

The Vocal Apparatus of Birds

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I'm interested in the biomechanics of the vocal apparatus of birds, including how the primary organ, the syrinx, creates and varies sound, and interacts acoustically with the rest of the respiratory tract. The illustrations I've created are one of the ways in which I'm investigating the biomechanics of seagull vocalizations. Specifically, I'm interested in how the posture of a gull influences their vocalizations.

The following images are photos of a series of observational study pieces I created based around the vocal apparatus of the gull. The pieces are organized by number, and fall into one of two categories: gull call sketches from video (1-5), and internal anatomy-centered pieces from photos taken during my dissection of a Japanese quail, *Coturnix japonica*¹ (6-9).

The call-based sketches (1-5) were done primarily to understand the varying types of gull calls, including their associated behaviors, postures, and nuances. I sketched the juvenile/'klee-ew' call, the 'kek-kek' and 'keow'/'kyow' calls, and the long call/trumpet call. Around the sketches are notes on the purpose of and the postural shifts involved in the call of focus. These sketches were done in graphite and colored pencil, and include both more zoomed-in/detailed sketches, and figure drawing-style illustrations.

The internal anatomy pieces focus on the body parts that allow for the creation of those calls. Specifically, they were made in order to process and record my understanding of the non-songbird vocal apparatus which I was able to obtain through hands-on learning via dissection. Pieces 6-8 are simplified, enlarged, and labeled diagram-style sketches from dissection designed for ease of comprehension of the upper vocal tract and syrinx. These were done in black pen, in a minimal line art style. Piece 9 is a more realistic depiction of what could actually be observed during dissection, including the color, texture, size, and location of the vocal apparatus as it relates to other parts of the body. This piece is a realism-style gouache painting with white pen highlights.

¹ Sourced from the Vassar Animal Care Facility. The individuals were originally used under an approved IACUC protocol for a different educational purpose, regulated by state and federal laws for the use of vertebrates. They were under the care of a veterinarian and were humanely euthanized.

"Klee-ew" Call (Juvenile Call)



Call can be made with beak open or closed

- relatively quiet
- relaxed, sinker posture

- repetitive begging call

"baby talk" may be used into adulthood



head tucked comfortably against body



Sometimes paired with bobbing or extending out of head for additional volume or emphasis

Varying by gull type & environment,
juveniles may begin producing other
calls such as the chinking call or
long call

(~4 days -

very early on

a few weeks old)

However,

these will be

hoarser,

less frequent,

and less

fully

developed

than

in addition,

The

"klee-en"

call is

the most

frequent and

highly departed

on call in

juveniles

by far.



