing their experiments. I encourage you to highlight some of these complexities when you introduce the lab, and to refresh their memories about logistic & exponential population growth, and the potential regulatory action of trophic interactions.

Given the constraints they can probably manipulate only one variable: either algal density or brine shrimp density. Remind students they must have replication to calculate and compare means at the end of the experiment.

Ask students what will have to happen to determine how many algae there are. If they have done their homework, they should be good with this. Walk them through the idea of a dilution series (e.g., Fig. 1), and the calculations – they will need to do these calculations to determine how to set up their experimental vials. Again, they should be fine if they did their homework.

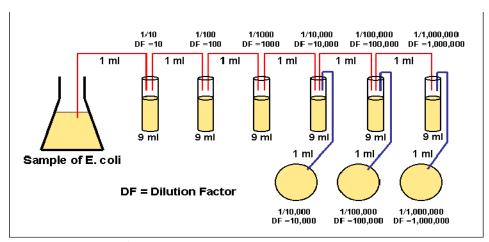


Figure 1. Example of a dilution series and calculations

You will need to measure absorbance of the stock algal culture <u>prior to each of your labs</u> (or perhaps as a demonstration) and calculate an estimate of algal density. Students will need to know the starting density of the stock culture prior to making their experimental microcosms. Remember to resuspend (swirl) the culture prior to collecting a sample for measurement.

Be sure students label their vials with the treatment, their names, lab section, etc. so they are able to recover data in two weeks during the follow-up. Completed vials should be tightly sealed and placed under illumination

Several pieces of equipment are used in this lab that may be unfamiliar to students. Thus, please take time to introduce proper use and handling of, for example, pipettors, depression slides, and spectrometers. I reference a YouTube video in the write-up that shows how to use our model of spectrometer (Pasco PS-2600), although the relevant content is only from about time 4:33 - 6:47 in the video. This video is also linked in the course website. Be sure students understand how to use pipettors properly (e.g., tip down, slow release, etc.).