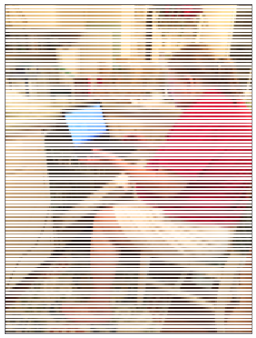
F*WL LANGUAGE

Not Brian Gordon's version…

Thanks to Noni! (yet again…)



Fowl Language—Non-vocal

Fowl Language—Non-vocal

- Plumage
- Body posture
- Beak Clacking
- Wing Beating
- Drumming

singing-wings-aviary.com/black-palm-cockatoo.htm

Fowl Language—Non-vocal

Implications for Rehabilitation?

- Plumage
- Body posture
- Beak clacking
- Wing beating

Audubon.org

Fowl Language—Vocal

Fowl Language—Vocal

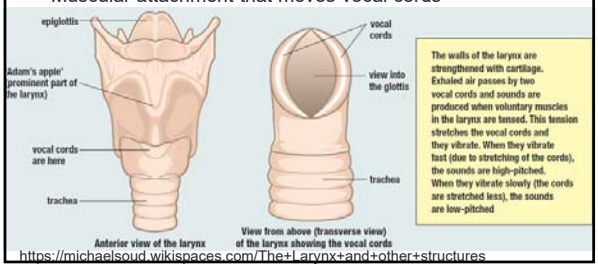
Fowl Language—Vocal

- Single 'sounds'
  - Hiss
  - Grunts
  - Calls
- Songs
  - Multiple notes

Sound Anatomy—Mammals

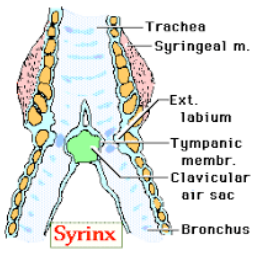
Larynx

- Outside thoracic inlet
- Muscular attachment that moves vocal cords



https://michaelsoud.wikispaces.com/The+Larynx+and+other+structures

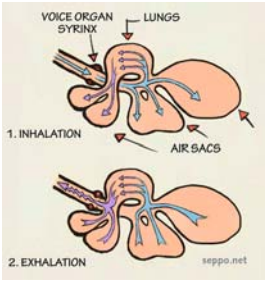
Anatomy of Sound—Birds



- Syrinx
- Inside thorax
- Size and shape varies
- Size and shape of trachea influences
- Multiple structures determines resulting sound
  - External labia
  - Internal labia

Anatomy of Sound—Birds

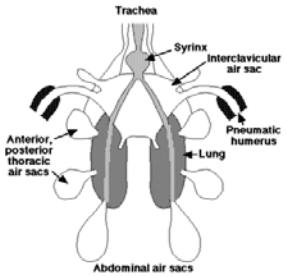
- Most of sound is on exhalation through syrinx
- Some on inhalation
- Some sing separate song through each bronchus
- % Air column for sound
  - Humans: 2%
  - Birds: 100%



Air Sacs

- 80% respiratory tract
- Generally 9:
  - 2 ea. cervical, cr. thoracic, cd. thoracic, abdominal
  - Single interclavicular
- Range 6-14

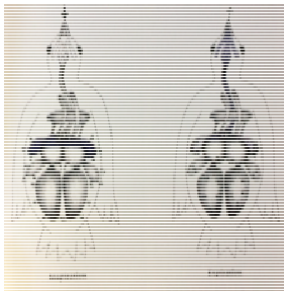
- Warm the air
- ↑ air passing thru lungs
- ↑ buoyancy
- Chg pressure on syrinx



Respiration Cycle 1

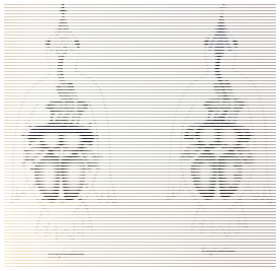
- Inspiration
  - Air passes thru trachea and lungs
  - Air enters caudal air sacs
- Expiration
  - Air moves from caudal air sacs into lungs

