



THE
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Birds: A Resource for Teachers

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There is great diversity in the shape, size, color, and habitat of birds. Birds can be found in various habitats from Antarctica to the deserts. The smallest bird is the Cuban bee hummingbird, which is approximately two inches (5 cm) in length and weighs about one-tenth of an ounce (2.8 gr). This tiny hummingbird will fit into the eye of the largest bird, the flightless ostrich, which can stand eight feet (2.4 m) tall and weighs up to 350 pounds (159 kg).

These warm-blooded feathered animals are adapted for flying. However, not all flying creatures are birds (flying bats are mammals), and not all birds fly in the air (penguins “fly” underwater).

Birds are the best-defined group of animals, largely due to:

- feathers are completely unique to birds
- wings (modified front limbs) that are curved above and hollowed underneath, allowing for lift
- streamlined body shape
- strong breast muscles for wing movement
- lightweight, hollow bones
- keen ability to see and hear
- efficient circulatory system (four-chambered heart)
- effective respiratory system (air sacs in addition to lungs)

Feathers give resistance to the wings and tail during flight and provide protection from heat, cold and rain. This allows birds to maintain a body temperature which is usually higher than that of mammals. The number of feathers depends on the species and climate. The colder the temperature, the greater the number of feathers. Feathers are made of keratin, which also makes up the body scales of reptiles and hair of mammals.



Birds are among the most colorful of all animals, making them both easy and difficult to see. Some birds are very brightly colored. Many male birds display their colorful feathers during courtship rituals. Other colors help with camouflage. Cryptic coloration allows a bird to blend into the background.

Posturing also aids in camouflage. For example, the bittern stretches its head up so the vertical neck markings help it merge into the reeds where it lives. Countershading (a lighter underside and a darker back) also helps some species blend into their background.

Birds spend considerable time keeping their plumage neat, clean, and somewhat waterproof. This is done by preening or combing the feathers. Most birds have “preening” or uropygial glands near the base of their tail. After pressing oil from this gland, birds run their oily bills over their feathers.



Body feathers are known as contour feathers and beneath these are down feathers. Water birds have thick coats of down to keep them warm. Newly hatched chicks usually have down feathers. Old feathers are replaced, at least once a year, with new feathers. This is called molting. Molting requires much energy and birds tend to remain somewhat inactive during this time.



The hind limbs of birds usually have four toes that have adapted to different ways of life. For example, water birds have webbed feet for swimming and perching birds usually have two toes pointing forward and two backward (or three forward and one backward). Some birds can fly, walk, and swim, but are usually good at only one or two methods. Many birds that hop or run on land have reduced foot sizes and fewer toes. The ostrich has only two toes, one much larger than the other.

Birds have legs with few large muscles except near the top of the leg close to the body. Tendons run from the top of the leg down to the toes and operate the leg in a similar way as ropes and pulleys. This allows perching birds to sit on a limb and “lock” themselves into position as the tendon tightens and pulls in the toes, causing the toes to curl around the perch. Hold is released by rising up.

Although generally specialized for flight, birds differ in form and action to adapt for life in particular environments. There are many styles of flight, including hovering, soaring, gliding, lifting, and diving. Tails assist in steering and braking. Takeoffs and landings are equally varied. Some birds need a running start, others taxi across the water, and others simply rise into flight.



Birds eat both plants and animals on land, in water or in the air. They may dig, dive, sort, seine, skim, or chisel holes in trees for their food. The beak or bill varies in shape and size. Its structure is adapted to the diet and eating habits of different birds. The upper and lower portions of the beak (mandibles) are usually bony-like structures covered with a layer of keratin. Some bills are quite flexible (snipes) and others are very hard (woodpeckers). Large, bright colored bills are often used by birds for

display. Some waders have a shovel-like bill for scooping. Birds of prey have sharply pointed hooked beaks, and seedeaters may have sharp-edged conical bills.

Herbst's corpuscles are touch receptors found in the tips of the mandibles of some wading birds. These allow them to feel prey that they cannot see. Grandry's corpuscles, other touch receptors, are in the tongue and palate. The nostrils are usually found near the base of the bill. Smell is seldom used by birds when searching for food.

Birds have no teeth, therefore, food eaten by most birds is moved into a two-chambered stomach. Digestive enzymes are found in the first chamber. The crop, a pouched enlargement in the gullet of many birds, serves as a storage place for food. A second chamber, or gizzard, substitutes for teeth. Birds swallow small pebbles which make their way into the gizzard. These pebbles help grind the food so it can be digested. The loss of energy when flying is extensive and requires large amounts of oxygen and food. Some birds eat more food than their own weight each day.



Many species of birds provide elaborate courtship rituals before nesting. It is also believed that "bird language" (calls, songs, whistles, clicks) is an essential part of the courtship procedure. Bird sounds are also used as danger and directional/locational calls.



The method of reproduction is oviparous, with an amnion and an allantois. An amnion is the inner wall of the fluid-filled sac in which the embryo is suspended. The allantois is another sac that projects from the embryo's digestive tract. It serves as a bladder to receive and store waste and allows oxygen and carbon dioxide in and out of the slightly porous shell.

Birds usually create a nest and lay eggs in trees, on land, or on the sides of cliffs. Some birds use a nest only once, others use the same nest year after year, and some use the abandoned nests of other birds. Most birds nest only once each year, but there are a few exceptions. Some species nest every two or three years and others nest up to three times in one season.

Females usually lay one egg each day. The average number of eggs is between three and five, though some birds lay only one egg and others lay up to thirty or more in a nesting season. Eggs vary in color, shape, and size. The smallest eggs can be the size of a small bean and some of the largest reach six inches (15.2 cm) in diameter.



Males and females often stay with each other during the nesting season. Some even mate for life. Males frequently assist in the incubation of the eggs which may vary from 12-60 days, with an average of three weeks. Some hatchlings are blind, bare, and helpless and must remain in their nest for constant care and food (altricial). Hatchlings often require up to half their body weight in food each day. Others can follow their mother soon after hatching (precocial). Most birds incubate and tend their own young, however, some birds that live in flocks may lay all their eggs in one communal nest tended by all males and females. Other birds have separate nests but tend to hatchlings in groups.

Some species of birds are permanent residents, never leaving the area in which they were hatched. Others move within a small area for available food. Movement between two different areas is called migration. Migration is likely a response to changes in environmental and/or biological conditions.



Birds are uniformly more migratory than any other group of animals. Birds of the same species often have different migrating habits. A daily migration involves moving to and from a familiar place to roost. A seasonal migration involves spending one season in one location and another season in a different location. An example of a vertical migration is spending the summer on mountain tops and winter down in a valley.

Birds must be ready to meet the energy requirement for migrating flight. They do so by eating excess food and storing it as fat. Birds migrate by day or night. Some birds such as loons, geese, and shore birds travel by day or night. Others migrate during daylight hours only, including herons, crows, hummingbirds, and swallows. Most passerine birds typically migrate between sunset until dawn.

The geographical range of each migratory bird is seasonally distributed. These species generally appear in one

part of their range in one season and in another part in a different season. Species are also ecologically distributed within shared geographical ranges and show relationships with other plants, animals, and organisms.

Scientists have studied bird migrations for many years. It appears that factors such as length of day and changes in temperature and food supply may stimulate glandular action and thus initiate migration. Documenting migration variances (stopping and starting times, length of time, rate, distance, specific route, and weather) help us better understand which behaviors are learned and which are innate.



Some groups seem to take routes that follow geographic features. Each year, the Arctic tern flies 11,000 miles (17,702 km) each way from the Arctic to the Antarctic each year. Most migrating birds fly 100-200 miles (161-322 km) in a single flight, averaging 20-50 miles (32-80 km) per hour. The Peregrine falcon, the fastest bird, can fly up to 175 miles (282 km) per hour for short distances. It is not unusual to see birds flying at an altitude of 14,000 feet (4,267 m) and some have been reported as high as 37,000 feet (11,278 m). Many migratory birds

travel short flights and stop, although some birds can fly nonstop for up to 60 hours.

