Vocal Production & Perception by Chickadees: Research from the Songbird Neuroethology Laboratory

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What is a songbird?

One of six groups of animals that are vocal learners
- Others include: humans, bats, parrots, hummingbirds, & cetaceans

Vocal learners: During development, need to hear adults of the same species in order to produce species-typical vocalizations

Songbirds produce two types of vocalizations: calls and songs
- For North American songbirds in general:
  - Calls: simple vocalizations, produced year-round by both sexes
  - Songs: complex vocalizations, produced during breeding season by males only

Why study chickadees?

Unlike most songbirds, chickadees have:
- A complex call & a relatively simple song
- Chickadees must learn their song and parts of their call
- Males and females both produce song
- In spring, males and females pair up & defend territories
- In fall, birds form flocks with dominance hierarchies

Bioacoustic Analyses

Using sound analysis software, we measure and analyze features of songbird vocalizations.

Using these methods, we have analyzed:
- chick-a-dee calls produced by numerous chickadee species
- tseet calls produced by black-capped & mountain chickadees
- fee-bee songs produced by black-capped chickadees

Features measured in fee-bee songs include:
- TD: total duration of song
- FD: frequency duration
- FG: frequency glide (decrease in the note frequency)
- IR: inter-note ratio (frequency ratio between notes)
- BA: base note maximum amplitude
- FA: fee note maximum amplitude

Operant Conditioning

Bioacoustic analyses indicate features that are different between vocalizations, but: Can birds perceive these differences?
To examine perception, we use an operant conditioning paradigm. We train birds to discriminate vocalizations (or other stimuli such as musical chords).

By manipulating specific features within these vocalizations and presenting these to the birds we can understand the mechanism that birds use to perceive differences in vocalizations.

Experimental Methods

Selected publications from SNL:

• Kindler A, Sturdy CB (2013). Female song in black-capped chickadees (Poecile atricapillus). Vocal acoustic features that contain individual identity information can be learned, Behavioural Processes, 88: 86-98.