

FEATURE ARTICLES

**WING SOUNDS CHARACTERISTICS OF FOUR HUMMINGBIRD SPECIES THAT BREED IN CANADA**

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*Abstract.* In contrast to vocalizations, nonvocal avian sounds have received little attention as potential means of communication. The high wing-beat frequency of hummingbirds in concert with the modified flight feathers of some species, generate sounds with the potential to play a role in communication. Technological limitations of previous studies have compromised assessment of the acoustic characteristics and importance of these sounds. This study was designed to record and analyze the sex-specific wing sounds of four hummingbird species, in order to provide a framework for further communication studies. We collected digital recordings of hummingbirds during hover flight and analyzed these with computer-based sound software. Our results showed that (1) males of all four species had higher wing-beat frequencies than conspecific females; (2) there was greater intra- and interindividual variation in wing-beat frequency than previously documented; (3) though not specifically tested, the sexual dimorphism and interspecific differences in wing-beat frequency support previous findings that wing-beat frequency is inversely related to wing length; and (4) that digital sound analysis is a powerful new tool for detailed study of wing sounds. We provide the first description of a characteristic behavior, which we have called the ‘Cobra’, in which an individual dramatically increases its wing-beat frequency. Finally, we have significantly expanded understanding of the wing trill sound produced by the modified outer primary feathers, and have shown that female Black-chinned Hummingbirds (*Archilochus alexandri*) also produce wing trill components despite previous beliefs that these were unique to male hummingbirds.

*Key words:* digital sound analysis, hummingbirds, wing-beat frequency, wing hum, wing trill.