An estimated 10,000 species (in some 180 families and 30 orders) make up the class of birds (Aves). Some of the more familiar orders are:

Anseriformes	(waterfowl) ducks, geese, swans, screamers
Apodiformes	swifts, hummingbirds
Apterygiformes	kiwis
Caprimulgiformes	nightjars, potoos, nighthawks, frogmouths, oilbirds
Casuariiformes	cassowaries, emus
Charadriiformes	shorebirds, snipes, skuas, plovers, woodcocks, sandpipers, auks, gulls, jacanas
Ciconiiformes	herons, storks, bitterns, shoebills
Coliiformes	mousebirds
Columbiformes	pigeons, doves
Coraciiformes	rollers, kingfishers, hornbills, motmots, bee-eaters
Cuculiformes	cuckoos, anis, roadrunners, hoatzins
Falconiformes	hawks, vultures, osprey, falcons, eagles (diurnal birds of prey)
Galliformes	domestic fowl and game birds
Gaviiformes	loons, divers
Gruiformes	cranes, rails, coots, sunbitterns, trumpeters, limpkins
Musophagiformes	turacos
Passeriformes	larks, martins, swallows, crows, jays, starlings, tanagers, blackbirds, shrikes, thrushes, wrens, finches, orioles, titmice, nuthatches (the majority of all birds)
Pelecaniformes	pelicans, gannets, cormorants, tropicbirds, frigate birds, ibis, spoonbills
Phoenicopteriformes	flamingos
Piciformes	woodpeckers, toucans, jacamars, barbets
Podicipediformes	grebes
Procellariiformes	albatrosses, petrels, fulmars
Psittaciformes	parrots, macaws, lorries
Rheiformes	rheas (ratites)
Sphenisciformes	penguins
Strigiformes	owls
Struthioniformes	ostriches
Threskiornithidae	ibises, spoonbills
Tinamiformes	tinamous
Trogoniformes	trogons, quetzals

ANSERIFORMES



Anseriformes is a large group of birds that includes ducks, geese, swans (waterfowl) and screamers. The family Anhimidae is made up of screamers that have little or no resemblance to other Anseriformes. They are large, goose-like, non-migratory birds with long legs and large feet with little webbing. The bill resembles that of gamebirds in that it has a downward hook and no filtering fringes often seen in waterfowl. They are mainly found in marshes, open savannas and edges of slow-moving streams or ponds. Swans, geese, and ducks (waterfowl)

belong to the family Anatidae. They are associated with marine or water habitats and vary in size from 10 ounces (284 gr) to more than 30 pounds (14 kg).

Waterfowl can be found on all major continents and islands except Antarctica. Some migrate thousands of miles. Most are gregarious but some do not live in colonies. There are approximately 150 species of Anseriformes.

APODIFORMES

Apodiformes contain more than 400 species of birds generally divided into three families. The Apodidae (swifts) are the most aerial of all birds and can fly rapidly for many days. Swifts fly with their mouths open, skimming for food. Their diet consists mainly of insects. The crested swifts or tree-swifts (Hemiprocnidae) often watch for food from perches high in trees.



Hummingbirds (more than 300 species) make up the Trochilidae family. These nectar drinkers are found only in the New World. Most are less than two inches (5 cm) in length. Their name comes from the noise made by the rapid beat of their wings when in flight. There are several species of hummingbirds throughout the Mundo Maya exhibit.

CHARADRIIFORMES



This group includes waders and all shorebirds (sometimes listed in thirteen families), skuas, jaegers, gulls, terns, skimmers, and auks. The family Jacanidae includes several species of jacana. They have unwebbed feet but can walk over floating vegetation such as lily pads, with the help of their extremely long toes and toenails, in search of food. Jacana eggs are among the most beautiful of eggs and males take the major role in nesting and caring for their young. Some are polyandrous, which is rare in birds.

Painted snipes (Rostratulidae) are difficult to study. They are active from dusk to daylight and frequent marshes and muddy bogs searching for insects and other invertebrates. When threatened, they spread both wings toward the danger, lower their head, while fanning and raising their tail. This makes the bird look four times bigger in size. This posturing is also used in mating displays.

Oystercatchers (Haematopodidae), also called sea-pies, are seashore wading birds. Many specialize in feeding on bivalve shellfish. They are expert at pulling the mussels off the bed, hammering a hole in the flat side of the shell, and cutting the adductor muscle that holds the halves together. Once this is accomplished, they can pry the shells apart and remove the meat.

Plovers (the Charadriidae family) have quite distinctive black and white wing markings or a white stripe that can be seen in flight. Most feed on insects, crustaceans and other arthropods, and invertebrates.

There are more than 80 species of sandpipers and snipes (Scolopacidae). These birds have a high latitude breeding range, the majority being north of 50 degrees N and well into the Arctic Circle. They feed by probing in sand, mud, earth, or silt for worms, insects, and crustaceans where the substrate is not frozen.

Stilts and avocets (Recurvirostridae) are proportionately the longest-legged waders. They also have long bills. Their plumage is mostly black and white. They are all usually found on the shores of shallow lakes and lagoons, often in brackish water. One species known as the ibisbill gets its name from its down-curved red bill that resembles that of an ibis. The ibisbill is sometimes listed as a separate family (Ibidorhynchidae).

The crab plover is the only species in the family Dromadidae. Their main diet consists of crabs, worms, and mollusks. Their powerful bill allows for the opening of prey with ease. They excavate nests up to five feet (1.5 m) long that are honeycombed with tunnels. They lay one large egg in the chamber at the end of the tunnel.

The nine species of thick-knees (Burhinidae) are also called stone-curlews, stone-plovers, or dikkops. The ankle joints are enlarged, therefore the name “thick-knees”.

The family Glareolidae is made up of short-legged pratincoles and long-legged coursers. These birds have sharp arched bills, long pointed wings, large eyes, and scratch the head with their foot under the wing.

Seed-snipes (Thinocoridae) are ground-living birds. They are well camouflaged in shades of brown, buff and black. Seed-snipes are vegetarians that eat mostly seeds and leaves.

Sheathbills (Chionididae) are dumpy white birds with short stubby bills surrounded by a horny sheath. They are the only birds in the Antarctic without webbed feet.

Skuas (or bonxies) and jaegers (Stercorariidae) are aerial seabirds that resemble dark feathered gulls with long central tail feathers. They are noted for harrassing other birds in flight until they disgorge their food which the skuas and jaegers then catch in mid-air.

Gulls (Laridae) are long-winged, heavy-bodied seabirds. They are mainly white, gray, and black. Terns (Sternidae) are slender sea birds with long wings and forked tails. They are white, gray-black, and brown. Terns are smaller than gulls.

Skimmers (Rynchopidae) are tropical tern-like sea birds with a flattened lower mandible that allows them to “skim” the water for fish, crustaceans and other plankters.

Auks (Alcidae) vary in length from 6 - 30 inches (15-76 cm). Their feathers are mainly black above and white below. Their bills range from long and pointed to short and wide. Some have decorative head feathers, and many have brightly colored feet.

CICONIIFORMES

Most Ciconiiformes are large wading birds with legs and bills shaped to fit their feeding behavior. They prey mainly on fish, amphibians, and insects. Ciconiiformes are found in all habitats throughout the world (except near the North and South Poles). Many are gregarious and migratory.

The Ardeidae family includes herons, night herons and bitterns. The word egret, derived from “aigretta,” was used to describe certain plumes of some white herons (more colors are now included). Most herons have short

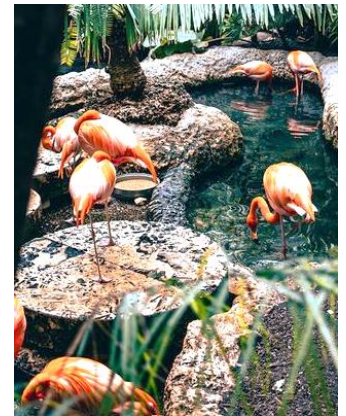
straight bills, except a few species with unique bills for specialized feeding (such as the boat-billed heron). Night herons are short, stocky birds with short legs and thick bills. They feed mainly at night and roost quietly in high trees. Bitterns are quiet and inconspicuous. They often use cryptic stances like standing erect with the bill pointed upward, resembling tall, slim vegetation, even moving as if being blown by the wind. They depend on camouflage to avoid predators.



The Threskiornithidae family is made up of ibises and spoonbills. Most ibises have sickle-shaped, down-curved bills. Found in most habitats, ibises are often linked with wetlands where they probe in water or soft sediment for food. Spoonbills have a long, flat bill that somewhat resembles a spoon. This partly opened “spoon” is moved from side to side. Acute nerve endings line the bill and when touched, the bill snaps shut. The head is thrown back, prey is released, and it slides down the throat.

There is only one species in the Scopidae family, the hamerkop (or hammerhead). The erected crest on the back of the bird’s head and stout beak gives the species a “hammerhead” appearance. Hamerkops feed on frogs, fish, and invertebrates. Their large, domed nests are up to six feet (1.8 m) in height and width and weigh up to 110 pounds (50 kg). They are built of grass, reeds, and plant matter and are in the fork of trees, on the ground, or on cliffs. The enclosed nest chamber is lined with dry grass or weeds. A small entrance hole is made from mud.

Flamingos are the only members of the family Phoenicopteridae. Their bright pink feathers and hooked bill allow for easy identification. Their legs and necks are proportionally longer to their bodies than other birds. Flamingos prefer brackish or salt water through which they drag their bills upside-down. The upper mandible has rows of slits, and the tongue is lined with tooth-like projections. The bill is opened and as the lower mandible closes, mud and water are pumped out through the slits and the microscopic food is then swallowed.



The shoebill stork is also known as the whale-headed stork. It looks like it is wearing a Dutch clog on its face. It is often classified as a single species in the Balaenicipitidae family.

The Ciconiidae family includes approximately 17 species of storks. Storks are large, long-legged, long-necked wading birds with large bills of various shapes. The Jabiru stork is a large bird with loose, brilliant red skin on the lower neck, which becomes inflated during danger, anger, or courtship.

