**Reef Survivor Board Game**

In this lab you will play an educational board game designed to teach you about the processes of fossilization. This board game, “Reef Survivor”, was designed by Dr. Martindale from the University of Texas at Austin. The game is modeled around reef (paleo)communities, the natural and human-made threats they face, as well as how reef builders and dwellers interact, evolve, and adapt.

**The goal of the game is to build a healthy, diverse reef ecosystem that can survive natural disasters.** Each player (or team of players) is a conservation expert in charge of keeping their reef healthy. Over time, environmental conditions can change; for example, global temperatures rise or fall, and more or less nutrients are washed off the land and onto the reef. Over many years and generations, species may change as well through genetic mutation, the influx of new organisms (migration), and environmental pressures that affect organisms in different ways (natural selection).

**BEFORE THE LAB:**

* **Watch the “how to play the game” video:** [www.youtube.com/watch?v=bw8geNpuEnQ](http://www.youtube.com/watch?v=bw8geNpuEnQ)
* **Read the game booklet** **and complete the “Pre-Lab” component of the worksheet** so you know the strengths and weaknesses of the different organisms, what environmental settings they can live in, what mutations might arise, and environmental catastrophes you may face. If you want to win, you will have to do your homework and strategize; you will need to be familiar with several concepts to protect these amazing fossils!

**DURING LAB:**

* Remember **to take photos of the game board at the end of each round** (i.e., when you survey your reefs).
* As you play the game, track and calculate the diversity of your table/your board. How does diversity change through time? How is the diversity of your game board different from the abundance of reef builders? How even is your community?
* Note the extinctions of different organisms. Keep track of which disasters have impacted your reef community (you’ll need these for the follow-up worksheet).
* Remember that not all mutations or disasters will apply to all reef organisms, know your reef community so you know how to protect it.

**ONCE YOU HAVE FINISHED THE GAME (STILL IN LAB):**

* Talk to another group about their game outcomes and the disasters they experienced. **You will need this information for the follow-up worksheet.** Each board is like a different region of the world and most of them will not have the same history!
* **Complete the “Follow-up” component of the worksheet.**
* **Complete the Google Survey:** <https://forms.gle/FwSKSjTzcbwurNRj6>.
  + *Note: it is CRITICAL that we can match your survey responses to your pre-lab and follow-up assignments. All identifiable data will be purged once the data are connected; all information will be kept secure and anonymous as part of this study.*

**Reef Survivor Follow-Up Worksheet**

***(Note: Some of these questions you have seen before. This is intentional, please do not just copy your previous answer)***

1. a. What was the composition of the community at the start of the game? Refer back to the photo taken of your reef BEFORE Disaster #1

b. What was the composition of the community at the end of the game?

c. How did the diversity of your community change over time (e.g., what was the diversity after each disaster?)

d. How is the diversity of your game board different from the abundance of reef builders (e.g., were there times when you had a low diversity but still lots of reef builders, or vice versa)?

e. How even is your community (i.e., a community is very even if there are the same number of each type of organism, an uneven community has a few of one species and many individuals of another)?

2. a. Which were the worst disasters for your reef? For your whole table?

b. Talk to another group, which were the worst disasters for their reef? For their whole table?

3. a. What are the mechanisms that ADD variation to gene frequency?

b. Do genetic mutations occur for the good of the organism or are they random? Do they help or hurt organisms? Or can they do both?

c. If a mutation helps a reef organism survive, explain how it becomes more abundant in a community over time.

d. Using your experience with the reef game, provide an example of a mutation that was beneficial, another that was detrimental, and a third that was neutral. Include the organism, mutation, and disaster in your examples.

e. Can an organism or species "prepare for" environmental changes or stresses? Explain your answer. What does this tell you about natural selection?

f. Does natural selection always impact a community in the same way? Explain your answer.

4. a. Which community is more likely to survive environmental change, one with lots of only a few types of reef builder, or a community with many different types of reef builder?

b. What are some things a conservationist might do to help a reef ecosystem survive environmental change like we are seeing today (i.e., climate change, rising CO2 levels, acidification, pollution, and overfishing)?

5. Find an example of a reef like yours from any place of the world. What are the similarities? What are some potential disasters or threats you might expect in this reef ecosystem?

6. Sketch a reef system, identify reef builders, stresses and how those stresses may change the reef through time. Make sure your sketch is labeled (e.g., the organism, the process description, the result of the process). *Note: There are multiple correct answers!*

7. This reef game models evolution. Make a simple sketch about how mutation, migration, random processes, and natural selection can impact a community. How might this lead to extinction over geological timescales? Make sure your sketch is labeled (e.g., the organism, the process description, the result of the process). *Note: There are multiple correct answers!*

8. Sketch a cross section of your reef bathymetry (depth of the water), include three of your reef builders. How did the water depth impact the chance of those organisms surviving (i.e., did the depth help or hinder their survival?)

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