EXPLORING EVOLUTIONARY MECHANISMS

Introduction

Your team has discovered a new population of Pom Poms that live along the coast. This organism is haploid, meaning it only has one copy of each chromosome. It has one visible phenotype (color), which is determined by the Color Gene. Like budding yeast, Pom Poms reproduce clonally via a budding process, resulting in two individuals who have the same genome and phenotype. They are exceptionally long-lived, meaning that each Pom can reproduce for many generations. Everything these Poms need to survive is on the coast – they can see an island off in the distance, but cannot reach it.

1. Establish your own population of Pom Poms – there will be 2 individuals of each color. Initial phenotypic ratios **(remember to write in your phenotype colors):**

Generation 1	Color 1: _____	Color 2: _____	Color 3: _____	Color 4: _____
Mainland population	2/8	2/8	2/8	2/8

Pom Poms are haploid, so how many alleles does a single Pom have for the Color Gene?

How many alleles for the Color Gene exist in Population 1?

2. What is the **founder effect**?

A rare low tide has exposed a temporary sandbar. Some curious Pom Poms take this opportunity to explore the nearby island, but they're stuck there once the sandbar is covered.

- Move a few Pom Poms of any color to the island (no more than 3).

After this tragic separation, each Pom will clonally reproduce one time.

- For each Pom Pom on the island and the mainland, add another Pom Pom of the **same** color to the same population.

Phenotypic Ratios:

Generation 2	Color 1: _____	Color 2: _____	Color 3: _____	Color 4: _____
Mainland population				
Island population				

After reproduction, how do the mainland phenotypic frequencies of Generation 2 compare to those on the **mainland** in Generation 1?

After reproduction, how do the mainland phenotypic frequencies of Generation 2 compare to those on the **island** in Generation 1?

3. What is **gene flow**?

Every so often, the currents are favorable and allow some Pom Poms to swim from the island to the mainland or vice versa.

- One member of your group will choose up to 5 intrepid Pom Poms to move from one population to the other – some can move to the mainland, while others can move to the island.

After the migration, each Pom Pom reproduces clonally one time.

Phenotypic Ratios:

Generation 3	Color 1: _____	Color 2: _____	Color 3: _____	Color 4: _____
Mainland population				
Island population				

Does evolution occur if a Pom Pom migrates from the island to the mainland, but then dies without reproducing? Why or why not?

4. What is **genetic drift**?

You and your team have gone to get more supplies to continue your work at the field site, so several generations go by before you can make an observation of these populations. Chose another group member to act out the effects of genetic drift.

- They will **close their eyes** and remove 2 Poms from the mainland population and 2 from the island population.

These unfortunate Pom Poms have perished before they are able to reproduce. All the remaining Pom Poms will reproduce clonally one time.

Again, the group member will:

- close their eyes and remove 8 Poms from the mainland population and 8 from the island population.

All the remaining Pom Poms will reproduce clonally one time.

Phenotypic Ratios:

Generation 5	Color 1: _____	Color 2: _____	Color 3: _____	Color 4: _____
Mainland population				
Island population				

- Which color, if any, has become more prevalent in the mainland population?

- Which color has become more rare?

- Which color, if any, has become more prevalent in the island population?

- Which has become more rare?

- Which population looks most different from your original population at Generation 1?

5. What is **natural selection**?

Choose another group member to act as a dreaded flying predator of the Pom Poms. This group member will choose their **two favorite colors** of Poms to eat.

- Fly between the island and the mainland, removing 10 Pom Poms of these two colors in total (decide how many to eat from each population).

All the remaining (and relieved) Pom Poms will reproduce clonally one time.

Phenotypic Ratios:

Generation 6	Color 1: _____	Color 2: _____	Color 3: _____	Color 4: _____
Mainland population				
Island population				

What characteristics of Pom Poms or their environment might help one color of Pom Pom survive better than another?

Does evolution happen if a Pom Pom is better at surviving, but would not reproduce? Explain.

6. What is a **population bottleneck**?

Chose another group member to become a force of nature. This group member will decide what event of mass destruction they represent (hurricane? earthquake? zombies?). Pom Poms will die in alarming numbers, but which ones will depend on the event. Will it be proximity to the ocean? Phenotypic color or disease susceptibility? Completely at random?

- Remove all but 10 Pom Poms (decide how to split the survivors between populations).

These (extremely shaken) Pom Poms are grateful to have survived and begin to rebuild their lives. They undergo one last repopulation event.

Phenotypic Ratios:

Generation 7	Color 1: _____	Color 2: _____	Color 3: _____	Color 4: _____
Mainland population				
Island population				

POST-LAB QUESTIONS:

Now that you've completed your field season, describe what happened to each color of Pom Pom over the seven generations you've observed.

Have any colors disappeared in Generation 7, in either population?

Will there be any Pom Poms of this color in future generations? Why or Why not?

CREDITS AND ATTRIBUTIONS

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