

Evolution Simulation.

Objective: To demonstrate the principles of Natural Selection.

- Procedure:
1. Get into groups of 5 or 6.
 2. Take out a coin
 3. Each person figures out their "phenotype" by flipping coins for the characteristics (use the chart below). Write down your phenotype on a piece of scrap paper and keep it with you. Each person begins the game by representing **20** individuals in the population who carry that phenotype combination. Write down your starting "score" of **20** somewhere on your scrap paper.

Designate one member of the group as **Narrator**. Designate another as **Recorder**. (or whatever eminent titles you wish to assign to them.)

CHARACTERISTIC	HEADS	TAILS
COLORING	BRIGHT	DULL
BEAK SIZE	SMALL	LARGE
BODY SIZE	LARGE	SMALL
TOLERANCE TO WEEVIL TOXIN	YES	NO

4. Calculate how many individuals in your population has each characteristic. Remember, you all represent 20 individuals. The Recorder will write this information on the provided chart under "STARTING SCORE".
5. **The Narrator** reads "**The Story of the Tobo-Island Warbler**". Everybody else listens carefully.
6. To start the simulation, **the Narrator** will read the conditions of Season #1. After reading the conditions, each "player" takes a turn to read their phenotype out loud to the group. **The group** decides whether each characteristic is advantageous, disadvantageous or neutral under those particular conditions. For **each advantageous characteristic**, a player adds 5 individuals to the population, for **each disadvantageous characteristic**, a player loses 5 points. Neutral characteristics get 0. Each player calculates their "score" for that season. (If you can come up with a more efficient method of doing this, be my guest.)
6. When all of the players have calculated their particular score, move on to season #2. #3, etc and follow the same procedure. Points are cumulative each season. Anyone reaching a score of zero has died out and can no longer play (That phenotype combination is no longer present in the population).
7. At the end of the game, calculate the number of individuals having each characteristic. **The Recorder** will record this information on the chart under "ENDING SCORE".

ASSIGNMENT

Instructions: Each group need to turn in this completed chart and answer the questions.

CHARACTERISTIC	STARTING SCORE	ENDING SCORE
Bright feathers		
Dull feathers		
Large beak size		
Small beak size		
Large body size		
Small body size		
Tolerance present		
Tolerance absent		

Questions:

1. What was/were the most predominant **selecting factor(s)** in each of the 9 seasons?
2. Were any of the characteristics ALWAYS advantageous or disadvantageous? If so, which ones?
3. Think of some other possible "selecting factors" that didn't appear in the simulation that might affect the Warbler population.
4. Do you think fluctuations in the warbler population affect the weevils and the snakes? IF so, how?
5. If a small population of warblers is able to leave the island, while a few remain behind, as happened in season #9, what might happen after millions of years? Will the two populations still be identical?

The Story of the Tobo-island Warbler.

Tobo-island warblers are flightless birds who dwell on the island of Tobo. Their only predator is a population of otherwise delightful snakes called Tobo-island Winders who tend to prefer the **LARGER**, juicier members of the species.

The only available food resource for the Tobo-island Warbler is the tasty seed of the ever-so abundant Tobo-island Wheatgrass. Unfortunately, highly toxic beetle grubs (Tobo-island Weevils) also enjoy the wheatgrass and must be avoided. Some members of the bird species, however, appear to be **TOLERANT TO THE WEEVIL TOXIN** and can even use it as an alternative food resource when Weevil populations are high.

While peacefully gathering sustenance in the open fields of deep-brown wheatgrass, Tobo-island Warblers are very susceptible to winder predation, especially those who are **BRIGHTLY COLORED** and therefore unable to camouflage themselves effectively.

The female Tobo-island warbler is a very fastidious sort, and prefers males that are **BRIGHTLY COLORED** for mating. **SMALL BEAKS** are also considered desirable.

The female Tobo-island warbler also likes to nest in the convoluted roots of mature Tobo-island willows. The Tobo-island willow produces a delicious but hard nut that cannot be cracked by warblers who have **SMALL BEAKS**. Those with larger beaks have little trouble.

Male Tobo-island warblers are very aggressive and constantly fighting each other, usually just for fun, but sometimes over females. When competition for females is extremely high, or when populations are becoming generally congested, they will fight to the death. **LARGE MALES** will often win these competitions.

Seasonal Conditions:

Season #1: Snake population is very low.

Warbler population is TOO HIGH: male/female ratio is 50:50

Wheatgrass population is TOO LOW.

Weevil population at moderate levels.

Season #2: SNAKE POPULATION EXPLOSION (because of last year's warbler crop).

Warbler population moderate: male/female ratio is 50:50

Wheatgrass is abundant because

Weevil population has been drastically reduced by a rare fungal disease.

Season #3: Snake population has been reduced because of disease.

Warbler population moderate: male to female ratio is 50:50

Wheatgrass is still abundant but

Weevil population has suddenly exploded.

Season #4: Snake population is moderate/recovering

Warbler population moderate: male to female ratio is 50:50

Wheatgrass is almost absent due to last year's weevil explosion.

Weevil population is HIGH but dwindling (not enough wheatgrass)

Season #5: DROUGHT. Snake population is tolerant and survives nicely.

Wheat grass and weevils are almost completely wiped out

Warbler population begins to die, Females go first.

Season #6: Snake population has survived in abundance. However, they are quickly dying

Due to low warbler population after last year's drought.

Wheatgrass begins to recover especially because Warbler and Weevil populations are so low.

Weevil population is almost absent.

Warbler population is low. Ratio is 50:50.

Season #7: Snake population low due to last year's low warbler population

Warbler population moderate/recovering due to reduced snake predation.

Weevil population low/recovering

Wheatgrass population high

Season #8: Snake population still low,, but recovering

Warbler population TOO HIGH: male:female = 50:50

Wheatgrass population high, but begins to dwindle due to so many warblers.

Weevil population moderate.

Season #9: Humans arrive, chop down most of the willows and clear the island for agriculture.

The Tobo-island warbler population goes extinct along with all of the other life that is unique to the island. This is unfortunate, because the weevil toxin is also a cure for cancer, but the humans will never know that.

Alright, I'm just kidding. Some are able to cling to the fringes of the island, but competition is high and 5 individuals make it to a neighboring island where the population eventually recovers.

(Calculate your final score before this travesty takes place.