



Monarch Butterfly Wing Patterns

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Questions:

- 1.) Do monarchs have different numbers of white spots on the edges of their wings?
- 2.) Do male and female monarchs show similar wing patterns?
- 3.) Are the number of spots on the forewings and hind wings correlated?
- 4.) Do monarchs exhibit any asymmetry in spot numbers?
- 5.) Are asymmetry and sex correlated?

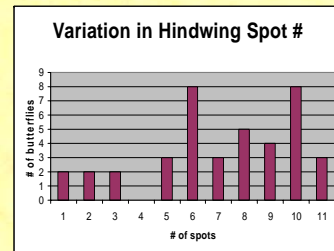


Figure 1.

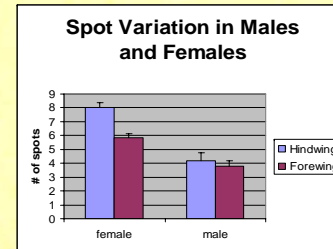


Figure 2.

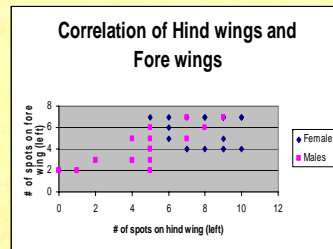


Figure 3.

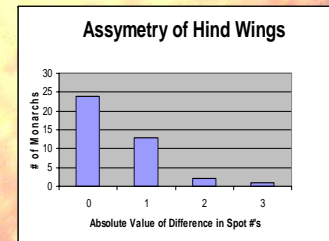


Figure 4.

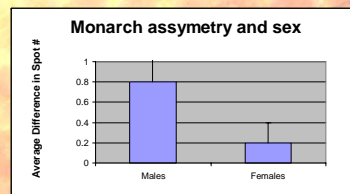


Figure 5.

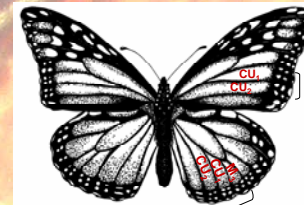


Figure 6.

Methods:

1. Mount 40 dead adult monarch wings using scotch No. 845 Book Tape (20 males, 20 females).
2. Number and label males and females
3. Count and record the number of completely white spots at the end of cells M_3 , CU_2 and CU_1 on the left and right hind wings (see fig. 6).
4. Count and record the number of completely white spots at the end of cells CU_2 and CU_1 on the left and right forewings (see fig 6).

Results:

Figure 1 demonstrates that monarchs have different numbers of white spots on their wings. Figure 2 compares the number of spots on males and females. A correlation test proves that males have more spots than females on both their hind and forewings.

Figure 3 is a correlation test to determine whether the number of spots on the forewings and hindwings are correlated. The number of spots on male monarchs' forewings and hindwings are correlated. Female monarchs, however, show no correlation between spot numbers on hind and fore wings. Figure 4 displays the difference of the number of spots on the right and left hind wings. These tests show monarchs do exhibit asymmetry. Figure 5 is a correlation test to determine if sex

and asymmetry are correlated. Males are more asymmetrical than females.

Conclusions:

From the results it is clear that individual monarchs are different and furthermore, that sexes are different. Fluctuating asymmetry, small random differences between left and right may have implications for monarchs. "In the process of selecting experienced males, the number of consecutive matings was correlated with low fluctuating asymmetry of the forewing." (2) This may suggest that fluctuating asymmetry may reduce particular males' mating success. Asymmetry in a routinely symmetrical organism may also suggest genetic mutation. In turn monarchs with asymmetry may have genetic mutations.

Resources:

1. Douglas, Matthew M. 1986. *The Lives of Butterflies*. Chapter 3: The Imago: pg 31-68.
2. Schaeffer, Martin A. and McNeil, Jeremy N. 2000. Are virgin male lepidopterans more successful in mate acquisition than previously mated individuals? A study of the European corn borer, *Ostrinia nubilalis* (Lepidoptera: Pyralidae). *Canadian Journal of Zoology/Revue Canadien de Zoologie*.
3. McMillian, Owen W., Monteiro, Antonia, and Kapan Durrell D. 2002. Development and evolution on the wing. *TRENDS in Ecology and Evolution*. Vol. 17 No.