

MONARCH BUTTERFLIES ARE EATEN BY BIRDS

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INTRODUCTION

The monarch butterfly (*Danaus plexippus*) is strikingly similar in appearance to the viceroy (*Limenitis archippus archippus*). A hypothetical explanation for the resemblance of these two animals was suggested by Walsh and Riley (1869). Their explanation has been accepted by the scientific community. Klots (1960: 37) states it this way: "The monarch (*Danaus*) is genuinely inedible, since it feeds on milkweed. It advertises this fact (warning coloration) by distinctive orange-brown color and slow, lazy flight. The viceroy (*Limenitis archippus*) which feeds on willow and poplar is perfectly good bird food. But it has the colors and habits of the monarch. Without doubt it gains much protection from birds which have learned to leave alone anything that looks like a monarch. This is our best example of butterfly mimicry. In the tropics there are dozens more striking . . ."

The hypothesis has been affirmed by Dr. J. V. Z. Brower (1958) who captured eight Florida scrub oak jays (*Aphelocoma coerulescens coerulescens*) and tried to feed four of them monarchs and swallow-tails while the other four were offered viceroys and swallowtails. Each butterfly had its thorax pinched before it was presented to a caged Jay. One group of birds ate all of the swallowtails offered and half of the viceroys. The other group ate all of their swallowtails and not one monarch. Dr. Brower concluded that monarchs are inedible, and that the viceroy is protected by its resemblance to the monarch.

The other side of the monarch-viceroy story has been presented by Dr. F. A. Urquhart who recently summarized arguments against accepting this hypothesis (1957, 1960). Here is a brief summary of Dr. Urquhart's arguments.

A general resemblance of the two mimetic forms, brought about by similarity of habitat, external conditions, or accidental coincidence may be required before predation begins to mold the mimic. (Bates, 1862).

Food habits of captive animals vary widely from normal, so experiments relying on the food habits of captive animals are suspect. Stomach analyses of wild animals are the best evidence of their food preferences (McAttee, 1932a).

Analysis of stomach contents of birds does not support the mimicry hypothesis (McAttee, 1932b).

No butterfly-predator has been suggested as the evolutionary force

responsible for mimicry (Punnett, 1915; Dewar and Finn, 1919).

Birds frequently eat caterpillars (which show no mimicry) and rarely eat butterflies (which supposedly mimic each other frequently). If natural selection were responsible for mimicry one would expect to find it in caterpillars — not butterflies (Dewar and Finn, 1919).

Even very distasteful creatures are better off to be inconspicuous than to be brightly colored (Dewar and Finn, 1919).

All Fifty people tested found nothing sharp or bitter or otherwise objectionable about the taste of monarch butterflies (Urquhart, 1957).

Only in Dr. Brower's work is there any indication that birds dislike monarch butterflies, and she used paralyzed butterflies and caged birds. It has yet to be shown that birds dislike the taste of monarch butterflies (Urquhart, 1960).

Birds have a very poorly developed sense of taste and smell (Pumphrey, 1948; Wallace, 1955; and Gurney, 1922).

Under natural conditions birds are almost never seen feeding on monarch butterflies. This would indicate that birds know nothing of their taste, for they have never been observed in the process of learning that monarchs are inedible. Is it not more likely that monarch butterflies fail to elicit a feeding response in birds? — that monarchs don't look like birdfood? (Urquhart, 1957).

Monarchs tagged for migration experiments have been eaten in large numbers — apparently because their appearance had been altered (Urquhart, 1957).

Mimicry theory fails to explain why the banded purple doesn't mimic the monarch, as it is the same genus as the viceroy. Or, if the banded purple is successful, why the viceroy didn't mimic it instead of the distantly related monarch? (Urquhart, 1960).

EXPERIMENTS

As an aid in understanding the relationship between birds and monarchs, Dr. Urquhart's hypothesis that monarchs don't evoke a feeding response in birds was tested.

