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Humming Birds: Pollination Facts and Fancy

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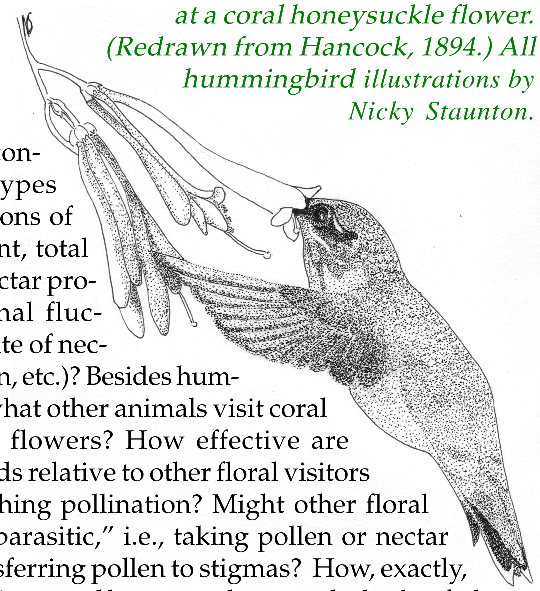
Hummingbirds

Pollination facts and fancy



Ruby-throated hummingbird feeding at a coral honeysuckle flower. (Redrawn from Hancock, 1894.) All hummingbird illustrations by Nicky Staunton.

Coral honeysuckle (*Lonicera sempervirens*), the 2014 VNPS Wildflower of the Year, is a classic example of a hummingbird-pollinated flower: bright red petals, often with contrasting yellow tones in the corolla throat, provide visual attraction, drawing hummingbirds to the flowers, where they are rewarded with a rich supply of nectar. Whereas hummingbirds have good color vision, they have a poor sense of smell. So it is not surprising that coral honeysuckle flowers are nearly scentless, at least to the human nose; even modern analytical instruments detect only traces of volatile molecules emanating from them. And open coral honeysuckle flowers, like those of many other hummingbird-pollinated species, are typically held in a slightly nodding orientation, which presumably makes it less likely that nectar will be diluted by rainwater. Coral honeysuckle exemplifies hummingbird-mediated ornithophily.

Consequently, it seems odd that there has been a dearth of formal, detailed studies of hummingbird pollination of coral honeysuckle. Oh, sure, one can easily find statements in books, scientific articles, and nature-based web pages linking the two organisms in the context of pollination. But my efforts to find a detailed study—using obvious search terms (*Lonicera sempervirens*, coral honeysuckle, pollination, ornithophily)—yielded little beyond brief mention of the most basic facts—information that could be easily confirmed by spending a few pleasant moments near the plants during their peak flowering time. It seems that a serious study of the phenomenon has yet to be undertaken.

Clever investigators of pollination biology could probe a wide array of questions by devising controlled experiments and carefully parsing direct observations: Will coral honeysuckle flowers produce seeds in the absence of pollinators? What are the dynamics of nectar production in the species (total sugar concentration, types and proportions of sugars present, total volume of nectar produced, diurnal fluctuations in rate of nectar production, etc.)? Besides hummingbirds, what other animals visit coral honeysuckle flowers? How effective are hummingbirds relative to other floral visitors in accomplishing pollination? Might other floral visitors be "parasitic," i.e., taking pollen or nectar without transferring pollen to stigmas? How, exactly, do pollen grains travel between plants on the body of a hummingbird? What is the efficiency of pollen removal by hummingbirds? What is the efficiency of pollen deposition on stigmas? How much pollen must be deposited on the stigma to yield viable seed formation?

My search for information on the topic did yield a rather old but interesting paper published in *The American Naturalist* (Hancock 1894). This paper recounts observations of pollen grains on the bodies of museum specimens of the ruby-throated hummingbird (plus one unlucky bird seized from the mouth of a cat belonging to a friend of the author!). Coral honeysuckle is mentioned in the paper and featured in one illustration, but the thrust of the paper involves microscopic detection of pollen grains on different portions of the birds' head. Hancock illustrates how pollen grains can be held between the vanes and barbs of feathers, and he carefully notes the presence of pollen on feathers from the cheek and

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lores (a lore is the region between the base of the bill and the eye). Hancock also reports the presence of nonfeathery pollen "repositories" on or near the lower mandible. One of these pollen repositories is a groove on the midline of the lower mandible, roughly from its base to its midpoint (Fig. 1A); two more are reported on the right and left sides of the head where the lower mandible joins the cheek. Hancock reported multiple kinds of pollen from these repositories, distinguished by size and shape, but none were identified to species.

At first I was a bit skeptical about the efficacy of the lower mandibular groove in moving pollen from one flower to the stigma of another. The problem, I thought, was that for a great many hummingbird-pollinated flowers, anthers and stigmas are located on the upper side of the corolla tube. Consider, for example, the bilaterally symmetric flowers of trumpet-creeper (*Campsis radicans*) (Fig. 1B) or crossvine (*Bignonia capreolata*): from a hummingbird's-eye-view at the mouth of the corolla tube, the anthers and stigmas are located near the roof of the floral tunnel, and below these organs there is nothing but a large void leading to the nectar at the bottom of the flower. Sure, there might be some stray pollen grains scattered on the floor of the corolla tunnel that could be picked up in the mandibular groove, but it is hard to imagine how that pollen would ever reach a stigma located near the top of the bird's head. Or, consider cardinal flower (*Lobelia cardinalis*) (Fig. 1C): the anthers and (later) the stigmas extend far beyond the corolla mouth and are borne in a curved configuration that puts the back of the hummingbird's head into play for deposition of pollen and its subsequent transfer to stigmas—the lower surface of the bill seems not to be involved at all; the real action appears to be on the opposite side of the bird's head. Just as football is a game of inches, in pollination allowable tolerances in the placement of anthers or stigma may be minute—just a few millimeters can make all the difference in the world.

