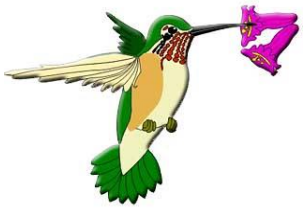
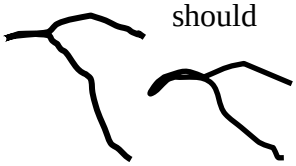


ScienceWatch - A Diet that Fits the Bill

Sexual dimorphism, which refers to features differing between males and females, is common among animals. Males may be larger (or smaller) than females, they may be more (or less) colorful, or one sex may have structures (e.g., deer antlers) lacking in the other. Charles Darwin observed these differences, and in his 1871 book, *The Descent of Man and Selection in Relation to Sex*, he offered three mechanisms for their evolution. The first was sexual selection, which in its extreme yields the flashy feathers of male birds of paradise. The second was selection for fertility, which can result, for example, in more robust females (witness the fact that women live longer on average than men). The third mechanism was selection due to the environment. Numerous instances of the first two mechanisms have been found in nature; however, the only instance where ecology appears to be the cause for sexual dimorphism occurs in mosquitoes. Male mosquitoes have mouthparts adapted for drinking nectar, while female mouthparts are adapted for drinking blood.

In the July 21st issue of the journal *Science*, evolution biologist Ethan Temeles and his students at Amherst College show that a difference in the food supply (differing flower shape) of purple-throated carib hummingbirds (*Eulampis jugularis*) has resulted in extreme bill differences between the sexes. Females are 25% smaller than males, yet their bills are 30% longer on average and have a greater downward curve (30^o vs. 15^o for males; see silhouettes below). Sexual selection for larger males is inconsistent with the smaller bills of males, since their bills should have increased proportionately. Apparently carib bill size has been subject to a different selection pressure than the one causing increased body size.



The birds live on the island of St. Lucia in the West Indies, where the only food plants available during the breeding season are a red-bracted flower (*Heliconia caribaea*) and a green-bracted flower (*H. bihai*). The hummingbirds are the sole pollinators of these flowers. Temeles and his students spent four weeks, at a time when the birds were actively nesting and rearing young, watching the birds that visited both types of flowers. They quickly noticed a pattern: all of the 15 males they observed fed from *H. caribaea*, whereas 11 of the 15 females chose *H. bihai* instead. A comparison of the two *Heliconia* flowers showed that the *H. bihai* blossoms fed upon by the females were longer and more curved (average of 44 mm, 31^o), than the *H. caribaea* flowers visited by the males (average of 38 mm, 21^o). The striking correspondence between flower length and curvatures, and carib bill length and curvatures is strong evidence that the bills of each sex have become specialized for efficiently feeding from different species of flowers. This hypothesis received additional support when the researchers observed that female feeding times were significantly shorter when they fed at *H. bihai* flowers as compared to those of *H. caribaea*.

How did the carib hummingbird sexes become specialized to feed from two different food sources? Observing that both males and females fiercely defend their patch of flowers against conspecifics, Temels suggests that food competition between the sexes is the most likely explanation. However, males also use their flower patch to attract a mate and their success is based upon the number of flowers they defend. Coincidently, of the two available *Heliconia* species, *H. caribaea* bears two to three times as many flowers as *H. bihai*. Temeles speculates that thousands of years ago, when the hummingbirds first arrived on the island, a patch of *H. caribaea* was more valuable for males, who would then drive out the smaller females, forcing them to feed on the less floral *H. bihai*. Thus, the food partitioning may have begun as a result of sexual selection for males with bountiful territories. Once the two sexes began feeding predominately on different shaped flowers, natural selection may then have acted on the bill proportions of males and females to yield the difference.

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