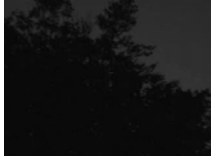


"singing in the wild is not a simple process" Hans Slabbekoorn *in*: P. Marler and H. Slabbekoorn, 2004. *Nature's Music*. Elsevier Academic Press.



Vocal communication



"Yes, as far as I know, songbirds write their own material."

Overview

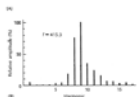
- Physical characteristics of vocalizations
- How the syrinx produces sounds
- Functional aspects of communication
 - Information content of song
 - Species and individual recognition
 - Advantages of song variety and dialects
- Vocal mimicry
- Learning to sing

Terminology

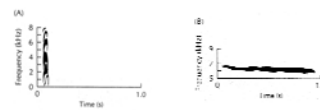
- Song
- Call
- Amplitude
- Frequency
- Glissando
- Harmonic
- Modulation
- Oscillograph/gram
- Sonograph/gram

Song types

- Whistled songs
 - Nearly pure sinusoidal waveforms, no harmonics (Blackpoll Warbler)
- Harmonic songs
 - Show multiples of fundamental frequency (Black-capped Chickadee)



Sound characteristics



• (A) Contact calls: short duration, broad frequency range are easy to locate.

• (B) Alarm calls: long duration, narrow frequency range are difficult to locate.



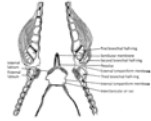
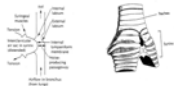
• Simple calls penetrate vegetation, common in forest birds (Bellbird, Ovenbird)

• Low frequency sounds are best for long-distance communication (Bittern, Owls)

• Complex calls most effective in open habitats (Meadowlark)

Sound is produced by the syrinx

- Located in the body cavity at the junction of the trachea and the two primary bronchi
- Primary structures are vibrating tympaniform membranes, supporting cartilage, and controlling muscles
- Sound created by vibration of air passing through syrinx
- Movement of the bill is generally not important to sound production

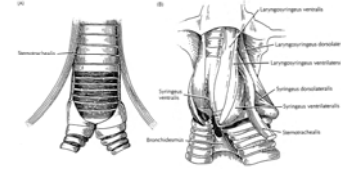


Syringeal musculature

- Syringeal muscles control song production
- 2 - 6 pairs
- Lacking in ratites, storks, and New World vultures

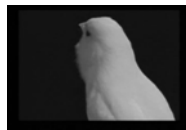
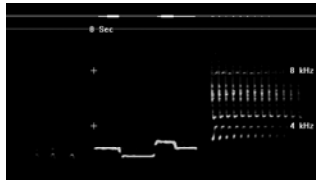


Cassowary



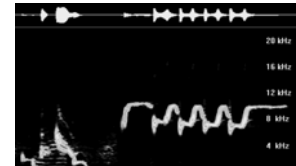
Birds have two voices

- The two halves of the syrinx are independent and can produce two distinct songs simultaneously

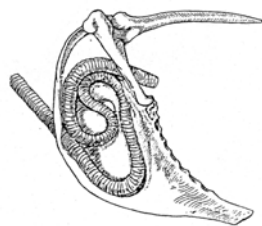


Complex modulation = complex song

- Rapid changes (modulation) in frequency and amplitude create complex songs



Whooping it up

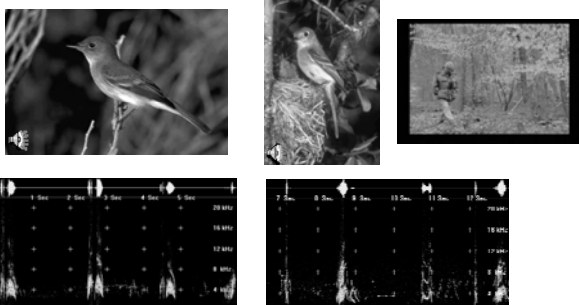


<http://www.operationmigration.org/>

Functions of songs and calls

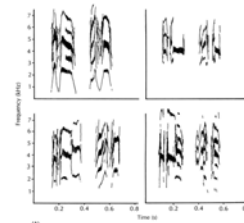
- **Reproductive**
 - Define territory boundaries
 - Defend territory against rivals
 - Attract mates
 - Synchronize reproduction
 - Strengthen pair bond
- **Social**
 - Species identification
 - Warning calls
 - Information about food
 - Flock maintenance
 - Mobbing predators
- **Individual**
 - Individual recognition
 - Identify mates, offspring, parents, neighbors
 - Define territory boundaries

Songs convey important information about species



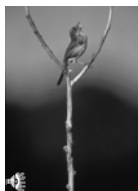
Songs convey important information about individuals

- Calls of four individual Least Terns



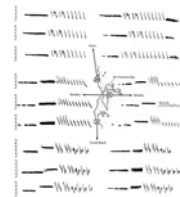
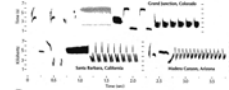
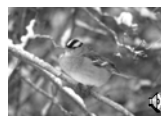
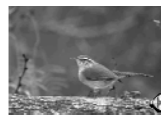
Song repertoires and mimicry

- Song repertoires and mimicry may represent sexual selection acting on song
 - Great tits and Swamp Sparrows with larger repertoires have higher reproductive success.
 - Northern Mockingbirds and Superb Lyrebirds with more diverse repertoires have higher mating and reproductive success



Song dialects

- Songs show variation at different geographic scales



Four stages of song learning

- Critical Learning Period
 - Usually first year, song memorized and stored
- Silent Period
 - No vocalizations for up to 8 months
- Subsong Period
 - Practice period, song is plastic, auditory feedback essential
- Song Crystallization
 - Syllables dropped, final form of song becomes fixed

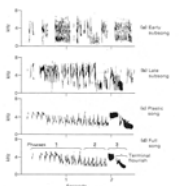
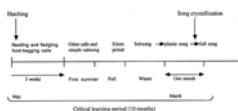


Fig. 7. Normal song development in the Chaffinch *Fringilla coelestis*.

Non-vocal sounds



"Peent!"