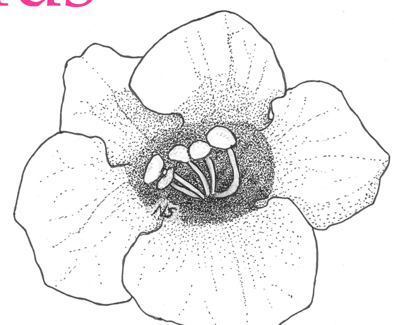

Fig. 1B: Illustration shows the corolla throat, anthers and stigma of trumpet-creeper flower.

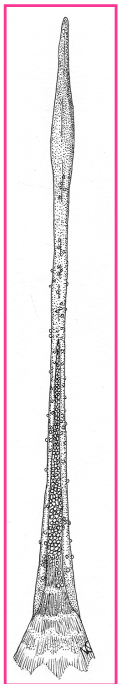

Fig. 1A: This close-up drawing illustrates the outer surface of the lower mandible from a ruby-throated hummingbird; minute circles denote pollen in the "repository." Redrawn from Hancock (1894).

Upon reflection, however, I soon realized that coral honeysuckle flowers (Fig. 1D) were not like those described above. Although held in a drooping position like those of trumpet-creeper (and many other bilaterally symmetric ornithophilous flowers), the flowers of *Lonicera sempervirens* are very nearly radially symmetric (one corolla lobe is slightly larger than the other four). Further, the five pollen-bearing anthers are more or less evenly spaced around the corolla throat, and whether the anthers are positioned slightly inside the corolla or project slightly beyond, the stigma projects still further and often (though not always) below the midline axis of the flower. The hummingbird's-eye-view during entry into the corolla is markedly different from that of the flowers of trumpet-creeper and similar plants: the corolla throat is essentially ringed with pollen-bearing anthers, and it may be reasonably postulated that pollen is deposited on all surfaces of the bird's face (i.e., lores, cheeks, and chin) and that some could become lodged in the mandibular groove highlighted by Hancock. Once dusted with a load of pollen, a bird entering another coral honeysuckle flower must first brush by the stigma to gain access to the corolla tube; the stigma could pick up pollen from any quadrant of the bird's face, depending on how the bird approaches the flower. Since the stigma is often positioned below the midline of the flower axis, it could very well slide along the lower surface of the bill as the hummer enters the flower, thus picking up pollen from the groove. Maybe Hancock was onto something.

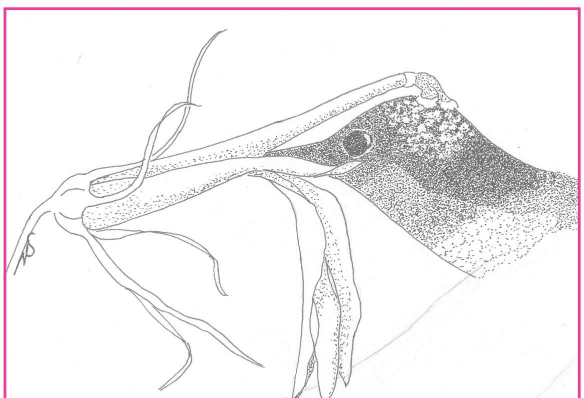

Fig. 1C: A hummingbird feeds at a cardinal flower; note the anthers in contact with the back of the bird's head.

As much fun as such speculation is, guessing how things might work is not the same as solid scientific documentation of how something does indeed work. The above paragraph should be considered little more than initial, off-the-cuff hypotheses. But it is from such hypotheses that good science can emerge. Pollination biology of coral honeysuckle appears to be a nearly

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• Pollination

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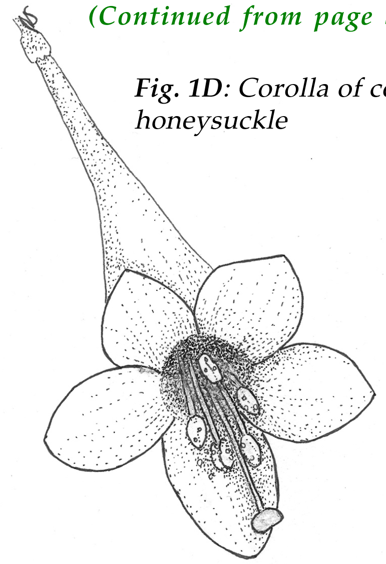

***Fig. 1D**: Corolla of coral honeysuckle*

blank slate. There is, I believe, an opportunity here for someone with curiosity, ingenuity, and determination to make real and fundamental contributions to knowledge about our Wildflower of the Year.

—John Hayden, VNPS Botany Chair

Source: Hancock, J.L., 1894. Ornithophilous pollination. The American Naturalist 28: 679–683.