"Kek-kek" & "Kyou" Calls

- Both given/produced with a straight upright posture

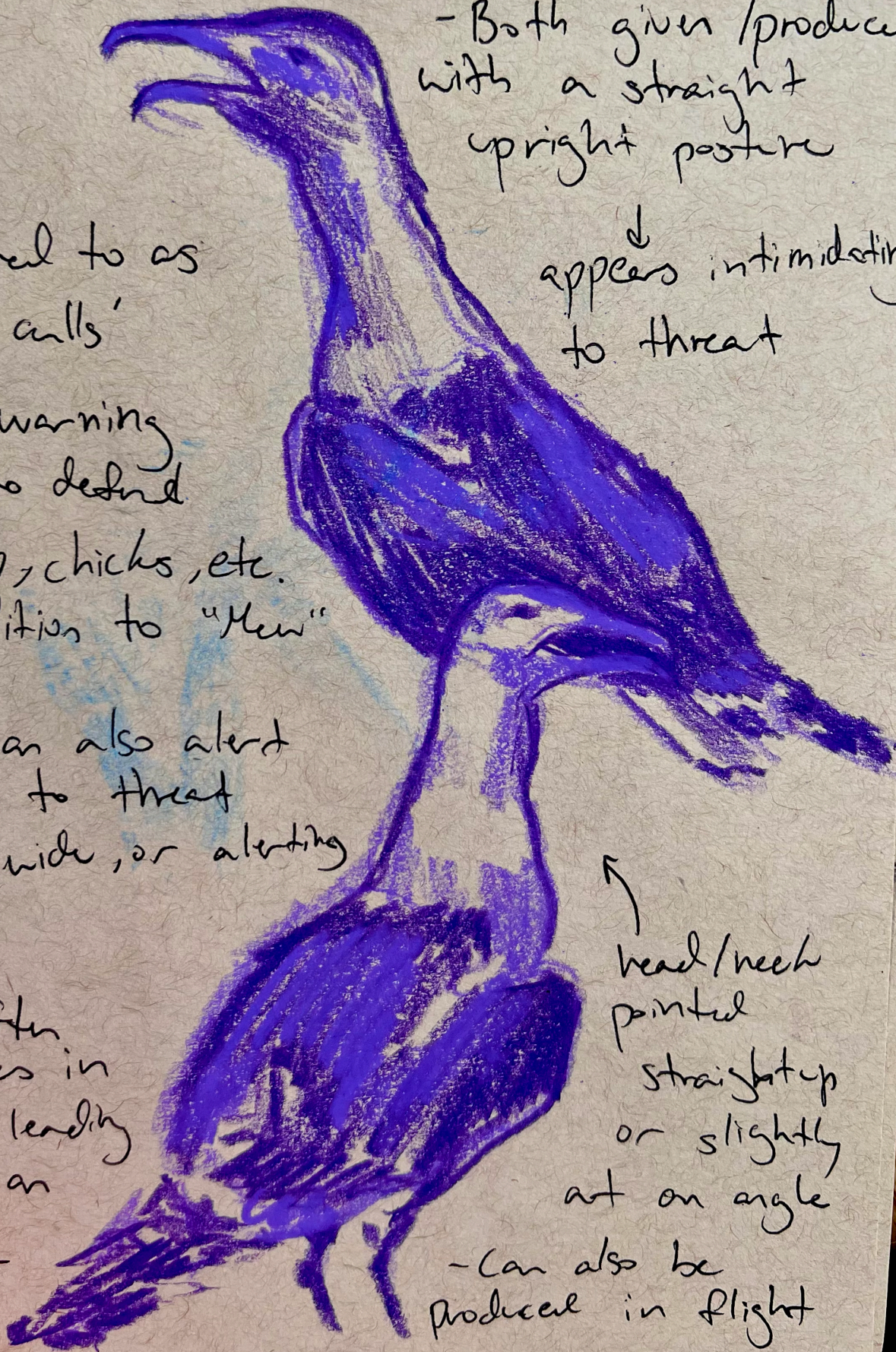
↓
appears intimidating to threat

- Referred to as 'alarm calls'

↳ warning used to defend territory, chicks, etc.
In addition to "Mew" call

↳ can also alert others to threat (colony-wide, or alerting mate)

↳ often increases in volume leading up to an attack



↑
head/neck pointed straight up or slightly at an angle

- can also be produced in flight



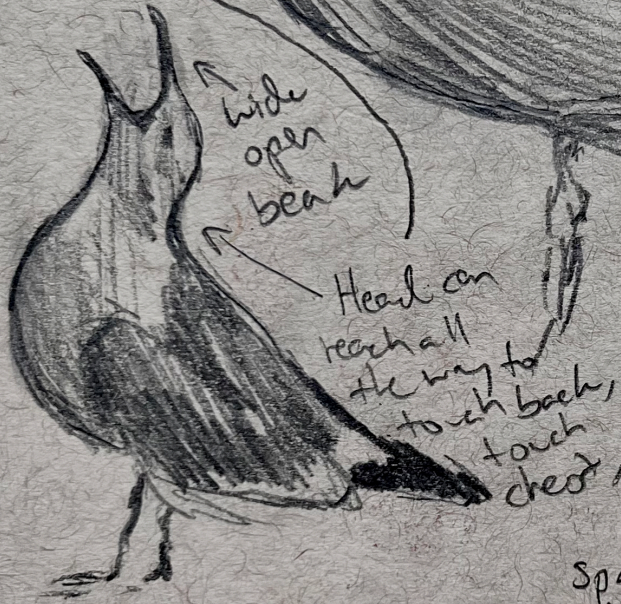
Beak opens wider during
ladder calls

↑ throat below beak after
puffs in Δ at throughout calls

Long Call / Trumpet Call → Most individualized call

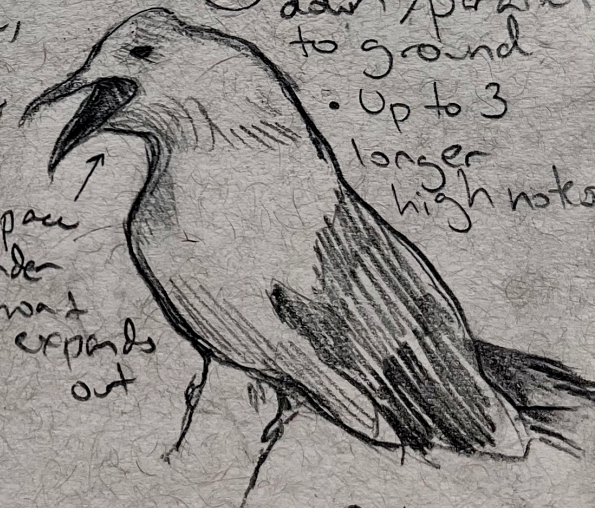
* Order of 1 & 2 may vary and range greatly in subtlety *

① • Head & neck tilted downward, tucked in / backwards
• A few rough / hoarse, short notes