COLUMBIFORMES

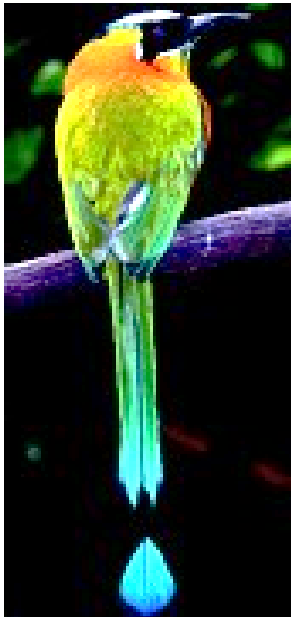
This widespread Columbiformes order is made up of doves and pigeons. The Columbidae family has a unique characteristic in that they immerse their bill to suck up water without tilting the head back.



CORACIIFORMES

Nine or ten families make up the large order of Coraciiformes with more than eighty species making up the kingfisher (Alcedinidae) family. As the name implies, they typically eat fish, however, many kingfishers live far from water and feed on insects, small mammals, reptiles, and amphibians. Kingfishers pair for life.

Todies (Todidae) are found only in the West Indies. These birds are small with large heads and long bills. Feathers are usually green above, white below, and their throats are red.



Motmots (Momotidae) are small, brightly colored Neotropical birds. They are very attractive birds that habitually sit motionless for long periods. Most motmots are olive green or rufous brown with brightly colored heads and a dark spot on the breast.

Bee-eaters (Meropidae) are insect-eaters. These Old-World birds live on flying insects with bees comprising 80% or more of their diet. Bee-eaters have long, somewhat down-curved bills. Feathers are mainly green with rufous, buff, yellow, red, blue, and black.

Rollers (Coraciidae) are mostly bright colored with patches of blue-green, violet, and brown. These Old-World birds are named as they roll or somersault during displays.

One species of cuckoo-rollers make up the Leptosomatidae family that is found in Madagascar and the Comoro Islands.

Hoopoes are the only member of the Upupidae. This species is noted for its cinnamon-pink feathers with black and gold wing bars. A thin, curved bill and erect head-crest of black-tipped pink feathers add to its unusual coloring. These Old-World birds are named for their “hoo-poo-poo” calls.

Wood-hoopoes or tree hoopoes (Phoeniculidae) have iridescent metallic green, blue, or purple feathers. Found only in Africa, these birds have an offensive body odor that comes from a rump preening gland and dirty nesting habits.



Hornbills, from the Old-World tropics, form the Bucerotidae. These medium to large-sized birds have large, multi-colored bills. They are both terrestrial and arboreal. Their name comes from the large bill surmounted by a casque. The male hornbill is usually larger and his casque is larger and brighter in color. Most casques are lightweight and made of a thin outer layer of horn filled with cellular, sponge-like tissue. Many hornbills have patches of bare skin around the eyes and throats that are often blue, red, and yellow in color. Eyelashes are usually long, black, thick, and curly. Feathers are often patterned in black or brown and white.

Most species eat fruit but will also eat any prey they can catch. Their dexterity in manipulating objects with their cumbersome-looking bill is remarkable. Hornbills can completely peel the outer skin from fruit before eating. Female hornbills, except for one species, wall themselves into a nest chamber during incubation. The wall blocks the entrance to the hole. It is built by the female bird from her droppings. Certain male species assist in the process by bringing clay pellets mixed with saliva to the nest site. After completion, only a slit remains. The slit is large enough only for the male to feed the female.

Females often break out of the nest when the young are two to three weeks old, or half grown. The young reseal the opening after the mother has gone. Both parents bring insects to the young. To reduce sanitation problems in the nest during this long period of incubation, the female hornbill defecates through the narrow slit at high speed. Some females undergo a complete molt while in the nest.

CUCULIFORMES

The tucaros (Musophagidae) are all found in Africa. They are known by many names — “go-aways” in savanna and arid areas, “louries” in South Africa and “turacos” in the evergreen forests. All have long, wide tails. Most have obvious crests. Their diet consists of berries and fruits such as mango and guava, but they also eat various insects.





Many cuckoos (Cuculidae) are parasitic in their breeding habits. In some host-parasitic species, the mimetic plumage resembles that of their potential host, or it may resemble a bird that would be frightening to the potential host bird. After laying egg(s) in the nests of birds of other species, the selected host cares and feeds the growing young. In some species where the cuckoo hatchling is larger than the young of the host, it forces out the hosts' chicks and remaining eggs. It is believed that all cuckoos eat insects. Some members of this family are known as couas, coucals, anis, malkohas and roadrunners. Not all Cuculidae are nest parasites, anis build communal tree nests

and others build funnel-shaped nests. Perhaps the best-known member of the Cuculidae family is the roadrunner, a terrestrial bird found in the U.S. and Central America. These birds will capture and eat snakes, lizards, mice, birds, and other vertebrates.

Hoatzins (Opisthocomidae) are large, unkempt-looking birds that live in South America. It is the sole member of this family. They are poor fliers and clumsily glide from tree to tree, flapping their wings to reach the intended site. Young hoatzin chicks leave the nest soon after hatching. Two hooked claws on the first two digits at the bend of each wing allow them to grab branches as they leave the nest. Hoatzins are named "stinky hannahs" because of their musky, unpleasant odor. Because of its smell and a call that sounds more like that of a reptile, hoatzins are often called "reptile-birds."

FALCONIFORMES

Five families make up the very large Falconiforme order of birds - Pandionidae, Sagittariidae, Falconidae, Cathartidae, and Accipitridae.

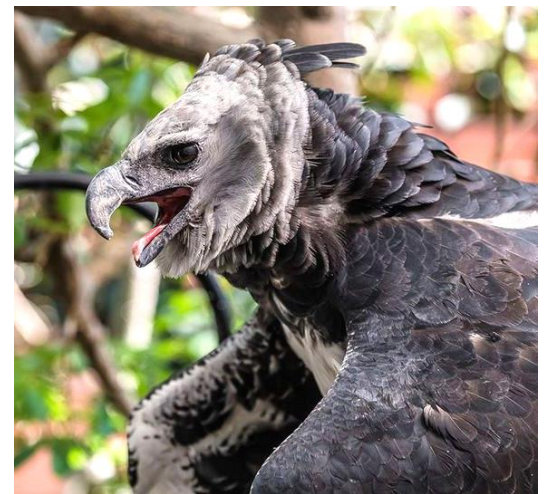
Pandionidae has one species, the Osprey. These medium-sized birds are sometimes called fish hawks because of how they seize their prey by plunging foot-first into the water. Ospreys, like other species that catch fish, have the most recurved and longest talons of all birds of prey. Spiny scale toe pads also help hold their slippery prey. Ospreys live in both temperate and tropical regions near rivers, lakes, swamps, or other bodies of water throughout the world. Stick nests are made in treetops or on the top of utility poles.

The Sagittariidae are also a one-species family, which is the Secretary bird. This African bird was named for the resemblance of its black-tipped feathers that project outward from the head to that of a secretary with quill-style pens stuck behind the ear. This stork-like bird is the only primarily terrestrial raptor. It uses its long legs and stubby toes to kill prey and, unlike most raptors, carries the prey in its beak. It feeds largely on rodents and reptiles. Unlike the other four families of Falconiformes, males are larger than females.

Generally divided into seven species, New World vultures and condors (Cathartidae) are quite different from Old-World vultures. New World vultures probably descended from the same line as storks. New World and Old-World vultures are excellent examples of convergent evolution: two unrelated groups in different “worlds” that look alike with many of the same adaptations for a similar way of life. New World vultures are easily recognized by physical differences such as open nostrils and an elongated joint of the inner toe. The California condor is one of the best known in this family. A ten-foot (3 m) wingspan makes it the largest of the North American flying birds. With a wingspan of 17 feet (5 m), the South American Andean condor is possibly the largest flying bird in the world. The turkey vulture is probably the most common vulture. The yellow, orange, purple, black, and white king vulture is the most colorful. Turkey and king vultures have a good sense of smell. New World vultures mainly feed on carrion.

The falcon family (Falconidae) includes true falcons and caracaras. Falcons are the most distinctive of the diurnal birds of prey. Made up of around 60 species, true falcons are birds that take mammals and other birds as prey. Their flight is one of speed and strength. Caracaras eat carrion as well as live insects, animals, mammals, and vegetation.

Most of the well-known birds of prey are found in the Accipitridae family — hawks, buzzards, kites, Old-World vultures, harriers, and eagles. The Accipitridae family is the largest (224 species) and most diverse of the Falconiformes. Accipitrids usually kill prey with their feet, build their own nests, and lay eggs that have green-lined shells. Accipitrids are rather uniform in structure, but vary in design, flying capabilities, predatory techniques, and size. They range in size from the small African sparrowhawk to the breathtaking Harpy eagle (*Harpia harpyja*), which lives high in the rainforests of Central and South America.



