

Long, sexy tails not a drag on male birds

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This is an Anna's hummingbird outfitted with two long feathers from the Jamaican red-billed streamertail, a hummingbird that naturally sports two 19-cm long tail feathers. Credit: Christopher Clark/UC Berkeley

The long tails sported by many male birds in the tropics look like they're a drag to carry around and a distinct disadvantage when fleeing predators, but experiments by University of California, Berkeley, biologists shows that they exact only a minimal cost in speed or energy - at least in hummingbirds.

"We estimate that having a [long tail](#) increases a bird's daily metabolic costs by 1 to 3 percent, which means the bird has to visit 1 to 3 percent more flowers in its territory," said Christopher J. Clark, a graduate student in UC Berkeley's Department of Integrative Biology. "Is that a lot? It's hard to say, but we argue that it's not, especially when compared to the costs of things like molting and migration."

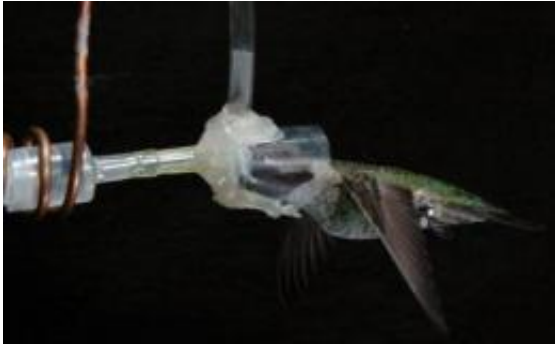
As a way to attract admiring females, in fact, long [tail feathers](#) may be one of the easiest ornamentations to evolve with the least consequences, the researchers say.

Clark and Robert Dudley, UC Berkeley professor of integrative biology, report the results of their study in the March issue of the journal [Proceedings of the Royal Society B](#), which appeared online this week.

Male [birds](#) of numerous species have evolved elaborate colors and decorations to attract females, many of them involving tail feathers. The peacock's eye-popping display, the broad, gauzy tail of the male lyre bird and the two-foot-long, iridescent green tail of the quetzal are but three examples.

Some biologists have made computer models of elongated tails, like those of the Jamaican red-billed streamertail [hummingbird](#), the scissor-tail hummingbird or the marvelous spatuletail hummingbird, and have predicted as much as a 50 percent greater energy cost when flying with a long tail.

In his experiment, Clark outfitted short-tailed Anna's hummingbirds (*Calypte anna*) with long tail feathers from a red-billed streamertail (*Trochilus polytmus*), giving the hummingbirds two tail feathers that were five times the normal length for an Anna's, and put the hummers through their paces in a wind tunnel. He and Dudley found that the hummingbirds with enhanced tail feathers suffered only a 3.4 percent drop in their maximum speed. This corresponded to an 11 percent increase in energy needed to fly at high speeds.



This Anna's hummingbird is trained to feed while flying in a wind tunnel so that the bird's breath can be collected and analyzed for oxygen content. Credit: Christopher Clark/UC Berkeley

For moderate and low speeds - the speeds at which hummingbirds typically flit from flower to flower and hover the long-tailed birds expended considerably less extra energy.

While other studies are needed to establish whether the same holds true in all bird families, Clark said, "I think that in most birds with long tails, the long tail is not costly."

Clark is writing his Ph.D. thesis on tail feather variation among the 330 known species of hummingbirds, which occur only in the Americas. Last year, he and fellow student Teresa Feo described how the Anna's hummingbird flares its tail feathers to generate a chirp at the bottom of its display dive.

In this new experiment, Anna's hummingbirds were the controls to discover whether very long tail feathers create enough drag to significantly affect flight performance. In visits to Jamaica, Clark collected five pairs of long tail feathers from red-billed streamertails, which molt their feathers once a year and then re-grow them. Eight of a streamertail's 10 flight tail feathers, called rectrices, are of moderate

length - slightly more than an inch long - but the two feathers next to the outside pair are about 19 centimeters (7 ½ inches) long. (Of the approximately 60 hummingbirds with long tails, all but the red-billed streamertail have the outer pair of tail feathers elongated, as opposed to the next-to-outer pair.)

He first glued two streamertail shafts to two of an Anna's own feather shafts and placed the bird in a wind tunnel to see how its metabolism was affected by hovering or flying into a breeze of up to 35 miles per hour, or 15 meters per second. He enticed the hummingbird to feed in flight at a plastic tube that allowed him to collect its breath, which was analyzed for oxygen content. Of six birds tested, all expended more metabolic energy when equipped with long tail feathers. At high speeds (12 meters per second or 27 mph), they expended, on average, 11 percent more energy.

Based on these metabolic measurements, Clark and Dudley predicted that long-tailed birds would show a 3 to 4 percent decrease in maximum flight speed, which is what they found: 3.4 percent, on average.

As an extra control, Clark tested the flight abilities of birds without rectrices and of birds without either rectrices or covert feathers (the short feathers that cover the bases of the rectrices, both above and below). Birds lacking both rectrices and covert feathers showed a 2 percent drop in maximum air speed, but those lacking only rectrices were unaffected.

Given that elongated tails in birds have evolved at least 26 times, if not hundreds of times, it seems as if tail feather variation is easier to live with than, for example, wing feather elongation, which would more likely affect flight and is rare in nature, Clark said. Tail feathers streamline the bird's body and reduce drag, but when folded in flight, the length of tailfeathers appears to be less important than having at least

some tail feathers.

"We propose ... that sexual selection has generated enormous diversity in avian tail morphology because, by 'hiding' in the wake of the body, such modifications can be relatively cost free," they wrote in their paper.

Although most biologists think that extreme ornamentation, like long tails, arise because females select males based on that trait, there is still much debate about the evolutionary details. Some suggest that females have an innate bias that is exploited by males to win over females. Others suggest that long feathers are a good indication of a healthy male, and thus stand out like "tall, dark and handsome" in human males.

"The energetic costs of a long tail are not high, but it remains to be seen if there are any benefits of a long tail, other than the indirect benefit of helping to pass on one's genes," Clark said.

Source: University of California - Berkeley ([news](#) : [web](#))

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