

The Correlation Between Coat Color and Body Size Across the Genus *Peromyscus*: Larger

Deer Mice are Darker Than Smaller Deer Mice

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Introduction:

In a single subspecies of deer mice (*Peromyscus maniculatus gracilis*, Figure 1) size and coat color were correlated (Hayssen, 2001). The nonagouti (melanistic) mice were larger and exhibited other differences in organ size. This correlation of melanism with larger body size within a subspecies suggests that body size and coat color may be related at higher taxonomic levels, e.g. across subspecies of *Peromyscus maniculatus* or across species of *Peromyscus*. The latter hypothesis has anecdotal support as *Peromyscus grandis* (Figure 2) is one of the largest species and is dark in color whereas *Peromyscus polionotus* (Figure 3) is one of the smallest species. Here we present quantitative data on color and size across 42 species of *Peromyscus*.

Methods:

Our general method was to use digital photography of museum specimens to assess coat color and compare that with head-body length from museum specimens of the same species. Photographs (n=1818) were taken of every tray of *Peromyscus* skins at the Smithsonian US National Museum of Natural History, Washington, D.C. (see below). As each tray was photographed the following were recorded: species, sub-species, geographic location (state or province, country), and museum location (row, case, drawer). Color was assessed using Adobe Photoshop (after each picture was standardized using the Munsell Mini Gray Scale in the photograph, Figure 1). Size data were from the same species but

not necessarily the same individuals as the color data. Both the size and color data were sorted and ranked in order and then divided into three even groups, the highest, the middle and the lowest rankings. A matrix was set up with the observed and expected number of species that fall into each color-size category (Table 1). A chi-squared test was performed on the resulting matrix to determine significance.



Camera Set-up



Figure 2.
Peromyscus grandis specimens from the Smithsonian



Figure 3.
Peromyscus polionotus allophrys specimens from the Smithsonian

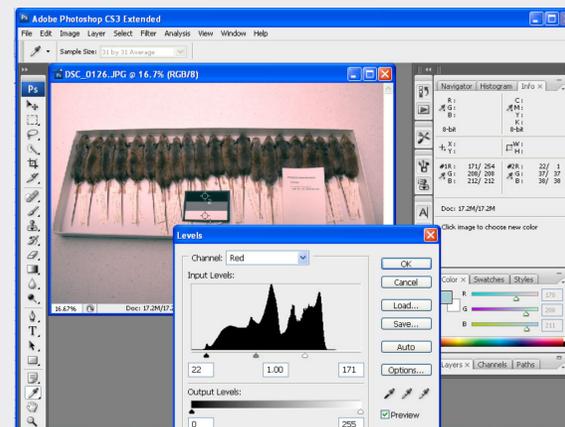


Figure 1.
Standardization of *Peromyscus maniculatus gracilis* specimen photographs in Adobe Photoshop (from top to bottom) before, during, and after standardization

Results:

A significant correlation between head-body size and mid-dorsal pelage color was found across the 42 species of *Peromyscus*. The matrix that shows the number of species which fall into each color-size category is clearly more heavily populated along the middle diagonal and less heavily populated along the opposite corners (Table 1). If pelage and body size were not correlated, the same number of species should occur in each category, however the distribution indicates that darker species are larger and lighter species are

Table 1. Species Color-Size Category Distribution

		Color Rank		
		Light	Medium	Dark
HB Size	Small	8 4.67	5 4.67	1 4.67
	Medium	4 4.67	7 4.67	3 4.67
	Large	2 4.67	2 4.67	10 4.67

smaller. A chi-squared test was performed to determine if this trend was significant. Species rankings were not equally distributed across the species, $\chi^2(4, N=42) = 16.29, p < 0.005$. Of that significance, 79% comes from the four extreme corners.

Conclusion:

A correlation exists between body size and coat color indicating that melanistic species are indeed larger than amelanistic species. The agouti allele, responsible for the correlation of size and coat color in *Peromyscus maniculatus gracilis* could be responsible for this larger trend (Hayssen, 2001). These data suggest an interaction between body size and coat color, at least in the genus *Peromyscus*.

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Reference:

Hayssen, V. 2001. Body and organ mass in agouti and nonagouti in deer mice (*Peromyscus maniculatus*). *Comparative Biochemistry & Physiology*. 130A:311-321.