GALLIFORMES

This large order of gamebirds contains six families. Megapodes (Megapodiidae) are ground-dwellers that resemble pheasants or hens. They feed by scratching the soil and pecking for seeds, fruits, or arthropods.

Guans, chachalacas, and curassows (Cracidae) are large, sometimes tree-roosting, ground-feeding birds with blunt wings and long, wide tails. They are all confined to the Americas. Guans are smaller than curassows and larger than chachalacas. Chachalacas are named for their cackling, “chachalaca” calls. Guans and chachalacas are mainly brown and quite plain, and curassows are usually black and white with decorative head appendages. Their feathers are usually dark with white patches, and many have crests of recurved feathers or casques. These birds are comparable to pheasants or turkeys.



Colorful knobs or wattles, bare skin on neck or face, “helmets” or “horns” (at the base of the bill and forehead) or crests/casques allow for easy recognition of different species. The base of the beak is stout and often has a fleshy cere or a protuberance in front. “Curassow” refers to the arrival of the first live birds in Europe from the island of Curacao in the Caribbean. It is believed the birds arrived in Curacao from Venezuela.

Grouse (Tetraonidae) are found in many habitats and despite heavy hunting, most species are abundant. Tetraonids are mainly vegetarians. Phasianidae includes most “gamebirds” — pheasants, quail, francolins, partridges, snowcocks, peafowl and domestic chickens. They range in size from the five-inch (13 cm) long quail to the 78-inch (198 cm) long peafowl. These birds are widely distributed. Most are terrestrial, feeding mainly on the ground, where they eat vegetables, seeds, fruit, buds, leaves, and roots, along with worms, insects, etc. Members of this family are of more economic interest than other groups, largely because of the domestic chicken. Chickens are more efficient in converting food to meat than most domestic mammals and can be kept at higher densities.

Guineafowl (Numididae) are gamebirds with fat, heavy bodies and a small head connected to a long neck. Most are mainly gray or black, and irregularly spotted with white. Even though some roost in trees, they are mostly terrestrial.

Turkeys (Meleagridae) are large, strong birds. They are New World birds that feed on grain, berries, and seeds along with insects and other invertebrates. Two species of wild turkey can be found in North and Central America. The common turkey (from which the domestic turkey has been bred) extends from Canada to Mexico.

GRUIFORMES

Most Gruiformes live, nest and feed on the ground.

Mesites (Mesitornithidae) are rail-like birds found only in the rainforests of Madagascar.

Button quails (Turnicidae) are quail-like, ground-dwelling Old-World birds. They are sometimes called bustard-quail. They do not have hind toes.

Plains-wanderers (Pedionomidae) are a one species family found only in Australia. They are like button quail but have well-developed hind toes. These birds will usually freeze when frightened rather than fly.

Cranes (Gruidae) are large, long-legged, and long-necked birds. Their feathers are usually white or gray with bare skin or colored plumes. Most species are migratory and can be found on all continents except Antarctica. These birds are always alert and observant.

The limpkin (Aramidae) is the sole species of this family. It is a slim, long-legged wading bird that flies with its neck and head extended. They are often called the clucking hen, courlan, or lamenting bird. They walk with a limp, therefore, the name limpkin.

Three species of trumpeters (Psophiidae) make up this family. They are found in the rainforests of South America. The name describes the deep loud calls given by both sexes. These chicken-like birds have long necks, slightly curved bills, somewhat long legs, and a hunched stance.



Rails, including gallinules and coots (Rallidae), are fowl-like in appearance and vary significantly in size. Coots, gallinules, and moorhens have a horny frontal shield that goes back beyond the bill. Rails are thought to be the most widespread group of terrestrial birds.

Finfoots and sun grebes (Heliornithidae) have a wide range in both the New and Old-World tropics. Sun grebes are good swimmers and divers. Their diet includes frogs, worms, crustaceans, and insects.

The kagu (Rhynochetidae) of New Caledonia is heron-like with an orange bill and legs. They have large heads with a gaudy crest. They are noisy night hunters, with a piercing rattling scream that can be heard a mile away.



The sunbittern is the only species of the family Eurypygidae. These birds have long, stout bodies, long slim necks, and small heads. The wings are long, wide, and rounded. The long, graduated tail is made up of 16 feathers. The body feathers are soft and full, but the neck feathers are short. Most of the feathers are barred with brown, gray, black, and white. The almost black head has white stripes. The concealing plumage is altered by the bright orange-chestnut patch on the tip of each wing, an orange lower mandible, orange legs, and red eyes.

Sunbitterns are found near water in the Neotropics in forests, woodlands, and swampy places. Their diet consists of insects, crustaceans, and small fish. The wings are held open during displays and are tilted forward, the tail is fanned, which fills the space between the back of the wings. The sunbittern then struts and bows. Captive birds have a variety of short notes accompanied by long whistles. The mandibles are also clattered to make a mechanical rattling noise.

Seriemas (Cariamidae) are large, long-necked, long-legged Neotropical birds. They are omnivorous. Their call consists of a high-pitched scream or bark.

Bustards (Otidae) are Old-World running birds. Bustards are heavy-bodied and are ostrich-like in appearance. They are clumsy fliers but are great runners.

PASSERIFORMES



Passeriformes, the largest order of birds, includes approximately 60% of all bird species. There are more than five thousand species in this order. Passeriformes are sometimes called songbirds or perching birds; however, both are misleading since birds from other orders are equally adept at perching and singing.

A few of the species in the large Passeriformes order are: accentors, antbirds, asities, babblers, bellbirds, birds of paradise, blackbirds, bowerbirds, bristleheads, broadbills, bulbuls, buntings, cardinals, caciques, chats, chickadees, cocks-of-the-rock, cotingas, crows, dacnis, dippers, drongos, euphonias, fairy bluebirds, figbirds, finches, flowerpeckers, flycatchers, gnateaters, grosbeaks, honeyeaters, honeycreepers, jays, larks,



logrunners, lyrebirds, magpies, manakins, martins, mockingbirds, mud-nesters, mynahs, orioles, oropendolas, ovenbirds, nuthatches, orioles, palm chats, pardolates, parrotbills, Philippine creepers, pipits, pittas, plantcutters, robins, scrub-birds, sharpbills, shrikes, sparrows, starlings, sugarbirds, sunbirds, swallows, tanagers, tapaculos, thickheads, thrushes, titmice, tits, treecreepers, troupials, vireos, wagtails, warblers, wattlebirds, waxbills, waxwings, weavers, white-eyes, woodcreepers, woodswallows, and wrens.

PICIFORMES

The order Piciformes includes almost 400 species generally divided into these families: Bucconidae (puffbirds, nunbirds), Capitonidae (barbets), Galbulidae (jacamars), Indicatoridae (honeyguides), Picidae (woodpeckers, wrynecks, piculets) and Ramphastidae (toucans, aracaris, toucanets). Bucconidae and Galbulidae are sometimes considered unrelated to the other four families. These families all share certain features:

- roost and nest in trees or cavities
- zygodactyl feet (two toes in front, two toes behind)
- usually lay white eggs
- typically do not have down feathers (except Galbulidae)
- most are brightly colored
- many live in tropical areas
- specialized bills and feeding habits



Bucconidae are all found in the New World tropics. These birds fly rapidly from their perches to grab insects and spiders in midair. They also forage through swarms of army ants and often eat lizards and small vertebrates. Nunbirds are smaller birds that typically join larger mixed-foraging groups.

Puffbirds are large-headed, short-necked, heavy-bodied birds named for their unusually loose, puffy plumage. They are generally of subdued colors, mostly brown or tan, although a few species have bold patterns of black and white. Nunbirds and puffbirds nest in burrows, often excavated in the ground or in termite mounds.

Barbets (Capitonidae) are widely distributed throughout tropical Asia, Africa, and America. They are small to medium-sized birds, large-headed, plump, and arboreal. Facial bristles are prominent. The plumage is brightly colored (green, red, blue, yellow, and black) and patterned. Their diet consists of fruits, invertebrates, and small vertebrates. Their bills are stout, pointed, and often notched. They nest in excavated dead tree holes.



Jacamars (Galbulidae) are small to medium-sized New World birds. They are slender with rather long tails and long, pointed bills. Plumage consists of two basic color forms: iridescent golden green above and reddish-brown (rufous) on the underparts, and the other is brown or black with white on the underparts. They nest in burrows, often excavating tunnels in termite mounds or in riverbanks. Jacamars dive from their perch, grab their prey (insects, spiders, lizards, small vertebrates) and often return to their perch to eat.

Honeyguides (Indicatoridae) are restricted to the Old World. Overall, they are dull olive-green or grayish birds with short, pointed tails and raised nostrils. Besides insects, wax is part of their diet and some species guide helpers (such as people, baboons, genets, or mongooses) to the hives. After the helper has opened the hive, the honeyguide feeds on bee grubs and wax. Some birds can enter the beehives on their own. Like cuckoos, many honeyguides rely on other species to raise their broods. They lay eggs among those of hole-nesting birds, only one in each nest. The honeyguide hatchling often uses a hook on its beak to kill the host's young, thus getting more food.

