

# CSI: Changing Species Investigation

## *Tail white in juncos*

This file contains real data about junco populations. Is there evidence of natural selection? You're on the case!

### Species Profile

You can find dark-eyed juncos in the mountains of the American West. They hop about the forest floor, making a "chip chip" sound.

Individual juncos have different amounts of white in the feathers along the edges of their tails (we'll call this the **tail white** trait). When male juncos court females, they fan out their tails to show off their white feathers. Females prefer mates with more tail white.

In 1983, a group of juncos moved from the mountains to the coastal area around the University of California San Diego (UCSD). Their descendants still live there. Local birdwatchers have noticed these birds look a little different. Males have less tail white.



The coastal birds have a different lifestyle from their mountain cousins. The mild climate makes their breeding season longer, and they can raise up to four broods each year (mountain birds usually raise one). The coastal birds are also less crowded, and birds are visible across greater distances. Most males find a mate.

### Is the tail white trait helpful, harmful, or neutral?

Circle the most likely answer for each environment.

1. In the past when all juncos lived in the mountains, the tail white trait was (**helpful** / harmful / **neutral**) to a bird.
2. In today's coastal population, the tail white trait is (**helpful** / harmful / **neutral**) to a bird.

### Prediction

Write a sentence about how the environment (for example, *mate preference*) may affect the **tail white** trait in junco populations:

## Has the bird population changed over time?

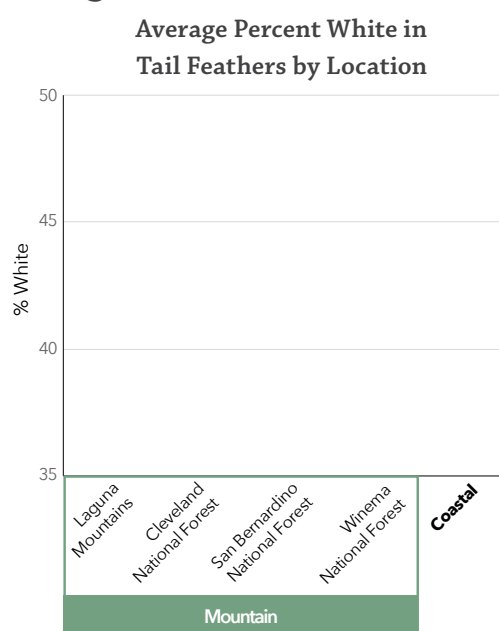
To find out if tail white has changed, you would ideally compare the trait in today's coastal birds to their ancestors soon after they arrived from the mountains. But since you can't travel back in time, the next best thing is to compare the coastal birds to their mountain cousins.

You catch 10-27 male birds from each study site, photograph their tail feathers, and release the birds. Then you measure the percent of white in each bird's tail from your photos. The table on the next page lists your measurements for representative birds from each location.

*Let's analyze your data!*

Fill in the table and make a bar graph of your findings.

Location	% White in Tail of Representative Birds	Average % White in Tail
Laguna Mountains	52, 46, 48, 37, 39	
Cleveland National Forest	50, 50, 45, 37, 48	
San Bernardino National Forest	51, 43, 57, 36, 29	
Winema National Forest	37, 35, 35, 52, 43	
Coastal	43, 30, 32, 37, 38	



**Summarize the evidence.** Complete the summaries by circling the correct words:

- The percent white in tail feathers is (**lower / higher**) in coastal birds, compared to their mountain cousins.
- If mountain birds represent past populations, and coastal birds the present, the percent of white tail feathers has (**increased / decreased / stayed the same**).
- Does the evidence suggest tail white in junco populations is influenced by the environment they live in? (**yes / no**)

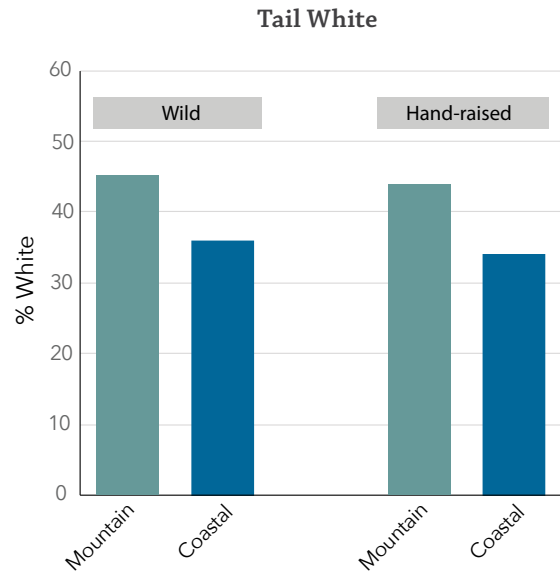
## Is tail white inherited?

To test if tail white is inherited, you gather eggs from nests in the mountains and the coast. Then you care for them in identical conditions.

When the chicks reach adulthood, you compare the tail feathers of hand-raised and wild birds. Your data is shown on the graph.

**Summarize the evidence.** Complete the summaries by circling the correct words:

6. For hand-raised vs. wild birds, tail white is **(different / about the same)**.
7. For hand-raised coastal vs. hand-raised mountain birds, tail white is **(different / about the same)**.
8. The evidence suggests tail white is **(heritable / acquired)**.



## Is it natural selection?

Write 2-3 sentences to explain your thinking: