

Investigating Coat Coloration in Mouse Populations

Color patterns of animals vary widely in nature, sometimes even among members of the same species. Mice of the species *Peromyscus polionotus* have different color patterns and reside in different environments. The beach mouse lives along the Florida seashore, a habitat of brilliant white sand dunes with sparse clumps of beach grass. The inland mouse lives on darker, more fertile soil farther inland (Figure 1). The natural predators of these mice, including hawks, owls, foxes, and coyotes, are all visual hunters (they use their eyes to look for prey). Researchers had a hypothesis to explain the variation in coat color but needed to test it.



Figure 1 Description of two mouse populations

1. [SP 3] Propose a hypothesis to account for the coat color variation seen in the two populations.

The researchers hypothesized that coat coloration provides camouflage that protects beach and inland populations of *Peromyscus polionotus* mice from predation in their habitats. To test their hypothesis, the researchers spray-painted mouse models with light or dark color patterns that matched those of the beach and inland mice and placed models with each of the patterns in both habitats.

2. [SP 3, SP 6] Considering the experimental design used by the researchers, what data would they collect to support or reject their hypothesis?

The researchers built hundreds of models of mice and spray-painted them to resemble either beach or inland mice, so that the models differed only in their color patterns. The researchers placed equal numbers of these model mice randomly in both habitats and left them overnight. The following morning, the team counted and recorded signs of predation, which ranged from bites and gouge marks on some models to the outright disappearance of others. Judging by the shape of the predators' bites and the tracks surrounding the experimental sites, the predators appeared to be split fairly evenly between mammals (such as foxes and coyotes) and birds (such as owls, herons, and hawks). Their results are summarized in Figure 2.

3. [SP 3] For each habitat, identify the control group and the experimental group.

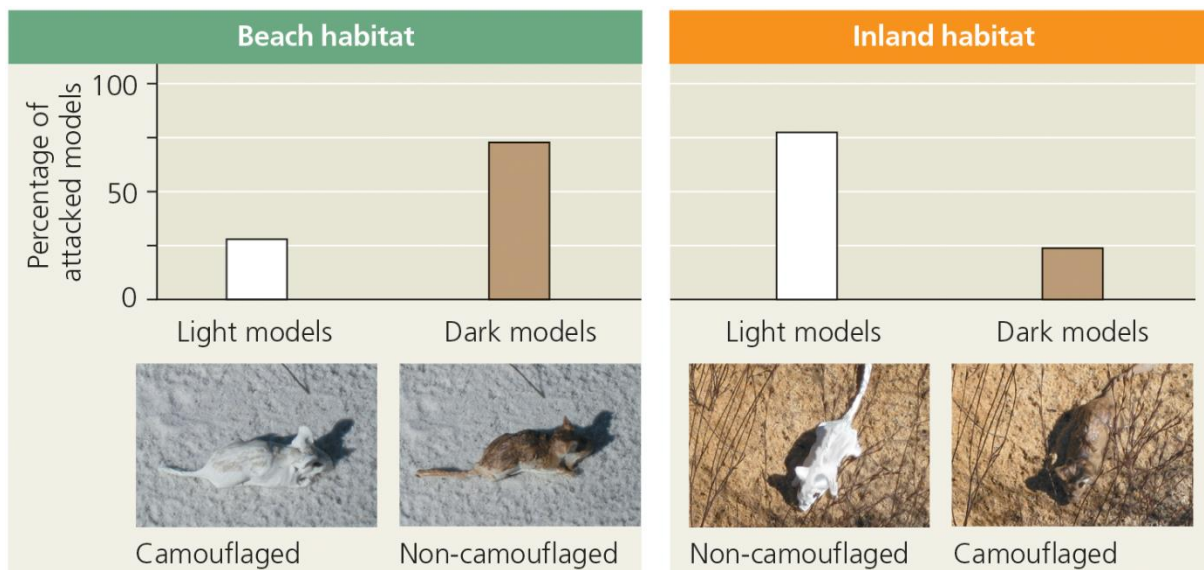


Figure 2 Predation rates in two mouse populations

4. [SP 2, SP 4] For each habitat, identify the model that had the greater rate of predation.
5. [SP 3, SP 6] State the importance of the control group.
6. [SP 2, SP 4] The bars indicate the percentage of the attacked models that were either light or dark. Assume 100 mouse models were attacked in each habitat. For the beach habitat, how many were light models? Dark models? Answer the same questions for the inland habitat.
7. [SP 6] State whether the observations support the hypothesis. Justify your response.
8. [SP 1, SP 3, SP 6] In the deserts of New Mexico, the soils are mostly sandy, with occasional regions of black rock derived from lava flows that occurred about 1,000 years ago. Mice are found in both sandy and rocky areas, and owls are known predators.
 - a) Predict the expected coat color in these two mouse populations. Provide reasoning for your prediction.
 - b) Other than using models, describe an experiment that could be done in this ecosystem to further test the camouflage hypothesis.