Anatomy & Adaptations 7-8

Unit Overview

This unit explores bird anatomy and adaptations, focusing on body parts, beaks, and feet. Students will examine how these features reflect evolutionary adaptations and ecological roles, with an emphasis on critical thinking and analysis.

Curriculum Relevancy

- **Grade 7:** Evolution by natural selection provides an explanation for the diversity and survival of living things.
- **Grade 8:** The theory of evolution explains the diversity of living things.
- **Learning Competencies:** Analyze anatomical features, interpret data on bird behaviors, and understand how adaptations support survival and ecosystem roles.

Objectives

By the end of this unit, students should be able to:

1. Identify and describe the structure and function of bird body parts, beaks, and feet.
2. Analyze how these adaptations reflect birds' ecological roles and habitats.
3. Explain how evolutionary adaptations enable birds to survive and thrive in their environments.

Unit Content

Introduction to Bird Anatomy

Slide 2

Bird anatomy is a result of millions of years of evolution. Over time, birds have developed physical traits that allow them to thrive in different environments. These adaptations, shaped by natural selection, are crucial for survival.
Natural selection is the process where traits that improve survival and reproduction become more common in a population over generations.

Studying bird anatomy helps us understand their behavior, feeding habits, and ecological roles.

Bird Skeletons

Slide 3

Birds and humans share most of the same bones, but birds' skeletons are adapted for flight. Their bones are hollow, making them lightweight yet strong enough to support flying.
Hollow bones are an example of convergent evolution. Other flying animals, like bats, have adapted similar traits for flight, even though they are mammals.

Bird's bones are hollow in order to make them light enough to fly.
Bones in the wings are like our arm bones
Skull is the same in humans
Ribs are the same as ours
Legs & feet bones just like ours

Show a labeled diagram comparing a bird's wing bones to a human arm, emphasizing shared structures like the humerus, radius, and ulna.

Bird Legs and Feet

Slide 4

Bird legs and feet are specialized for their environment and lifestyle. For example, a locking tendon mechanism allows birds to perch securely, even while sleeping. This adaptation saves energy and prevents falls.
What looks like a backward knee is actually the ankle. Birds' real knees are hidden closer to their bodies.

Wings and Flight

Slide 5

Wing shapes are adapted for different flight styles and environments. The broad wings of eagles allow for soaring, while gulls' long wings are ideal for sustained flight over the ocean.

Flight depends on three forces: lift (to stay in the air), thrust (to move forward), and drag (to overcome air resistance). Birds' wings are shaped to maximize these forces for efficient flight.

Slide 6

Passerines with small wings to fly between bushes & trees.

Hummingbirds with narrow wings to be able to beat at 60 beats per second.

Eagles with broad wings to soar high in the air.
Gulls with long wings to fly way out to sea.

Slide 7

Penguins no longer fly, their wings have changed and they use them to swim.

Feathers

Slide 8

Birds change their feathers a couple of times each year – called molting.
Sometimes they change ALL their feathers and sometimes just a few.

Plumage is essential for flight, insulation, and camouflage. Feathers have microscopic barbs and barbules that interlock, creating a strong but flexible structure.

Slide 9

Bright plumage is often used for mate attraction, signaling health and genetic fitness. Camouflage helps birds avoid predators by blending into their surroundings.

Include an image showing a magnified view of feather barbs and barbules, as well as examples of brightly colored and camouflaged birds.

Eyes, Ears, and Nose

Slide 10

Most species of birds can usually see 2-3 times better than humans. Some can spot prey from over 2 miles away.
Birds also see more colors because their eyes are different to ours.

Slide 11

Birds can sleep with one eye open. If the right eye is open the bird is resting the right side of the brain. This is useful to watch for predators. It also enables them to continue flying when it is sleeping.

Slide 12

Do birds have ears? Yes, but we cannot see them most of the time because they are covered in feathers.

Slide 13

Location of owl ears.

These are not ears they are just feather tufts.

Slide 14

Do birds have noses? Yes, birds have noses. However, they are not the same as human noses. Birds have nostrils on the sides of their beaks that they use to breathe.

Beak Types and Functions

Slides 15-22

For each beak type:

- **Conical Beak Slide 15**
  This beak is designed for cracking seeds. Birds with conical beaks, like sparrows, are often found in seed-rich environments where their beaks provide an advantage.
- **Hooked Beak Slide 16:**
  Raptors like eagles have strong, hooked beaks for tearing prey. This adaptation allows them to efficiently consume meat, giving them a survival advantage.
- **Needle-like Beak Slide 17**
  Hummingbirds have long, slender beaks adapted for feeding on nectar from tubular flowers. This is an example of co-evolution, where both the bird and flower species benefit.
- **Chisel-shaped Beak Slide 18**
  Woodpeckers' strong, chisel-like beaks are perfect for drilling into trees to extract insects. Their reinforced skulls protect them from the impact of repeated pecking.
- **Straining Beak Slide 19**
  Ducks' straining beaks have lamellae, comb-like structures that filter food from water. This adaptation allows them to thrive in aquatic environments.
- **Spear Beak Slide 20**
  Waders, such as herons, egrets and bitterns, have long, pointed beaks. These beaks are effective for foraging in shallow water, where they can grasp fish, frogs, and other prey.
- **Probing Beak Slide 21**
  Shorebirds like sandpipers and snipes have long, thin beaks that they use to probe the mud or sand for small invertebrates. These beaks allow them to reach and capture prey hidden beneath the surface.
- **Insect-eating Beak: Slide 22**
  Refers to a beak or bill that is specialized for capturing, manipulating, and consuming insects These bills are generally narrow and short to medium in length.

Foot Types and Functions

Slide 23

Some birds also need their feet to feed. Bird feet are like a tool, and each type is designed for a special job, helping birds survive and thrive in their own unique way. Some birds need their feet to catch and carry food, some use their feet to dig for food, some use their feet to swim or walk on top of mud and wet sand, and some use their feet to hang on to tree branches. First we will look at the structure of the foot (and leg) and then we will see the different ways in which they are used.

Slide 24

People think a bird's knee bends backwards. But the backward facing joint that seems to be knee is the ankle . Knees are hidden close to body. Birds tarsus = Human foot. Bird's foot is really just the toes! Birds spend their lives on tip-toe.

Slides 25-28

For each foot type:

- **Grasping Feet Slide 25**
  Raptors have strong feet with sharp talons for catching and holding prey. This adaptation is crucial for hunting and survival.
- **Zygodactyl Feet Slide 26**
  Woodpeckers and owls have zygodactyl feet, with two toes forward and two backward. This provides a stronger grip for climbing trees or holding prey.
- **Webbed Feet Slide 27**
  Ducks and other waterbirds have webbed feet for efficient swimming. The webbing increases surface area, acting like paddles.
- **Wading Feet Slide 28**
  Herons and egrets have long, spread-out toes for walking on soft mud and stirring up prey in shallow water.

Evolutionary Adaptations

Slide 29

Bird anatomy reflects millions of years of adaptation to specific environments. For example, Darwin's finches evolved distinct beak shapes to exploit different food sources on the Galápagos Islands. This is a classic example of adaptive radiation. These adaptations demonstrate the connection between form and function in evolutionary biology.

Activities

Anatomy and Adaptations Drawing

- Students will draw a bird and label key body parts, beaks, and feet.
- They will write explanations for two features, describing how they are adapted for survival.

Craft

"Build-a-Bird" Evolutionary Adaptation Model.

Reflection Questions:

How do specific adaptations, like beaks or feet, help birds survive in their environment?

What challenges might birds face if their environment changes?