Picidae is the largest family of the order Piciformes. They are distributed worldwide except on some oceanic islands such as Madagascar, Antarctica, and those in Australasia. They are noted for their straight, strong, and chisel-tipped bills. Nests are typically excavated tree cavities, often those of other species.



Woodpeckers excavate cavities for roosting and nesting in both living and dead wood. A specialized bill, stiff tail for bracing, unique skull for cushioning, and long-clawed toes for clinging allow these birds to survive wherever trees are found. The Picidae family mainly includes woodpeckers, wrynecks, and piculets. Woodpeckers are adept at clinging to the bark of trees while probing and drilling to forage beneath the bark. An extremely long tongue can extend beyond the bill in search of insects. Woodpeckers and piculets communicate by drumming

with their bills on trees.

Woodpeckers are often black and white, but some are green, red, or brown. Many have red or yellow on the head. Sexes usually differ in most species, with females lacking color on their head. The wryneck is named for its ability to move its neck into snakelike positions when disturbed at its nest. These movements are often combined with a hissing sound to deter predators. Unlike woodpeckers, wrynecks and piculets have soft-feathered tails that are not used for bracing. They are often brownish in color with peppered and blotched patterns. The males and females are similar. Piculets are tiny birds, generally brownish in color with yellow, orange, or red markings and three white stripes on the tail.

PSITTACIFORMES

This order of colorful birds can mainly be found in the tropics. The bill is shaped for eating fruits and seeds. Parrots, cockatoos, macaws, and lorries (Psittacidae) vary in size from 3-40 inches (8-102 cm) long, vary in color (green is predominant) and have a fleshy covering of the upper mandible that is connected to the skull by a flexible joint that allows it to move. The curved upper mandible fits into the larger upper mandible when the beak is closed. The feet are zygodactyl. Some have musical whistles, while others have harsh, raspy voices and can be trained to imitate the human voice.





They feed on fruits, seeds, and nectars. Included are macaws, amazons, parakeets, budgerigars, lovebirds, and conures. Native to Central and South America, macaws are the brightest birds in the parrot family. They can be recognized by the large, bare patches of skin around their eyes. Popular macaws are the Scarlet, the Gold and Blue, and the Military macaw. Cockatoos have a crest of erect feathers on the head. Parakeets are small parrots with long tails. Lorries and lorikeets use their brush-tipped tongues to feed on nectar

and pollen.

SPHENISCIFORMES

Penguins (*Spheniscidae*) are seabirds restricted almost entirely to the Southern Hemisphere. These flightless birds have a streamlined and very strong body. They are the most marine of all birds. Their wings lack feathers and cannot be folded. Wings are used as paddles for propelling through water, aided by webbed feet. They can run, walk, hop, and climb on rocks and ice. The feet are used for braking and steering.

Short, overlapping feathers cover the body. These feathers form an oily, waterproof covering with a layer of down that keeps the birds warm. Underneath the feathers is a layer of fat that aids the feathers in protecting against both heat and cold. Most species are white on the chest and abdomen. Some have bands or daubs of black, making them more difficult to see from below in sunlit waters. Feathers that distinguish species are found on the head and neck. Penguins are very social and remain in groups on land and in water. They feed at sea. All species have beaks with sharp cutting edges. Backward pointed spines in their mouth help hold slippery prey.



STRIGIFORMES

Owls are mostly nocturnal or crepuscular predatory birds. Except for the somewhat similar strong claws and bill, owls are very different from diurnal birds of prey. Owls have dense, soft plumage which makes them almost soundless when flying. Their night vision and sense of hearing are exceptional. Feet are feathered to the toes. Eyes are surrounded by feathers that fan out in a disc-shaped mask.



Barn, grass, and bay owls (Tytonidae) have a facial disc of pale stiff feathers around the eyes, curved bill and claws, black forward-looking eyes and spotted or barred plumage in chocolate or golden brown. The round and large head has no ear tufts. Diet includes small mammals, birds, lizards, frogs, bugs, and fish that are mainly caught between dusk to dawn.

Typical owls (Strigidae) are larger than the Tytonidae. The cryptic-colored feathers are usually cream, buff, or brown with speckles and/or bars. Head shape, ear tufts, colors and calls help identify species. They regurgitate pellets of indigestible material including teeth, fur, bones, and fibers.

TINAMIFORMES

Neotropical tinamous (Tinamidae) resemble partridges but are probably related to rheas. They are clumsy and cannot fly long distances.

TROGONIFORMES

Trogons (Trogonidae) are brightly feathered birds with delicate skin. Many are brightly colored with a lot of metallic green. They are largely fruit-eaters. All trogons are arboreal and mostly confined to woodlands or forests in Central and South America.

USEFUL VOCABULARY

adaptation	the act of changing or adjusting to fit the environment
allantois	embryonic sac from the digestive track that stores waste and allows oxygen and carbon dioxide in and out of the body
altricial	immature and dependent at birth, requires care
amnion	sac in which the embryo is suspended
arboreal	adapted for living in trees
bipedal	two-footed
camouflage	a disguise or concealment
carrion	dead or rotting flesh
casque	armor or “helmet” for the head
cere	brightly colored, fleshy area at the base of the beak of some birds; contains the nostrils
convergent evolution	the development of similarities in different species living in different areas but under similar ecological constraints
crop	a pouch found in many birds for storing food
cryptic coloration	camouflages appearance, rendering the animal less visible
display	a pattern of movement or sounds associated with courtship, territorial or defense
diurnal	active during the day
domestic	not wild, tame
down	the first covering on young birds; fluffy feathers with no shaft
echolocation	sense that allows animals to locate something by measuring the time it takes for an echo to return to the animal
ecology	interrelationships of organisms and their environment
endangered	at risk of extinction
extinction	no longer in existence
feathers	the light horny structures forming the external covering of birds; highly modified scales
fledgling	a young bird
forage	hunt for food
gizzard	bird’s second stomach for grinding food
gregarious	social, prefers communal existence, prefers to be with others
habitat	the type of environment in which one normally lives
hatch	emerge from an egg
hemipode	“half-foot”, no hind toe

imprinting	fixing in the memory
incubation	maintaining a favorable temperature for development
keratin	protein that occurs in the outer layer of the skin and in such tissues as hair, feathers, nails, and hooves
mandible	jaw, upper, or lower part of bird's beak
migratory	moving from one area or habitat to another
molting	shedding of old feathers and growing of new ones
nocturnal	active at night
omnivores	eating both plants and animals
oviparous	eggs that mature and hatch outside the body
parasitic	living off another, such as stealing nests of other birds
polyandrous	having more than one mate at a time
posturing	adopting a noticeable position
precocial	independent from birth
preening	using the beak for oiling, cleaning, or arranging of feathers
probe	search, explore, particularly for food
roost	a shelter with perches for birds; to settle or stay
rufous	reddish-brown
savannas	a flat grassland in tropical or subtropical regions
stance	standing posture
supersonic	having frequencies above those of audible sound
talons	sharp hooked claws
terrestrial	relating to land, as opposed to the sea or air
uropygial gland	preening or oil gland near the base of the tail
warm-blooded	having a body temperature that remains relatively constant, independent of and usually higher than that of the surroundings
webbed	joined by a web or interconnection of tissue

PENGUINS

Spheniscidae family

- Adélie (*Pygoscelis adeliae*)
- Gentoo or Johnny (*Pygoscelis papua*)
- Chinstrap (*Pygoscelis antarctica*)
- Magellanic (*Spheniscus magellanicus*)
- Humboldt or Peruvian (*Spheniscus humboldti*)
- Black-footed or Jackass (*Spheniscus demersus*)
- Galapagos (*Spheniscus mendiculus*)
- Rockhopper (*Eudyptes crestatus*)
- Macaroni (*Eudyptes chrysolophus*)
- Royal (*Eudyptes schlegeli*)
- Fjordland Crested (*Eudyptes pachyrhynchus*)
- Erect-crested (*Eudyptes sclateri*)
- Snares Island (*Eudyptes robustus*)
- Emperor (*Aptenodytes forsteri*)
- King (*Aptenodytes patagonicus*)
- Fairy or Little blue (*Eudyptula minor*)
- Yellow-eyed or Hoiho (*Megadyptes antipodes*)



Black and white coloration gives most of the world's penguins a very formal look. Coloration, adaptation to the sea, and behavior all play a part in their survival. All penguins have dark backs and white on their chest and belly, however, all species have distinguishing head patterns and markings. From above, the dark back is difficult to see against the black depths of the ocean and the white stomach is difficult to see from below as it blends into the sunlight on the surface of the water. This is called countershading. Additionally, the dark and light

coloration allows penguins to reflect heat by turning their white parts to the sun or, if they are too cool, they can absorb heat by turning their black backs toward the sun.