Respiration Cycle 1



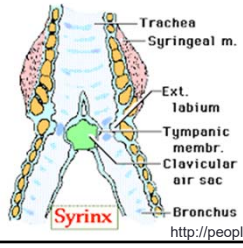
- Inspiration
  - Air moves from lungs to cranial air sacs
- Expiration
  - Air moves from cranial air sacs and out the trachea
- May breathe in and out 2x/second

Full Cycle



Implications for Rehabilitation?

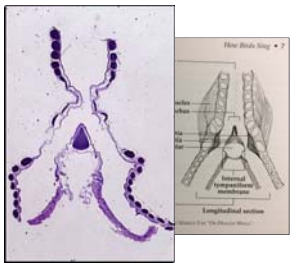
- Interclavicular air sac
  - Cannot sing if ruptured
  - If scarred??



http://people.eku.edu/ritchisong/birdcommunication.html

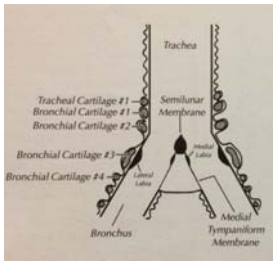
Syrinx Anatomy

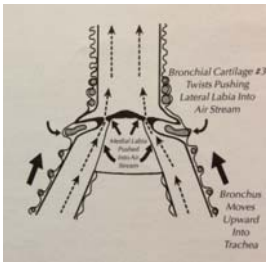
- At tracheal bifurcation
- Each bronchus functions separately
- External muscles
- External labia vibrates
- Internal labia vibrates



http://trc.ucdavis.edu/mjguinan/apc100/modules/Respiratory/airways/syrinx/syrinx.html

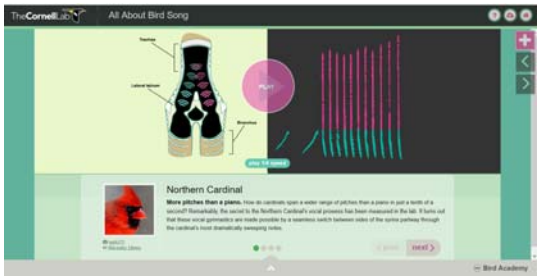
Syringeal Action in Sound





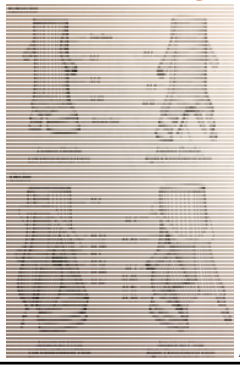
H.E. Evans & J.B. Heiser

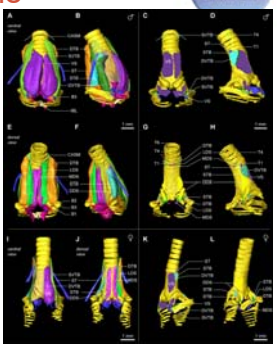
Science of Sound



https://academy.allaboutbirds.org/features/birdsong/how-birds-sing

Suboscine vs Oscine





Ames 1971 BMC Biology

Songbird sound

Oscine

- 5-8 syringeal muscles
- Independent control

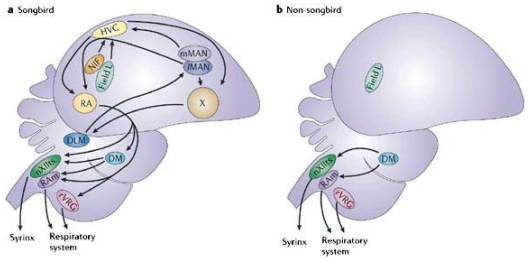
Suboscine

- 0-4 syringeal muscles

Muscles…

- …change the shape of the trachea syrinx
- …tense or relax the labia
  - Air causes labia to vibrate
  - Vibration produces sound
- …are 'superfast': change direction in less than 10 microseconds
- As tension and diameter change, resulting sound changes

Brain centers to go with muscles.



