

Bird Beak Buffet

Grade Level: 1, 2

Next Gen Standards

1-LS1-1 From Molecules to Organisms: Structures and Processes

Disciplinary Core Ideas

LS1.A: Structure and Function

All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.

LS1.D: Information Processing

Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.

K-2-ETS1-2 Engineering Design

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

2-LS4-1 Biological Evolution: Unity and Diversity

Make observations of plants and animals to compare the diversity of life in different habitats.

Vocabulary Words/Terminology (For Presenter's Use)

Adaptation – modification of an organism or its parts that makes it more fit for existence under the conditions of its environment

Biodiversity – a measure of the variety and variability of life on Earth, or in a biome, ecosystem, specific habitat, or population.

Ecological Niche – the role and position a species has in its environment; how it meets its needs for food and shelter, how it survives, and how it reproduces. A species' niche includes all of its interactions with the biotic and abiotic factors of its environment.

Ecosystem – a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycles and energy flows.

Ecosystem Services – the direct and indirect contributions of ecosystems to human well-being

Habitat – the type of natural environment in which a particular species of organism lives – where that species can find food, shelter, protection and mates for reproduction.

Specialist – can thrive only in a narrow range of environmental conditions or has a limited diet

Generalist – able to thrive in a wide variety of environmental conditions and can make use of a variety of different resources

Wetlands – distinct ecosystems that are covered often intermittently with shallow water or have soil saturated with moisture. They offer numerous ecosystem services and are extremely biodiverse. (E.g. swamps, marshes, bogs, mangrove forests, floodplains, etc.)



Materials

- **Pictures of bird beaks**
 - A‘eo – Hawaiian Stilt
 - Koloa maoli – Hawaiian Duck
 - Nene – Hawaiian Goose
 - ‘Alae ke‘o ke‘o – Hawaiian Coot
 - ‘Alae ‘ula – Hawaiian Gallinule
 - ‘Io – Hawaiian Hawk
 - ‘I‘iwi – Scarlet Honeycreeper
 - ‘Alalā – Hawaiian Crow
- **Pictures of Bird Feet**
 - A‘eo – Hawaiian Stilt
 - Koloa maoli – Hawaiian Duck
 - Nene – Hawaiian Goose
 - ‘Alae ke‘o ke‘o – Hawaiian Coot
 - ‘Alae ‘ula – Hawaiian Gallinule
- **Wetland Bird Taxidermy (if available)**
- **Pictures of Hanalei Refuge Habitat**
- **Model Beaks**
 - Chopsticks (A‘eo)
 - Strainers (Koloa)
 - Ridged Clothespins (Nene)
 - Smooth Clothespins (‘Alae ke‘o ke‘o / ‘Alae ‘ula)
- **Model Food**
 - Invertebrate animals (insects, spiders, worms – 30+)
 - Cotton Balls / White Pompoms (naupaka berries)
 - Pink/Red Pompoms (apple snail eggs)
 - Green/Brown Pipe Cleaners (terrestrial vegetation)
 - Plastic Aquatic Foliage (aquatic vegetation)
- **Model Nests**
 - Detective Hats (for now)
- **Predator Cards** (Made into long necklaces for students to wear)
 - Pig, Dog, Cat, Mongoose, Bullfrog, Egret, Chicken

Lesson Outline

- How do different types of bird beaks reflect the kind of food they eat?
- How do other physical adaptations assist in a bird’s pursuit of food?
- Habitats provide a variety of foods that satisfy the survival needs of many different birds.
- How can beak and diet specialization be both beneficial and detrimental to a bird’s survival in the face of changing environmental conditions?
- The introduction of invasive species, habitat loss, and pollution all present serious problems for endangered Hawaiian wetland bird species.

Set-Up

- Set up half as many nesting locations around the perimeter of the playing area as there are students.
- Disperse the red/pink apple snail egg pompoms throughout the playing area within the nest perimeter.
- Place one beak at each nesting area. Vary the beak types from nest to nest.
- Have the pictures of the habitat in Hanalei and the different bird beaks and feet (including 'io and 'iwi) with you as interpretive tools for your talk.
- Make sure all of your materials for later rounds are ready for setup once the lesson and first round are complete.

Delivery

Explain

Animals and plants are built to survive in the environment where they live. That relationship plays a part in why protecting habitats is so important.

Ask

Can anyone tell me what a habitat is?

Explain

A habitat is the natural home, or environment, of an animal or plant. Every habitat has a unique mix of food, water, cover, and other characteristics.

Ask

What are some examples of a habitat?

Explain

Those are all good answers. A habitat can be large or small. Deserts, forests, coral reefs, rivers, cities, or even a tree in your back yard can all be considered habitats for the animals and plants that live in or on them. If you put a bunch of habitats in one area together, you get an ecosystem.

Ask

What are some examples of ecosystems?

Explain

Grasslands, Desserts, Tropical Rainforests, Tundra, Oceans, and more are all ecosystems. Today, we are going to be specifically talking about the Wetland Ecosystem, like taro fields or the Hanalei National Wildlife Refuge. Every ecosystem has something we call Ecosystem Services which are the benefits a certain ecosystem has toward humans.

Ask

How do wetlands help people?

Explain

Wetlands help to control floods, they help refill the groundwater where we get much of our drinking water, they help protect shorelines from storms and erosion, they help clean dirty water of sediment and toxins, provide us food (like taro), and are biodiversity hotspots.

Ask

Can anyone explain what biodiversity means?