Wings are flipper-like for faster “flying” in the water. Because water is denser than air, penguins have developed wing muscles that are the largest and most powerful muscles found on birds. Penguins swim by flapping their wings as if in flight, often reaching swimming speeds up to 20 miles (32 km) per hour when hunting fish, krill, and squid. When eating, they usually swim 5-10 miles (8 - 16 km) per hour. An average dive lasts about one minute. Emperor penguins can stay underwater for 15 or more minutes, diving between 750 - 1,000 feet (228- 305 m). To breathe while swimming, penguins take long, shallow leaps out of the water while swimming. Penguins take in only enough air to keep their lungs from collapsing and breath out just as they re-enter the water. This action carries the penguins farther through air than through water, using much less energy.



Penguins see well underwater. They do not have binocular vision, so when on land, they must turn one eye and then the other eye to an object to see it correctly. Penguins use their tail and feet as rudders for steering when swimming and for walking when on land. This graceful underwater bird becomes awkward and comical as it waddles when out of water.

Penguins can run in soft snow as fast (and sometimes faster) than man. They sometimes save energy by sliding on their bellies on snow or ice by pushing with their wings and feet. Penguins have the innate instinct to follow anything that appears to be moving with purpose.



Penguins must make and maintain their own heat, not taking on the temperature of their environment. The thick layer of fat just under their skin provides insulation in or out of the water. It is also an energy reserve during nesting season when penguins go without food and lose one-third or more of their body weight. The colder the temperature, the thicker the layer of fat.

The feathers of most birds are arranged in rows. This is not true in penguins as their feathers are distributed all over the body. Penguins have more feathers than most birds, approximately 70 feathers per square inch (10.8 per sq cm). Feather density and length varies to match the climate of the species, with Antarctic species having the thickest feather covering. Penguins “preen” to make their feathers waterproof.

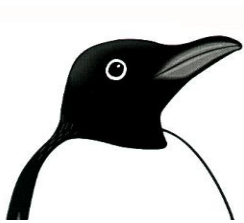
The molt usually begins shortly after breeding season and can last up to six weeks. During this time, penguins do not enter the water because all their waterproofing is gone, making them quite vulnerable to land and aerial predators. Penguins must eat more frequently before molting to build the fat reserve for use during the process. Galapagos penguins are the only species that molt twice each year.

All penguins live in the southern hemisphere, as south as Antarctica and almost as far north as the equator. The Galapagos penguin lives the furthest north, on the Galapagos Islands located off the coast of Ecuador. The average life span of a penguin is 15-25 years, though individual birds may live considerably longer.

Penguins are the most social of all birds. They choose one mate for an entire breeding season, for several seasons, or for life. Selection of a mate in most breeds includes behavior displays (such as craning the neck), usually accompanied by a series of specific calls. While penguin calls may all sound the same to us, penguins can easily differentiate the vocalizations of their mates, parents, and young.

Predators at sea include sharks, orcas, and seals. Predators on land are eagles, gulls, feral cats, foxes, and dogs. Lizards and snakes also prey on eggs and hatchlings. The largest problems for penguins are created by humans. Pollution, encroachment, habitat destruction, overfishing and oil spills are largely responsible for the huge decline among penguins, especially in the warmer parts of the southern hemisphere.

Species included in the stiff-tailed or brush-tailed group are Adélie, Gentoo, and Chinstrap penguins. *Pygoscelis*, loosely translated from Greek, means "rump-legged". Smaller than King and Emperor penguins, this group is distinguished by long stiff, spiky tail feathers and similar body contours.

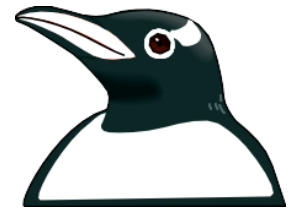


Adélies are black except for the white on the underside of the wings, the chin, belly, chest, and legs, and around the eyes. Adélies live on the Antarctic continent and surrounding islands. Migration to land for nesting starts around October, the beginning of the South Pole summer. Adélies may travel up to 40 miles (64 km) over ice to reach the nesting sites used the previous year. Males arrive a few days before the females to search

for the old nesting site or to make a new nest if necessary. Adélie nests are about 15 inches (38 cm) in diameter and made of pebbles. Finding pebbles is a full-time activity during the nest-building process.

The same male and female may mate for several years and sometimes for life. Sometime during the first two weeks of November, Adélies lay two eggs, two to four days apart. Hatching takes place in approximately 35 days. Three weeks after hatching, Adélie chicks leave the nest for the creche stage. This stage is like a group nursery in the rookery where all the young chicks stay close together for warmth and safety from predators while their parents gather food.

The Gentoo or Johnny penguin looks much like the Adélie, with a bonnet-like splotchy white band that stretches from eye to eye across the top of its head. Gentoo beaks are yellow to bright orange and are long and sharp, allowing them to eat larger fish than the Adélie or Chinstrap. The Gentoo mating season varies from August in the northern rookeries to October in the southern rookeries. Mating couples of Gentoos often arrive together and jointly build their nest of pebbles, seaweed, moss, and grass. Gentoos are the most passive of all penguins.



The Chinstrap penguin has a white face with a thin black line under the chin that spans from cheek to cheek. Their amber eyes are outlined in black. The mating season for Chinstraps begins in November with rookeries being emptied by late April. Their nests are made of only a few pebbles. Unlike Adélies and Gentoos who prefer flat nesting sites, Chinstraps build their nests on rocky slopes.

Temperate penguins (*Spheniscus* - Greek for "little wedge") are the northernmost penguins and live in areas where the climate is warmer and more tropical. Common to each of these four species are black chest markings called bands. Temperate penguins display either one or two of these U-shaped bands. These penguins have a fleshy area around their eyes with no feathers that radiates heat. Penguins also radiate heat by turning their feet skyward. Their heads and backs vary in color from dark brown to black.

The Magellanic, Humboldt, Galapagos, and Black-footed penguins have larger beaks, are slimmer, and do not stand as upright as their Antarctic relatives. They are found on southern coastlines of South America and Africa, as well as on the Galapagos Islands off the coast of Ecuador. They prefer to nest in burrows dug in soil or guano.



The Magellanic penguin is the most southerly and most numerous of the four *Spheniscids*. Magellanics nest in burrows or under bushes and climb as high as 900 feet (274 m) to find good drainage so their eggs will be safe from floods. Unlike other *Spheniscids*, Magellanics have two dark bands separating their chin from their belly.

The Humboldt (or Peruvian) penguin has only one black band but otherwise closely resembles the Magellanic. Humboldts inhabit island coastlines of Peru and Chile. Decline in population of the Humboldts has resulted from overfishing of anchovies (their primary food source) and the loss of guano nesting habitats. Humans collect penguin guano for use as a natural fertilizer.



Black-footed penguins (*Spheniscus demersus*) live off the tip of South Africa around the Cape of Good Hope, with the largest concentration being on Dassen Island. Dassen Island is a sandy island 32 miles (52 km) north of the Cape Town docks. Black-footed penguins lay two green eggs in holes dug in the ground. They burrow in the hard soil on the offshore islands, trying to escape the hot African sun and predators on land (such as wild cats and dogs).

Galapagos penguins, living near the equator, are the most tropical of all penguins. These penguins have the largest areas of facial skin without feathers that allow body heat to escape and keep them from overheating. Galapagos penguins either nest in burrows or lava cracks, using the damp shady spots to cool their chicks. They are about two-thirds the size of the other temperate penguins and have lighter, less distinctive markings.

Decorative plumage distinguishes the crested penguins from other groups (*Eudyptes* - Greek for "good diver"). Rockhopper, Macaroni, Royal, Fjordland, Erect-crested, and Snares Island penguins all have feather crests of white, yellow, or orange on their heads. This plumage is common to both males and females in these species. The crested species share some common physical characteristics, but nesting procedures and breeding cycles vary greatly. Most crested species lay two eggs but incubate only the larger second egg.

Rockhopper penguins have an average height of 24 inches (61 cm). Rockhoppers get around by hopping on steep rocky slopes and can hop half their height in one leap. Rockhoppers jump into the water feet first. Female Rockhoppers, like Macaronis and Royals, take the first incubation period before males (normally the males incubate the eggs before females). The crest of the Rockhopper goes over its red eyes like thick yellow eyebrows with long, yellow, and black feathers sticking out from its head. The Macaroni's limp crest drapes across its forehead.

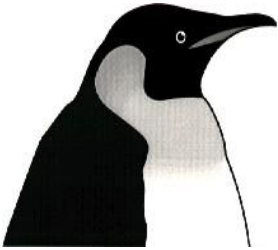


Royal penguins are found only on Macquarie Island, New Zealand. Unlike most other penguins, it is easy to tell which Royals are male or female -- females have gray faces and males have white faces. The crest of the Royal penguin is bright orange.

The Fjordland penguins breed in rainforest fjords on the northwest coast of South Island, New Zealand, as well as other nearby islands. They have grey feathers at the base of their cheeks. The crests of the Erect-crested penguins are stiff and thick.

