



Natural selection and  
fur color frequency in  
wolf-infested  
environments

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# Introduction

- natural selection
  - some organisms survive better than others (Gregory, 2009)
    - better adapted
      - mutations - changes in genetic material (Whitaker, 2012)
- purpose of lab
  - examine natural selection through simulation
- hypothesis
  - white fur more frequent in arctic; brown fur in desert
    - same color → camouflage

# Methods

- PhET simulation - "Natural Selection"
  - arctic, desert environment
  - brown fur - "dominant trait"
  - wolves - "environmental factor"
    - Generation 4
  - recorded population data



# Results

- desert environment
  - brown rabbit pop. → increase; white rabbit pop. → decrease (Fig. 1)
    - same for trait frequency in total pop. (Table 1)
  - higher end-of-sim. frequency for brown (Table 1)
- arctic environment
  - opposite of desert
  - brown rabbit pop. → decrease; white rabbit pop. → increase (Fig. 2)
    - same for trait frequency in total pop. (Table 2)
  - higher end-of-sim. frequency for white (Table 2)

## WHITE AND BROWN RABBIT POPULATION IN DESERT ENVIRONMENT

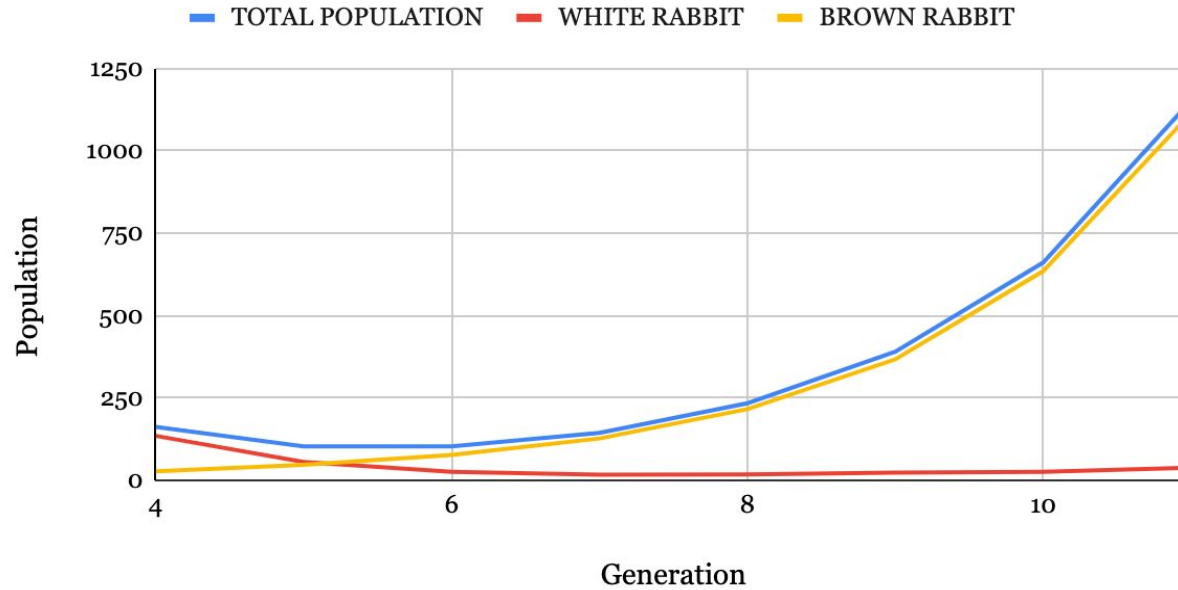


Figure 1. Population totals of white fur and brown fur rabbits from generations 4 to 11 (end of simulation) in desert environment.

| GENERATION | TOTAL POPULATION | WHITE FUR POPULATION | BROWN FUR POPULATION | % FREQUENCY OF WHITE FUR | % FREQUENCY OF BROWN FUR |
|------------|------------------|----------------------|----------------------|--------------------------|--------------------------|
| 4          | 162              | 135                  | 27                   | 83                       | 17                       |
| 5          | 103              | 56                   | 47                   | 54                       | 46                       |
| 6          | 103              | 26                   | 77                   | 25                       | 75                       |
| 7          | 144              | 17                   | 127                  | 12                       | 88                       |
| 8          | 234              | 18                   | 216                  | 8                        | 92                       |
| 9          | 390              | 23                   | 367                  | 6                        | 94                       |
| 10         | 661              | 26                   | 635                  | 4                        | 96                       |
| 11         | 1153             | 38                   | 1115                 | 3                        | 97                       |

Table 1. Percent frequency of white fur and brown fur traits in total rabbit population in desert environment.

