

Natural selection and fur color frequency in wolf-infested environments

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A thin, light brown L-shaped line that starts with a vertical segment to the right of the text, then turns 90 degrees to the left to run horizontally below the text.

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

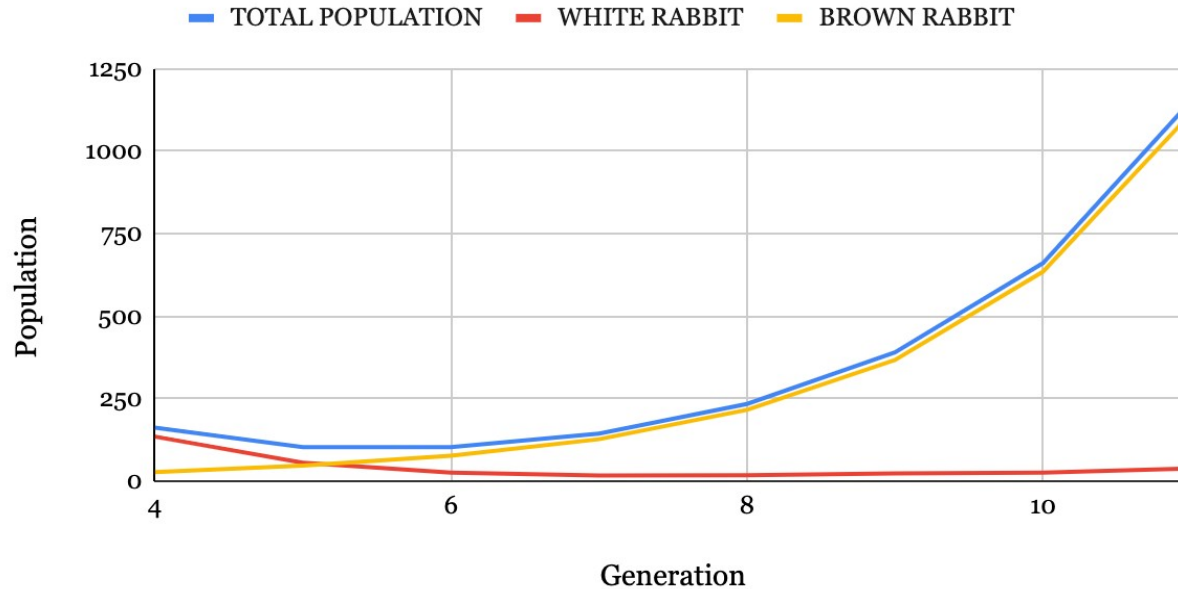


Figure 1. Population totals of white fur and brown fur rabbits from generations 4 to 11 (end of simulation) in desert environment.

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

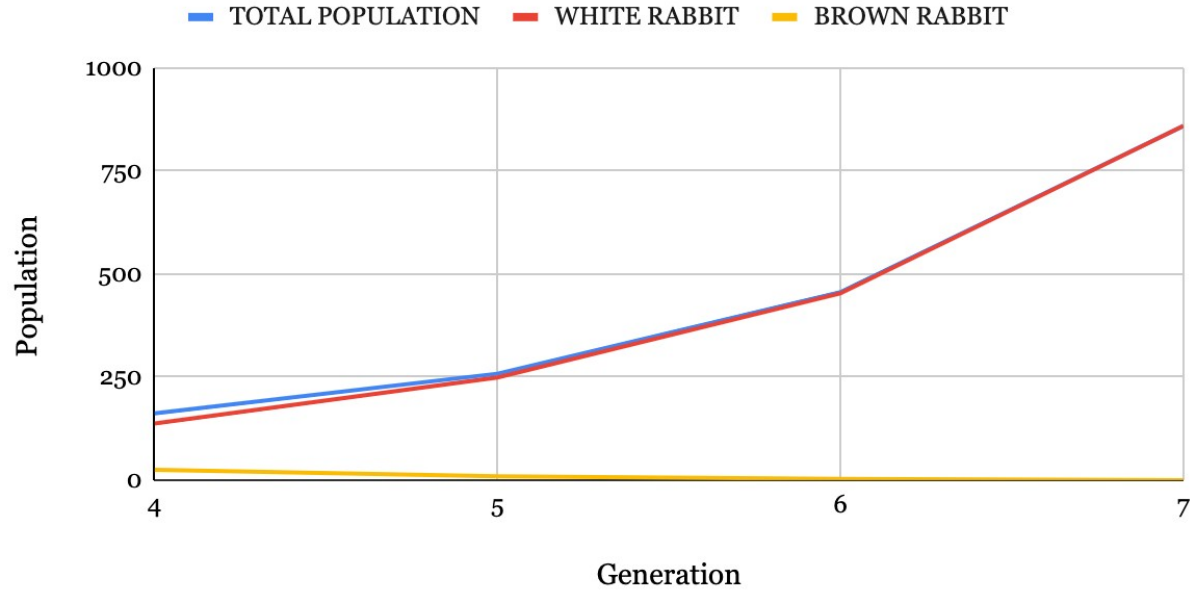


Figure 2. Population totals of white fur and brown fur rabbits from generations 4 to 7 (end of simulation) in arctic environment.

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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