- Male songbird HVC brain 30-40% larger
- Larger in birds w/larger song repertoire

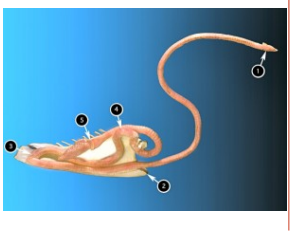
Trachea modifications

- Whooping Crane

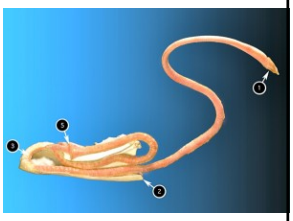
https://etc.usf.edu/clipart

Trachea modifications

Trumpeter Swan



Tundra Swan



Trachea modifications

Purpose?/Advantage?

- Enable especially loud, resonant noises
- Lower the fundamental frequencies, exaggerating the acoustic size of the birds
- May provide advantage in sexual competition and may intimidate predators
- Many species with long, looped tracheas nest in areas with dense vegetation where visibility is restricted

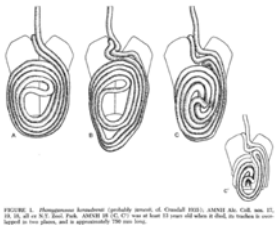
Implications to Rehab?

- large, complex tracheae make these species especially prone to fungal infections

Medical mycology 53(8) · August 2015

Trachea modifications

Phonygammus keraudrenii

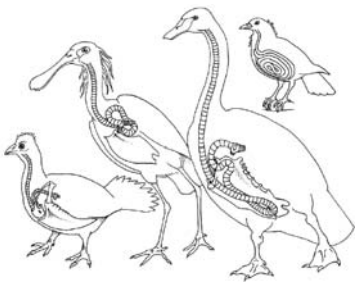


Clench (1978)

Side view…

http://www.hbw.com/ibc/family/grid/birds-paradise-paradisaeidae

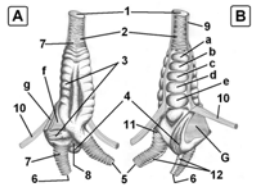
More cool tracheas….



Fitch & Hauser, in press

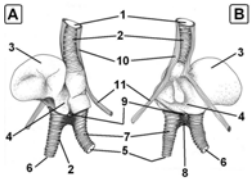
Tracheal modifications

Syrinx of Long-Tailed Duck Drake



- 1 – trachea
- 2 – cartilagines
- 3 – the greater tympanum ventricle
- 4 – the smaller tympanum ventricle
- 5 – right primary bronchus bronchus primarius dexter
- 6 – left primary bronchus bronchus primarius sinister
- 7 – membrana interannularis
- 8 – ligamentum interbronchiale
- 9 – musculus tracheolateralis
- 10 – musculus sternotrachealis
- 11 – membrana tympaniformis lateralis
- 12 – membrana tympaniformis medialis
- a, b, c, d, e, f – membranes tracheosyringeales

Syrinx of Mallard Drake



- is
- iale
- alis
- ealis

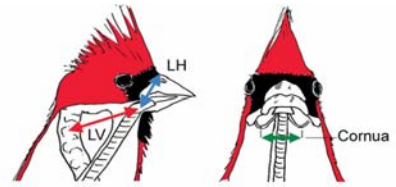
Syringeal Nodules

- Northern Gannets
- Male and female
- Composed of fat
- Modify vocal quality
- Convey info about condition of bird

