

## The Hummingbird Chirps

A diverse array of birds apparently makes mechanical sounds (sonations) with their feathers. The mechanics of how the sounds are created hasn't received much attention until recently. Ornithologists have long debated whether this sound is produced vocally or by the tail, and in fact, one of the earliest reports suggested a tail-feather source. A 1979 article by the late songbird expert Luis Baptista of the California Academy of Sciences, argued that the frequency of the chirp is similar to the hummingbird's vocalization frequency, and thus the chirp is probably vocal.

Christopher Clark and Teresa Feo, two Berkeley graduates, set up a study to determine the origin of the chirping. They observed the male Anna's hummingbirds (*Calypte anna*), using a high-speed video camera. Using a stuffed female hummingbird or a caged female, Clark and Feo, recorded the male display dives.

The Anna's hummingbird has a glossy green back and grey below with green flanks. The adult male has a glossy red throat and crown. Females and juveniles have green crowns, a grey throat with some red markings and a dark tail with white tips.

The hummingbird's breeding season is November through May. During this time the males perform dramatic display dives while guarding their territory. Rising rapidly to a height of 100 feet or more, males execute a looping dive at speeds of over 50 miles per hour.

A video of the display dive revealed a very brief flaring of the male's tail feathers at the bottom of the dive, just prior to the bird's ascent for another dive. The fluttering of the trailing vane of the outermost tail feathers produces the sound. The flaring coincided with the chirps.

To confirm the display dive video, the students captured males and plucked or trimmed their tail feathers. The birds can fly without tail feathers and they typically grow back in five weeks. Those males missing the outer pair of five pairs of tail feathers, or those with the trailing (inner) vanes of the outer feathers trimmed, were unable to make dive sounds.

The researchers then took the tail feathers to a wind tunnel at Stanford University's Hopkins Marine Station in Pacific Grove, California. They demonstrated that a wind blowing at the same speed as a diving hummingbird made the tail feathers flutter at a frequency of 3.3–4.7 kilohertz. This is equivalent to the highest note on a piano, four octaves above middle C. Apparently, barbules linking the barbs of the feather vane make the vane stiff enough to vibrate like a reed in a wind instrument. Blowing outward on the tail feather makes the same frequency as in the dive.

This mechanism is not a whistle. The subtle changes in feather shape will tune the frequency of sound produced by the feathers. Many kinds of birds reportedly create aerodynamic sounds with their wings or tail. Future studies may show a wide diversity of non-vocal sounds produced by birds. The most likely birds to make tail-feather chirps are the Anna's relatives, the "bee" hummingbirds, the tiniest hummers in the world as well as the Rufous, the Allen's, the Costa's, the ruby-throated and black-chinned hummingbirds.

It is interesting to note, that the tail chirp of the Anna's hummingbird is louder than its vocalizations. Switching to feather sonations has allowed small birds, with small song boxes or syrinxes, to escape the constraints on vocal sound volume. By testing related hummingbirds, Clark and Feo hope to see whether their tail feathers also vibrate and are responsible for chirps made during display dives.

For information on various aspects of the Anna's and Rufous hummingbirds of the Pacific Northwest see the Garden Mastery Tips article, [Hummingbirds in Winter](#).

The research into the mechanism of sonation in birds was supported by UC Berkeley's Museum of Vertebrate Zoology and was recently published in a prestigious British journal. The April, 2008 issue of the Smithsonian noted that during courtship the male Anna's hummingbird's tail feathers chirp, vibrating like a clarinet reed.

## References

[How hummingbirds chirp: It's all in the tail](#). Patricia Yollin. *San Francisco Chronicle*, February 8, 2008. Retrieved March 24, 2008