Lab 6—Succession in a Marine Fouling Community

Let's review what we have done so far this quarter: In Lab 1 you looked at species diversity in a community. We can define a community as multiple species living together at a particular place (note: this is NOT the same as a population). Lab 2 dealt with how different organisms obtain resources. In Labs 3-5 we focused on intraspecific interactions—that is what is going on with one species—whether it was population growth, natural selection, inheritance, or changes in gene frequencies. In labs 6 and 7 we now change our focus to interspecific interactions—that is, how are multiple species interacting with each other. In the last lab, Lab 8, we will return to intraspecific interactions when we look at speciation.

Lab 6 revisits ideas from Lab 1, namely diversity. In Lab 1 we were looking at diversity at one moment in time. This time we are interested in how diversity changes through time. This change through time we call succession. The basic idea with succession is that you start with some bare habitat with no organisms. This bare habitat could occur because of a fire, volcanic activity, glacial melt, etc—in lecture they will discuss these ideas.

We start with a habitat with basically nothing in it. This habitat starts to get colonized by organisms (possibly resulting in founder effects—if we were interested in gene frequencies this would be our focus, but not for lab 6, but you might keep this in the back of your mind). As time goes on we start seeing a shift in the types of organisms present in the habitat. Colonists are typically r-selected species—organisms that can grow quickly and reproduce a lot. As time passes, more K-selected organisms start to colonize, and then at the latest time period (what is sometimes called the climax community) the habitat it typically dominated by K-selected species. Pretty much all the r-selected species have been outcompeted and thus excluded from the habitat (think about the competitive exclusion principle). In lecture they will talk about different types of succession and ideas of facilitation. We will not go into that here.

In our lab we provide you three different ages of marine fouling plates. They are called fouling plates because these organisms are notorious for growing on docks and the bottoms of boats, "fouling" these structures. We have a 3-month old plate, a 6-month old plate, and a 9-moth old plate. Your mission was to calculate the Shannon-Wiener Index for each of these plates to see if diversity has changed through time. Our expectation was that the 6-moth old plate should have the highest diversity as there should be a mix of r- and K-selected species. The 3- and 9-month old plates should have the lowest diversity.

We have done this experiment for a couple of years now and we find that the time of year we put the plates out plays a very significant role in our results. Summer is the best time to get the plates colonized because this is when the organisms are reproducing (in ecological parlance we call this recruitment). In the winter, our plates are not as productive.

Back to the lab. You calculated H' for the three plates but were then asked to pool your data with a few other groups in your lab. Can you think why this might be the case? Think back to labs 3 and 4 where you took averages and pooled data. Why would one data point not be as meaningful as if you had multiple data points? You were then asked to provide some testable hypothesis to explain your results. We find students struggle with this as their hypotheses tend to be overly broad or not testable. When developing a hypothesis you want to think back to your numerical prediction—what are you actually going to measure? Can it be boiled down to a mathematical expression? This then narrows your focus to something that one can actually go out, measure, and hope is supported by your data.

You were then asked to consult with a different group. The purpose for this was to get you thinking about different ideas that could explain the results. Was there variation in the data? What is their opinion as to what might be happening? We are trying to get you to think rather than just do. The doing is easy, the thinking is the hard part.

Just a couple of notes: we were not looking at changes in r-and K-selected organisms on the plates. Our diversity index does not care whether or not a species is r-or K-selected. We presume there is a change, but we are not measuring that (we would need to know more about the organisms to make these determinations). Also, we are seeing a change in the species composition over time, but again our H' calculation does not tell us this. All it can tell us is how diverse each plate is, and so any discussion related to these plates in this lab should not stray beyond what the index can tell you. There are other indices one can use that would inform us about changes in species composition over time (Sorenson's coefficients, for example) but we are not going there with this lab. In general you want to know what your tools can and cannot tell you and limit your discussion to what you absolutely know.