The Snares Island penguins live only on Snares Island, New Zealand. They are pale around the beak, lack stripes on the cheeks, and have limper, thicker crests than the Rockhopper.

The Emperor and King penguins form the group of large penguins. Aptenodytes means "diver without feathers", which is not an accurate description of these birds. They are excellent divers, and both King and Emperor penguins are among the most densely feathered birds on earth.



Emperor penguins can reach a height of approximately four feet (1.2 m) from beak to tail and can weigh over 90 pounds (41 kg). Emperors have colored head markings around the cheeks and throat known as auricular patches. These patches are bright orange at the upper and back edges, fading to pale yellow at the front where they merge into the gold to yellow chest markings. Emperors also have a gold stripe on their bills. Emperors are unique in that they never come to land. After breeding on shelf ice, Emperor penguins lay a single egg in the dead of the Antarctic winter in temperatures of -150 degrees F (-101 degrees C).

King penguins are about 12 inches (30 cm) shorter and about half the weight of Emperors. The auricular patches on their cheeks and throat look like a large, orange teardrop outlined in black, paling into yellow before blending into the white chest. The pink and lavender marking on each side of their beak widens as it gets closer to the mouth.

The Kings, who are found in the muddy sub-Antarctic islands surrounding the ice shelf, raise only two young in a three-year period. Building no nests, the Emperors and Kings incubate a single egg on top of their feet, covering it with their "brood pouch" which is something like an inside-out kangaroo pouch.



The "other" group includes two species (Yellow-eyed and Fairy penguins) whose characteristics set them apart from others. The yellow-eyed or Hoiho (*Megadyptes* - Greek for "large diver") penguin has a catlike yellow eye that blends into the eye stripe. Hoihos have weaker bills and longer necks than other penguins. Both species build their nests in seclusion rather than in a colony.



The little blue penguin (*Eudyptula minor*) is the smallest species, sometimes weighing less than three pounds (1.4 kg). *Eudyptula* is Greek for "good little diver." The Fairy penguin is gray/blue rather than black on its head and back. The Fairy penguin has a distinctly blue back with a white underbelly. The bill is gray-black and pink at the lower base. They are 16-17 inches (41-43 cm) tall and weigh about two pounds (0.91kg). Both sexes are alike, but the males are heavier with a larger bill.

Most little blue penguin adults are sedentary, remaining with the colony when not at sea. Adults forage at sea from dawn to dusk. They feed alone, not as a cooperative group. Their prey includes small fish (anchovies, squid, plankton, krill, seahorses, etc.), cephalopods, and crustaceans. They often travel 8.7-12.4 miles (14-20 km) daily when searching for food but travel less when breeding. They can dive to 226 feet (69 m), but usually dive an average of 98 feet (30 m). Little blue penguins remain offshore until dusk, then cross the beach in tight groups to head to their own burrows.

Little blue penguins are quite vocal and make a variety of calls for various situations. Most breeding pairs live in colonies, though some nest on their own. Both parents dig the burrow, with the male contributing more than the female. The burrow, averaging 16 inches (41 cm) in length, is dug in sand or other soft soil. Grass is collected to line the nest. In some areas, they nest in crevices or caves in the rocks.

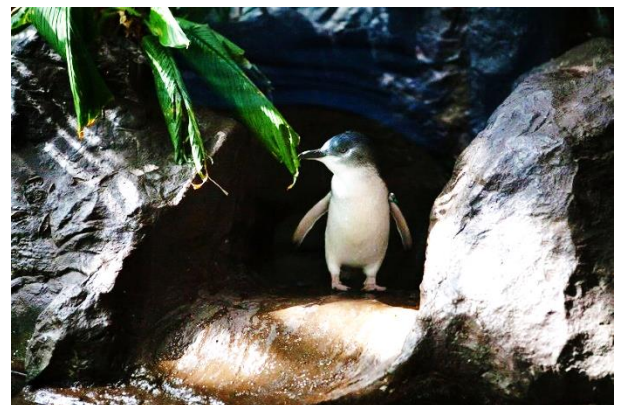


The normal clutch is two white eggs which are incubated by both parents for 33-39 days. An average time of 68 hours between the laying of the first and second egg is reported, however, they normally hatch together. Chicks are first covered with gray down that is soon replaced with a second dark brown coat. The nesting period is between 54-63 days, with both parents tending the chicks. Within a few days after hatching, parents alternate, with one guarding the nest while the other forages for food. Chicks are fed regurgitated food. After two weeks, both parents forage for food each day, returning in the evening to feed the chicks. After approximately eight weeks, young fledglings are forced from the nest to fend for themselves.



Little blue penguins are monogamous and usually return to the same colony each year, but often to different burrows. Parents actively defend their burrows, resulting in aggressive behavior, including posturing, calling, slapping with flippers, pecking, and shoving. Sexual maturity is reached at two to three years of age. The lifespan averages about seven years.

Little blue penguins are found in the Southern Hemisphere in the waters of New Zealand and southern Australia. They live in waters that range between 55-68 degrees F (13-20 degrees C). Little blue penguins feed in inshore waters around the coastlines and breeding islands and occasionally, out to the continental shelf.



USEFUL VOCABULARY

antarctic	at or near the South Pole, the area encompassing Antarctica and the Antarctic Ocean
arc	to move in a curve or part of a circle
auricular patch	a small area near the ear with distinctive coloration
binocular	the use of both eyes
brood patch	skin on the underside of the belly that keeps eggs/chicks warm
carnivorous	an animal that eats flesh
countershading	the protective coloration/camouflage of animals (lighter bellies and darker tops)
creche	nursery
ecstatic displays	signaling to attract a mate by throwing back the head, stretching wings and neck, and crying loudly
fjords	narrow strips of sea bordered by cliffs
plumage	all of the feathers covering a bird
rookery	a breeding place for birds

Toucans, Aracaris & Toucanets

PICIFORMES

The order Piciformes includes almost 400 species, generally divided into six families which share certain features such as:

- roosting and nesting in trees or cavities
- zygodactyl feet (two toes in front, two behind)
- laying white eggs
- typically do not have down feathers (except Galbulidae)
- most are very colorful
- many live in tropical areas
- specialized bills and feeding habits

Members of the Ramphastidae family are found in the Neotropics.

RAMPHASTIDS



“Toucanos,” the name given these colorful birds by the Topi Indians of Brazil, probably represent the New World tropics better than any other animal. They can be found from southern Mexico to Argentina. Although some toucans are found at altitudes over 10,000 feet (3,048 m), Ramphastids are mainly in the middle to upper canopies.

Ramphastids have slender bodies, short broad wings, a long tail, and pincer-like feet. It is their boat-shaped, colorful, and patterned bills (sometimes half their body length) that distinguish them from other birds. In addition to the fancy bill, many Ramphastids have colorful chest, rump, and ear patch feathers and bright skin around the eyes.

Although the bill and plumage are colorful, these birds are rather inconspicuous in heavy vegetation and spotty sunlight, where the broken patterns of the bill blend into the dense, dark foliage. Most bills are brilliantly colored with stripes, patches, spots, or streaks. The enormous yet lightweight bill is made from a porous material supported by bony fibers. The upper mandible (also called the maxilla) is curved downward and ends in a sharp tip. The edges of the bill are serrated.

These birds can reach out with their long bill, snip off an individual fruit with the tip, toss it backward into the throat, and gulp it down. They either regurgitate the seed or pass the seeds whole, making them important seed dispersers in the forest. Toucans are considered soft-billed birds because they eat soft food. They prefer ripe fruit and select their food based on color (darkest being the ripest).



Although they are largely frugivores (fruit-eaters), Ramphastids are true omnivores (eat plants and animals). When breeding, they eat insects, lizards, small rodents, snakes, eggs, and baby birds to get the necessary protein. Ramphastids drink by dipping water with their beak and tipping the head back to let the water flow down the throat. Moisture comes from the fruits they eat as well as water from the cup-like centers of bromeliads or rain-filled hollows in trees.

Toucans can be seen “fencing” with their beaks, particularly before breeding. Although these behaviors can become quite intense, food tossing and fencing seem important in their mating rituals. Toucans are some of the noisier animals in the rainforest. They do not “talk” like other popular species of tropical birds but are very communicative with their mate or flock. Sounds vary among species, ranging from croaks, peeps, barks, hollow rattles, yelping calls, to mechanical clicks. Their sounds can be heard up to half a mile (0.8 km) away.



Toucans are gregarious, living together in pairs or small flocks of a dozen or so birds. They are agile and easily hop from branch to branch. Although they are accomplished fliers, they are not able to travel long distances. They can often be seen gliding between trees. Unlike most birds, they move their tail up and down while flying. They select a favorite branch and return there to roost each night where they will sleep from sunset until dawn.

When sleeping, the toucan lays its huge bill along its back and covers it with its tail. Larger toucans sleep alone or with their mate while the medium-sized and smaller birds sleep in groups. Toucans frequently nest in dead palm logs or abandoned woodpecker nests. The log is hollowed out until it is deep enough to fit inside. They dig deeper each year. The only lining is wood chips or regurgitated seeds.

