

Background. We are going to simulate evolution using threespine stickleback. Each generation you will use 1 or 2 coin flips to determine if an individual fish reproduces, for each fish in the generation. You'll repeat this until one of the phenotypes goes to **fixation**. The simulation models what happens when a marine population colonizes freshwater. In this **founder** population, there is a **low frequency** of partially plated individuals. The simulation models two mechanisms of evolution.

Need: 70 partially plated (freshwater) fish, 30 fully plated (marine) fish.

Read through the simulation directions and answer these questions before beginning the simulation

1. In Simulation 1, what is the probability of reproduction in the partial fish? \_\_\_\_\_
2. In Simulation 1, what is the probability of reproduction in the full fish? \_\_\_\_\_
3. In Simulation 2, what is the probability of reproduction in the partial fish? \_\_\_\_\_
4. In Simulation 2, what is the probability of reproduction in the full fish? \_\_\_\_\_

#### Simulation 1

1. Start with 16 full and 4 partial
  - a. align the fish in a row in front of you, keep the remaining fish in a partial pile and a full pile
  - b. write the **absolute frequency** of each phenotype in row 1 of your data sheet
2. For each fish, flip 2 coins
  - a. **if partial**: if there is **at least one head**, the fish reproduces – add this fish and a new partial from the pile to the new generation
    - i. to start a new generation, create a new row of fish
    - ii. if the fish doesn't reproduce, add to the correct pile
  - b. **if full**: if there **are two heads**, the fish reproduces – add this fish and a new full from the pile to the new generation
    - i. if the fish doesn't reproduce, add to the correct pile
3. After completing reproduction for each fish in the generation, write the **absolute frequency** of each phenotype in the next blank row of your data sheet
4. Repeat Items 2 and 3 until one of the phenotypes goes to fixation

#### Simulation 2

1. Start with 8 full and 2 partial
  - a. align the fish in a row in front of you, keep the remaining fish in a partial pile and a full pile
  - b. write the **absolute frequency** of each phenotype in row 1 of your data sheet
2. For each fish, flip 1 coin
  - a. **for both phenotypes**: if heads, the fish reproduces – add this fish and a new fish of the same phenotype from the pile to the new generation
    - i. to start a new generation, create a new row of fish
    - ii. if the fish doesn't reproduce, add to the correct pile
  - b. write the absolute frequency of each phenotype in the next blank row
    - i. if the fish doesn't reproduce, add to the correct pile
3. After completing reproduction for each fish in the generation, write the **absolute frequency** of each phenotype in the next blank row of your data sheet
4. Repeat Items 2 and 3 until one of the phenotypes goes to fixation or both go extinct

Repeat Simulation 1 and 2 and enter data in last two columns

	Simulation 1		Simulation 2		Simulation 1		Simulation 2	
Generation	Full	Partial	Full	Partial	Full	Partial	Full	Partial
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