In the summer, monarchs are common over the grounds of the Iowa Lakeside Laboratory, near Milford, Iowa. In the caretaker's back yard are a birdbath and two feeding stations which attract a wide variety of birds. In the summer of 1963, five species were frequent visitors: cardinals, brown thrashers, grackles, robins, and english sparrows. They were fed on table scraps of every sort, birdseed, and suet. A white enamel pan was placed on the ground in this yard between the birdbath and one of the feeders. Live (and lively) monarch butterflies, after having their wings trimmed off, were placed in the pan

every morning before dawn. Removing the butterflies' wings altered their appearance drastically. They looked like elongated, jumping, black spiders with tetany; and they did elicit a feeding response in the birds. Nearly every morning for two weeks the birds emptied the pan. The best customers were the brown thrashers, one pair of which was observed feeding the butterflies to their young. Between July 18 and July 31, 110 of 112 wingless monarchs were eaten (Graph 1). The birds that ate them could have lived off a bounteous Iowa summer, or the food in the bird feeders if monarchs were distasteful to them.

Between December 24, 1963, and January 3, 1964 a similar experiment was run at the edge of the Garden of the Gods in Colorado Springs, Colorado, where Mr. Paul Nesbit feeds birds on his patio. A subspecies of scrub oak jay (*Aphelocoma coerulescens*) is found here. A baking dish containing the butterflies was placed in the yard near some suet, birdseed, and cracked corn. Every day for four days the live, wingless butterflies were eaten by the jays. On December 27 monarchs with wings were offered in the dish, and these, too, were eaten. Moving pictures were taken of the feeding jays. Early in the morning the butterflies were immobilized by the cold, but as the temperature edged into the forties and fifties they would become quite lively. One monarch flew off as a jay pecked at it and the jay followed in fast pursuit. Although he snapped at the flying butterfly for fifteen yards, the jay did not catch it. How much better could the monarch have avoided capture at 85 degrees F. over an Iowa meadow? After that event, the major wing vein (the costa) was severed on the remaining butterflies so they could not fly, but only flutter and hop. There were eighty monarchs with wings eaten in that week, with most of them going to the scrub oak jays, some to pinon jays, and one to a chickadee. The last one to be eaten had been lying dead on the patio for four days. A day-by-day tabulation of the butterflies is presented in graph 1.

CONCLUSIONS

Five common species of birds will eat wingless monarch butterflies in the summer in Iowa when they are placed near the birds' usual feeding station in a lively condition.

Scrub oak jays and pinon jays will eat monarch butterflies even with wings in the winter in Colorado if the butterflies are lively, but cannot fly, and are placed near where the birds usually feed.

These experiments appear to support Dr. Urquhart's hypothesis that the monarch butterfly is not eaten under entirely natural conditions because it doesn't elicit a feeding response in birds — it doesn't look like food. These experiments seem consistent with his explanation of why the butterflies he tagged were eaten by birds.

GRAPH 1

Date	Wingless monarchs		Monarchs with wings		Remarks
	offered	eaten	offered	eaten	
July 18	5	4			It was difficult to catch enough butterflies at first.
19	4	3			
20	5	5			
21	5	5			
22	7	7			
23	10	10			
24	10	10			
25	6	6			
26	10	10			
27	10	10			
28	10	10			
29	10	10			
30	10	10			
31	10	10			
Dec. 24	10	3			All of the butterflies used in Colorado were transported from Carmel, California.
25	10	10			
26	10	10			
27	10	10	27	25	The butterflies were taken in early on the 29th as the sky was too cloudy for photographs.
28			20	18	
29			10	3	
30			25	21	
31			6	1	The jays were absent on 12/31 and 1/1, but returned on 1/2 to eat the few remaining butterflies by 9:30 A.M.
1			8	5	
2			7	7	

These experiments appear to deny the conclusions of Dr. Brower and Dr. Klots that the monarch is "genuinely inedible". They seem to call into question the basis of the mimicry hypothesis that has long

been used to explain the resemblance of the monarch and viceroy butterflies.

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THE STORY OF A "MIXED UP" *THORYBES PYLADES* (*HESPERIIDAE*)

While on a collecting trip near Warsaw, Missouri in early April of 1963 I observed a male *Thorybes pylades* Scudder hovering about six inches above the ground in the mating ritual common to the species. I cautiously advanced intending to drop my net over a pair of *pylades*. Then much to my surprise I saw that the object of *pylades* intentions was not a female of the species but a dark little *Euclidina cuspidata* Hübner. This moth, a member of the family Noctuidae is a common spring species found in wooded areas. It has nervous habits, is easily flushed from the ground, and flies in a skipper-like manner. In fact on several occasions I have started to catch specimens thinking they were specimens of one of the *Erynnis* species. It was thus with a bit of satisfaction that I saw