② • Head tilted down / parallel to ground
• Up to 3 longer high notes

Space under throat expands out



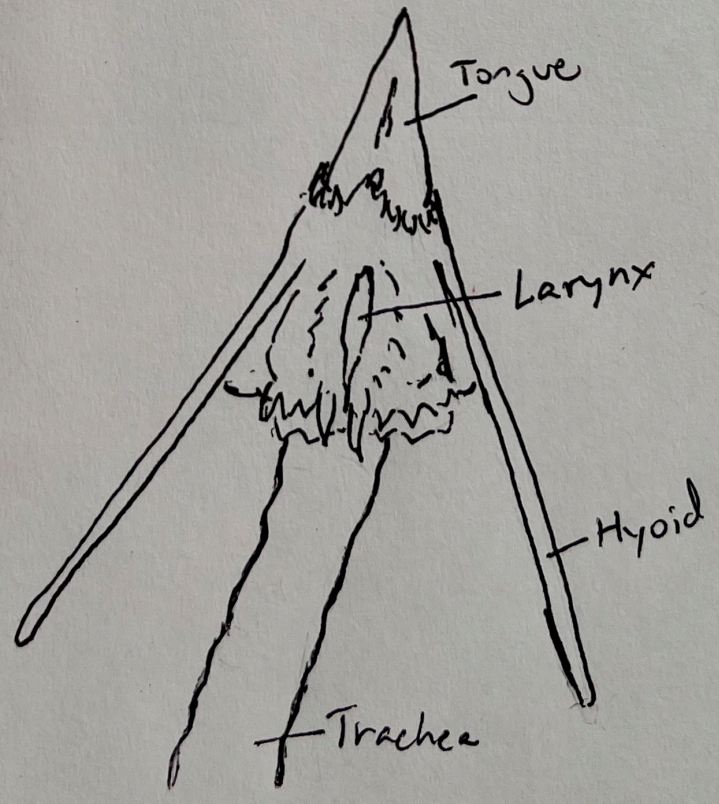
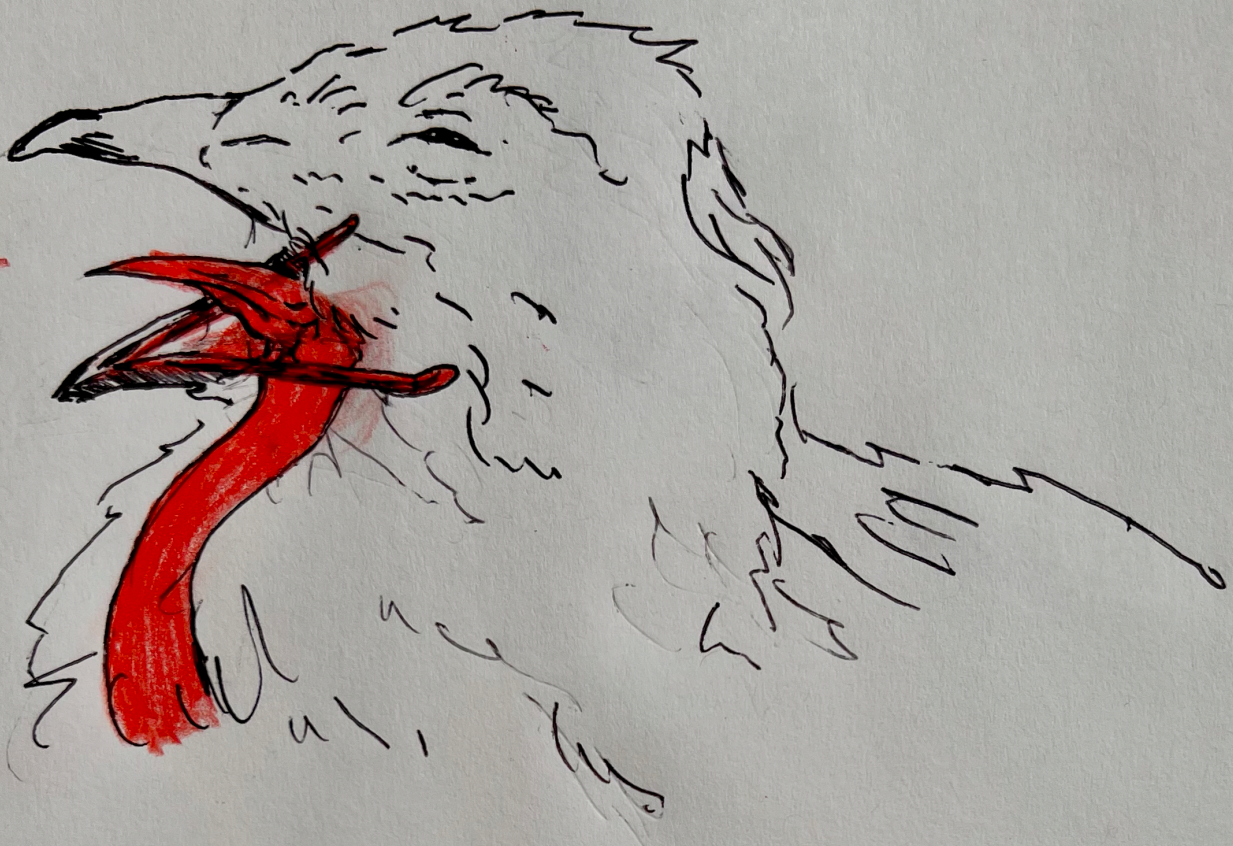
③



• Return to relaxed, scales posture with head against body occurs at end of call

• Up to 25 mostly identical high short notes

• Head pointed up high, often starting to tilt down throughout this stage



Tongue

Larynx

Hyoid

Trachea