Other Implications for Rehab

- Radiograph interpretation…

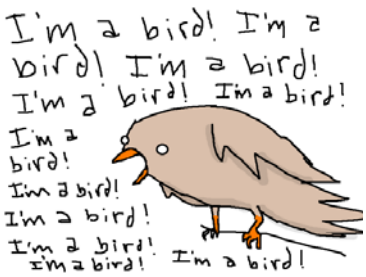
Final sound modification



Modifications in tongue, beak, gape and upper throat positions change the size and shape of the pharynx, 'fine-tuning' the sound

http://people.eku.edu/ritchisong/birdcommunication.html

Bird Sounds



Sounds (Calls & Songs)Used For:

- Location
- Predator alert
- Competition & Attraction
  - Mate, territory, food
- Fight songs
- Food begging

Calls

- Short & simple
  - Contact calls
    - Migration, Shorebirds
  - Alarm calls/Distress calls
    - Longer, higher pitch
    - Predator or other danger
  - Mobbing calls
    - Attract conspecifics and distract predator
    - Pishing is a mobbing call
  - Distraction calls
    - e.g., killdeer

Song

- Influenced by sex hormones
- important in reproduction
  - defending territories
  - attracting mates

Why More Singing in Summer?

Melatonin

- M is produced at night
- Shorter days = increase M
- Increased M = smaller HVC (High Vocal Center) in brain
- Small HVC = Sing less

Testosterone

- Sunlight triggers T production
- Increased T = bigger HVC
- Large HVC = sing more
- Castration…don't sing
- T injections…sing!

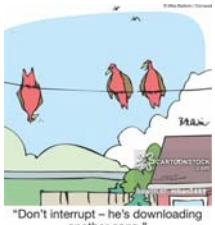
Learning Song

Oscine

- 'Template' hardwired
- Learn from adults
- Filter out songs of other spp.
- Age varies
  - INBU learn when young ad
  - WCSP learn 10-50d
    - Learn best from live birds
  - Some practice & perfect their song on wintering grounds

Suboscine

- Hard-wired
- Flycatchers & related



"Don't interrupt – he's downloading another song."

Implications for Rehabilitation?

- Expose young birds to species specific song
- Raise with exposure to males of same species
- Recordings of adult song may reduce imprinting & stimulate feeding response

Whisper Songs vs. Subsongs

Subsongs

- Quiet
- Partial or repeated songs
- Usually given from dense cover
- Full of mimicry
- May bear little resemblance to familiar adult songs
- Juveniles practicing

Whisper songs

- Quiet
- Full vocal control
- Precise pattern repetition
- Adult males in breeding season
- Often at night
- 'Seductive whispering'

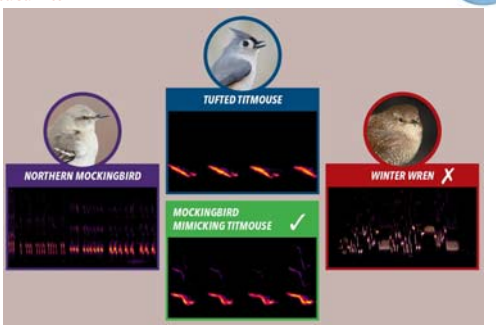
--earbirding.com

Mimics

- Usually both male and female sing
- Do have their own song and range
- Most are 'open-end' learners
- Sing day and night
- One mockingbird learned >200 songs…

"Hey, that's my song. That's copyright infringement."

Mockingbirds can accurately mimic simple phrases that fall in their own natural range and patterns. *Spectrograms from Macaulay Library of Natural Sounds/Cornell Lab. Images: Northern Mockingbird by Kim Caruso; Tufted Titmouse by Michele Black; Winter Wren by Linda Gail Price.*



Brood parasites

- If raised in captivity:
  - learn song of adult species that raise them
- In raised in the wild:
  - 20-25d old
  - Reverse of human teen behavior…

http://www.audubon.org/news/how-does-cowbird-learn-be-cowbird

Implications for Rehabilitation?

- Move cowbirds to outdoor cage by 3 wks?
- Exposure to adult cowbirds?
- ??

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Thank-You!!