

A Teacher's Guide to Adaptations in

Bird Beaks, Feet, and Colors

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What makes a bird a bird?

- Hard-shelled, amniotic eggs
 - Hard-shelled eggs are not a trait exclusive to birds. Most reptiles and a few mammals (platypus and echidna), also lay hard-shelled.
- Fast metabolism
 - Metabolism is the process which ???
- *Toothless beaks
- *A lightweight skeleton
 - The bones have a hollow structure inside, like a honeycomb. This makes them lighter, and allows them to fly easier. Some birds can't fly because they are too heavy, such as ostriches (300 lbs!) and penguins.
- Feathers
 - A feather is a skin covering, like hair or fur, that is exclusive to birds. They are made of keratin, which is the same thing found in your fingernails. They can be used for flight, warmth, and for display.

How many birds are there that we know of?

- 9,799 living species of birds have been discovered so far. There are more bird species than there are mammals, amphibian, or reptile species!

Where do birds live?

- Birds can be found on every continent and in every environment, except for the open oceans (although some birds live almost entirely on the surface of the water for most of their lives).

***What do birds eat?**

- Almost everything on Earth is a potential food resource for birds.
- Some birds are exclusively herbivores (plant eaters), eating grass (e.g. ostrich, chickens), leaves (e.g. mousebird, hoatzin), nuts (e.g. finches, grosbeaks, corvids - crows, jays), fruit (e.g. quetzals, toucans, hornbills, cedar waxwings), nectar (e.g. hummingbirds, orioles), and seeds (e.g. several passerines (songbirds)). Some herbivorous birds eat pinecone seeds with oddly shaped bills (e.g. American crossbill)
- Many birds are carnivorous (meat eaters), eating every meat source including insects (e.g. warblers, flycatchers), other invertebrates (e.g. worms – thrushes, robins, mollusks - many shorebirds, small animals including rodents and birds - raptors, fish - other raptors, terns, skimmers, gulls, and carrion - vultures.
- Some birds are omnivores, eating both plant and animal material. These include crows and gulls, as well as other opportunists.

***How can birds eat all those different things?**

- Beaks are adapted to best take advantage of its food source. Each bird species has a different beak shape.

***What other features do birds have that are adaptations?**

- The feet, plumage color, wing shape, and feather type are all adapted to a bird's environment. Even eggs can adapt to be more hidden in the environment.

***How are beaks adapted to a bird's diet?**

- Fish eaters (piscivores): some have pouches to carry fish in (pelicans - pouches can hold 9 gallons of water); some have spears and either dive at fish from height to stab them or to snap them up (kingfishers, terns), or stand in the water and wait, then stab them (egrets and herons); some have enlarged lower mandibles and skim on the surface to look for fish (skimmers); other have hooked beaks to rip fish apart (fish-eating raptors)
- Invertebrate-eaters: Most sweep bills through the water to try and feel for invertebrates. When prey is sensed, the bill snaps closed in a reflex and the bird swallows the animal; some have sensitive combs inside the mouth and use them as filters, eating like baleen whales, sifting out water while retaining the invertebrates in (flamingo); others have a spatula-like bill (spoonbills), or long thin bills for probing either on the surface of the water or plunging their bills in the mud for worms and other invertebrates.
- Meat-eaters (carnivores) have hooked bills to rip prey apart (raptors, shrikes)
- Nut-eaters have heavy bills with thick bases to crack nuts open (finches, sparrows, grosbeaks).
- Insect-eaters (insectivores) have thin toothpick or tweezer-like bills to pick prey up and hold them tightly. Some insectivores have big, wide, gaping mouths to catch insects in the air (swallows and swifts).
- Nectar-eaters usually have long, thin bills with long tongues for reaching deep into flowers for nectar.
 - Some exceptions to the rule: lorikeets – parrots, have short tongues with bristles on the end to suck up nectar like a sponge; orioles – have tweezer-like beaks; they are insectivores, but they also eat fruit and will take nectar from flowers if they get the chance.
- Special cases: some birds are highly specialized to their diet, so much so that no other bird eats that food. Crossbills eat the seeds of young pinecones, and get to them by prying cracks open with their oddly-shaped bills, which can move side to side, which allows the bird to hold the pinecone “open” while its tongue reaches the seeds and draws them out. The exact opposite of these specialized feeders are those that can eat

many different food types, birds which have no specific beak shape and therefore have a varied diet. These are the generalists, which include gulls, crows, and chickens.

***Adaptations in bird feet**

Aquatic and semi-aquatic (live on water, nest on land) birds have webbed feet to swim with small claws. Some birds have their legs and feet set towards the back of their bodies so that they work as propellers (grebes, loons).

- Arboreal (tree living) birds have gripping feet, sometimes zygodactylous (2 in the back, 2 in the front) to really grip on to the branch or trunk. The claws are usually long and curved to grab onto the branches, especially in parrots and woodpeckers.
- Raptorial feet (carnivorous) have long, curved claws to hold onto prey and rip it to shreds.
- Primarily aerial birds usually have small feet in comparison to body size, because they do not need to perch in trees or on the ground for food (hummingbirds and swallows).
- Ground birds usually have flat, non-remarkable feet, sometimes with sharp talons for defense (cassowaries), or sometimes with less than the average 4 toes (ostriches have 2 toes). This is usually because ground birds are fast runners.

***Color Adaptations:**

- Birds use color for mating displays (peacocks, blue-footed booby, manakins)
- Birds use color for camouflage (the potoo is a good example for this).
- Birds use it for threatening displays (sunbitterns).
- Birds use warning colors:
 - Aposematic coloration is used to warn predators that the animal is poisonous. There is only ONE poisonous bird: the pitohui of New Guinea.

***Why is it so important that birds have these adaptations?**

- If birds didn't have these specific adaptations, their survival would be reduced.
 - Guam is the only island without birds on it. This is because of the introduction of brown tree snakes in WWII. Because there are no birds on Guam, the insect and spider populations have ballooned out of control. Birds are an important part of the ecosystem, and they need to be protected for that reason.

Great Books About Birds:

Cassie, Brian. **National Audubon Society: First Field Guide Birds.** 1999. Scholastic Inc. New York:
Illustrations of birds as well as handy information about the birds of North America. Very helpful book for kids.

Several authors. **Encyclopedia of Animals: Mammals, birds, Reptiles, Amphibians**
1993. Weldon Owen, Pty Limited:
A well written encyclopedia with an large, well illustrated section on birds. Provides basic information about bird families. Recommended.

Handy Bird Websites:

A good general overview of birds
<http://en.wikipedia.org/wiki/Bird>

The website to the Cornell Lab of Ornithology. Very helpful, with a lot of information for all ages
<http://www.birds.cornell.edu>

The Internet Bird Collection: a free database of bird videos; has a very wide selection
<http://www.hbw.com/ibc/>

A great website for novices in the ornithology world; has lots of information about birds and the field of ornithology
<http://ornithology.com/>