## WHITE AND BROWN RABBIT POPULATION IN ARCTIC ENVIRONMENT

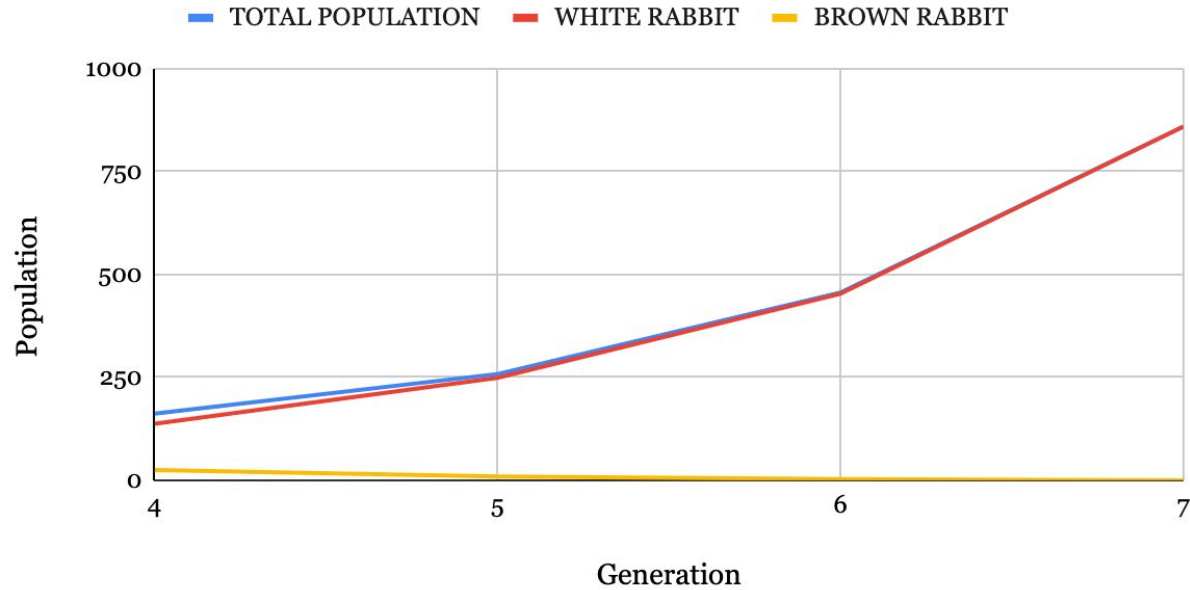


Figure 2. Population totals of white fur and brown fur rabbits from generations 4 to 7 (end of simulation) in arctic environment.

| GENERATION | TOTAL POPULATION | WHITE FUR POPULATION | BROWN FUR POPULATION | % FREQUENCY OF WHITE FUR | % FREQUENCY OF BROWN FUR |
|------------|------------------|----------------------|----------------------|--------------------------|--------------------------|
| 4          | 162              | 137                  | 25                   | 85                       | 15                       |
| 5          | 258              | 249                  | 9                    | 97                       | 3                        |
| 6          | 456              | 453                  | 3                    | 99                       | 1                        |
| 7          | 859              | 0                    | 0                    | 100                      | 0                        |

Table 2. Percent frequency of white fur and brown fur traits in total rabbit population in arctic environment.



# Discussion

- results support hypotheses
  - white fur more freq. in arctic; brown fur in desert
- camouflage (Jones et al., 2020; Zimova et al., 2014)
  - snow of arctic & white fur
  - sands of desert & brown fur
  - prevents detection by predators → higher rate of survival
- increase in freq. of trait over time / higher end-of-sim. freq.
- other traits were controlled for
  - no bearing on results



# Conclusion

- examined natural selection & trait frequency
- brown fur trait → higher freq. in desert
- white fur trait → higher freq. in arctic
- more individuals with traits better suited for environment
- future research
  - relationship between other mutations, env. factors, and climate

# Literature Cited

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