Explain

Biodiversity is a measure of the variety of life in a particular habitat or ecosystem. If a habitat has a lot of niches, or potential ways in which life can find a way to survive, then it will have high levels of biodiversity. Plants and animals are highly adapted to the unique mix of food, water, cover, and climate present where they live, so they have the greatest chance of survival in their niches they have carved out in their native habitat.

Ask

Does anyone know what an adaptation is?

Explain

An adaptation is a characteristic that a species has developed in order to be successful in a certain environment. Today we are going to be talking about some of the adaptations birds have that help them survive in their wetland habitats on Kauai.

Ask

Who can tell me what kinds of adaptations they think birds have that help them to survive?

Discuss

Discuss briefly whatever adaptations your group may bring up.

Explain

Today we are going to be looking specifically at how birds' beaks and feet help them search for and eat food in the wetland habitats of Hanalei and Hulē'ia refuge here on Kauai.

Discuss

Show different bird feet and beaks to students. Ask students what they notice about the shapes of the feet and beaks. Are all of the feet the same? Are all of the beaks the same? How do birds use their feet? How do they use their beaks? How does a bird's feet/beak help them survive?

Examples:

- **Stilts**
 - Long pink legs for walking in water up to 9 inches deep, small partially webbed feet provide stabilization, allow for swimming, although they rarely swim.
 - Very long, straight beaks that to probe for worms, crustaceans and other small creatures in mudflats and shallow water.

- **Koloa**
 - Orange webbed feet are used for paddling in deeper water.
 - Rounded, olive-colored spoon-shaped bills that act like strainers to filter tiny plants and animals from the water.
- **Nene**
 - Black feet have lost much of their webbing for an important function- walking on sharp bumpy lava rock.
 - Strong rounded beaks with serrated teeth help them grab Naupaka berries off the bush or tear blades of grass from the ground.
- **Coot and moorhen**
 - Long lobed toes, no webbing, coot has blue/gray feet, moorhen has yellow feet. Both can walk on floating vegetation, and can construct their nests on floating vegetation.
 - Shorter, pointy beaks that allow them to pinch seeds, fish, snails, etc.
- **‘Io and ‘Iiwi**
 - Explain how the Hawaiian Hawk has a strong, hooked beak designed for ripping and tearing pieces of meat
 - Explain how the ‘Iiwi is strongly adapted to the plants that share its evolutionary history. Its long, downward-curving bill is specialized for sipping nectar from tubular flowers. The ‘ohi’a lehua flower has become very important for their survival as the flowers they evolved to get their food from have become rare.

Explain

Depending on the type of beak, each bird is adapted to collect and eat certain types of food. Now we are going to play a game using tools that represent the beaks of the birds we just talked about.

- Chopsticks (A‘eo)
- Strainers (Koloa)
- Ridged Clothespins (Nene)
- Smooth Clothespins (‘Alae ke‘o ke‘o / ‘Alae ‘ula)

Activity

Bring the students to the playing area directing them to pair up and choose a nest. Explain that the game is a relay, and pairs must work together to collect food from the feeding grounds. For the first round, explain that the wetlands are overrun by invasive apple snail eggs (pink pomp oms – which are the only thing on the ground in this round), and they need to clear the area of eggs before they can eat their favorite foods in later rounds. In round 2, distribute all of the other native food types for the students to collect. Each member of the pair will take turns with the beak, visiting the feeding grounds and bringing one food item back to their nest. Explain that each beak is best suited for different types of food. At least in the first rounds, allow them to use their “beaks” to pick up whatever kind of food they can.

- Pink/Red Pompoms (apple snail eggs)
- Invertebrates
- White Cotton Balls/Pompoms (naupaka berries)
- Green/Brown Pipe Cleaners (terrestrial vegetation)
- Plastic Aquatic Foliage (aquatic vegetation)

Depending on time, explain that students will each use the beak once, twice, or until you blow the whistle, etc. Choose the time frame that works for your activity schedule. If time allows, extend the game into multiple rounds with new challenges. At the end of each round, ask the students to explain how the new changes affected their ability to find enough food. Examples include:

- **Invasive predators have been introduced to the wetlands by humans!** Take the beaks from some students and give them predator cards to where instead. Explain that when a bird gets tagged by a predator, the bird must wait 5 seconds before foraging again and the predator must wait 5 seconds before tagging another bird (they'll need some time to digest!) and that they cannot tag the same bird twice in a row.
- **Invasive plants have spread through the refuge, out-competing native plants!** Take away a certain plant-based food source or decrease the food supply overall. This round can have the most obvious effects if you are having the students search only for the "foods" their "beaks" are adapted to.

After the game is over, collect the beaks, nests, stomachs, and predator cards. Ask the students to help gather the food in the playing area.

Wrap-Up

Ask the group how specialized beaks can help some birds stay alive; how can specialization be a good thing? (A bird with a specialized beak can often eat a type of food that no other bird can eat.) Then ask how a specialized beak could be a negative thing; how it might hurt a bird. (If the bird's habitat changes and its food is no longer available, the bird might die because it can't eat anything else.) Optional: Explain that some birds, such as Hawaiian Crows ('Alalā), have very versatile beaks which allow them to eat fruits, nuts, berries, dead animals, and even fish and small rodents. These birds are called generalists.

Explain that protecting habitat is a way that we help to protect these special birds. We work to protect the place where the birds live, protect their food sources, and in that way, we can help to protect the birds as well, which is one of our responsibilities as a wildlife refuge.

Ask if there are any questions.