They lay one egg each day for two to four days. Incubation lasts 15-20 days. The eggs are initially white but turn gray after nine or ten days. Both parents take turns sitting on the eggs and caring for the young. Unlike most birds, Ramphastids are not always on the nest. If spooked, they will leave the nest unattended to protect themselves. They return to the nest after the threat is gone, often too late for the eggs or chicks. The nestling period is between 41-51 days, with the smaller birds requiring less time.



TOUCANETS

The smallest Ramphastids are called toucanets. They are approximately 13-14 inches (33-36 cm) long and are primarily dark green above, often lighter below, with reddish-brown tails. Their beaks are often yellow above and dark below.

Aulacorhynchus



Crimson-rumped toucanets (*Aulacorhynchus haematopygus*) are mostly green in color and have a red rump. The blue-green tail has red-brown tips. The patch at the base of the mandible, the area around the eyes, and the broad band across the breast are blue. The beak is reddish-brown and black with a vertical white stripe at the base. The skin around the eyes is brown and the iris is dark.

The crown and mantle of the Emerald toucanet (*Aulacorhynchus prasinus*) are olive green in color and, except for a white throat, the underparts are a lighter green. The green tail becomes blue just before the chestnut tips. The beak is mostly yellow on the top mandible, except for a few black spots, and the bottom mandible is black. Their eyes are red-brown with black/brown skin around the eyes. There are many subspecies, many of which are mostly green.





Groove-billed toucanets (*Aulacorhynchus sulcatus*) are like Emerald toucanets in both habits and appearance although they are usually found at lower elevations. The bill is grooved, and the upper mandible and the tip of the lower mandible are red-brown. The remainder of the beak is basically black. The ocular area and feathers at the base of the mandible are blue. The throat is pale gray and the rest of the body is grass green. The bellies are lighter in color. The tail is green with blue tips.

Bailloni

The Saffron toucanet (*Bailloni bailloni*) is a small lowland species of the Brazilian rainforests. They are approximately ten inches (25 cm) long with a two to three-inch (5-8 cm) long beak. These golden toucanets are distinguishable because of their yellow-gold colored chest feathers. They are the only species in the *Bailloni* genus.



Selenidera (all are dimorphic)



Guianan toucanets (*Selenidera culik*) have a longer bill and shorter tail and wings than other toucanets. There are distinct sexual differences in this species. The head, throat, and most of the belly of the male is black. The remaining parts are mostly green, with a narrow, yellow band across the upper mantle, brown on the thighs and red on the underside of the tail. Both male and female have black and red beaks, blue eye patches, yellow ear feathers, and red irises.

Spot-billed toucanets (*Selenidera maculirastris*) are found mainly in the lowlands of Brazil and Argentina. The two-inch (5 cm) long beak is the smallest of the Ramphastids. Each beak has its own pattern of spots. The head and chest of the males are black (brown on females).



ARACARIS

The medium-sized Ramphastids, known as aracarís, are approximately 15-16 inches (38-41 cm) long. They are often dark with bands on their breast, highlighted with bright yellow or orange/red. The beak patterns are usually gray/black. The tail is more pointed than the tails of the larger toucans.

Pteroglossus



Black-necked aracarís (*Pteroglossus aracari*) have a black head and neck with dark chestnut ear feathers. A red band with yellow above and below is near the middle of the body with a black line at the base. The back is dark gray, and the rump is red. The four-inch (10 cm) long bill has an ivory upper mandible with an upper black ridge. The lower mandible is black.

Curl-crested aracarís (*Pteroglossus beauharnaesii*) are unusual looking birds due to the curled feathers on their crown. The curly feathers look and feel as if they are made of patent leather or are lacquered. The off-whitish, disheveled facial feathers have black tips. The beak has various colors, ranging from shades of golden brown to off-white.





Many-banded aracaris (*Pteroglossus pluricinctus*) are unique in appearance and somewhat resemble a bee. The sexes are quite different. The males have a maroon patch of feathers over the ears, which is absent in females. It is like the Black-necked aracari except that it has two bands — a narrow black one on the breast and a wider red/black band on the belly. The upper mandible is ivory, and the lower mandible is black.

The Chestnut-eared aracari (*Pteroglossus castanotis*) is one of the most common Ramphastids and is the most widely distributed species of aracari. It is like the Black-necked aracari in appearance, only larger and more colorful. The bill is multicolored with bright yellow white “teeth” and a caramel-colored band along the base of the upper mandible, set off by a red area. The base of the upper mandible is black, and the front is caramel brown. The eye skin varies from gray to blue-green and the iris is whitish yellow. The throat, ears and nape are chestnut-colored, and the head is black. A red belly band broadens at the sides.



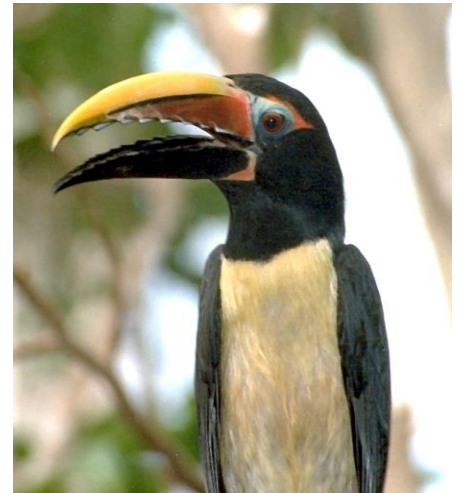
The Pale-mandibled aracari (*Pteroglossus erythropterygius*) is similar in appearance to the Collared aracari (breast and beak are different). The beak is mainly ivory orange in color. There is a horizontal black stripe on the lower breast, and, like the Collared aracari, it has a spot in the middle of the upper breast. It is one of the larger aracaris.

The Ivory-billed aracari (*Pteroglossus flavirostris*) is one of the most colorful aracaris, with broad bands of crimson and black on its breast. The bill is ivory with small markings outlined in black.



The head and neck of the Collared aracari (*Pteroglossus torquatus*) are black with a red-brown collar at the nape of the neck. The wings, back, and tail are olive green. The rump and portions of the tail are red. The bill is long and slender. The black lower mandible is outlined with a white line and the upper mandible is ivory with a black ridge and tip. The slender breast and belly are muddled with bands and spots of yellow, red, and black. It is an active social bird commonly seen in its natural habitat.

The Green aracari (*Pteroglossus viridis*) has yellow underparts with a black neck and head. The wings, back, and tail are dark green. The rump is red. The multicolored bill has an orange base and black lower mandible with yellow-orange and red markings. The skin before the eyes is blue, changing to red behind the eyes. It is the smallest of the aracaris.



TOUCANS

The largest Ramphastids are toucans which average 18-25 inches (46-64 cm) in length.

Andigena

The Plate-billed mountain toucan (*Andigena laminirostris*) is a dark olive-brown bird with slate-blue underparts. The bill is dark with a raised, rectangular, cream-colored plate near the base on each side of the maxilla. The eye is surrounded by blue skin above and yellow skin below. These birds are rarely seen and are found in Colombia and Ecuador in humid mountain forests to an altitude of 10,500 feet (3,200 m).



Ramphastos



The Red-breasted toucan (*Ramphastos dicolorus*) is one of the smaller species of the black toucans, weighing 12-13 ounces (340-369 gr). The four-inch (10 cm) long beak is the shortest beak of the large toucans. The common name stems from the large area of red feathers that are on the abdomen. The breast is orange in color with yellow on the sides. The throat is yellow, and the bill is green with red highlighted maxillar “teeth”. The Red-breasted toucan is one of the more commonly seen species throughout central and southern Brazil and south into Argentina.

The Chestnut-mandibled toucan (*Ramphastos swainsonii*) is also known as Swainson’s toucan. It is the second largest of the Ramphastids. The outer top third of the upper mandible is yellow and the rest of the bill is red-brown. The skin around the eyes varies from green to blue. The chest is white with a thin red band at the bottom.



The colorful Citron-throated toucan (*Ramphastos citreolaemus*) has a bright yellow throat and breast (with a red band). It has black wings, underparts, back, and tail. The tail is accented with yellow and red feathers. The ear tufts are white. The black bill is green in the center with a ridge of yellow, and the base of the bill is blue with a yellow patch near the head.

The bill of the Keel-billed toucan (*Ramphastos sulfuratus*) is one of the most colorful. The upper mandible is pea green with a wedge-shaped orange area, red tip on both mandibles, and a pea green patch at the back of the lower mandible that changes into blue near the tip. “Teeth” are prominent on the beak. The mantle is maroon, the remainder of the back, wings, and tail are black (some tail feathers are white and yellow). The throat and breast are yellow with a red breast band. The eyes are turquoise blue with pale green facial skin.



Red-billed toucans (*Ramphastos tucanus*) have black wings, upper parts, and tail (with red and yellow tail coverts). The throat and breast are pale yellow with a thin red breast band at the bottom, and the belly is black. The bill is mainly dark red with a small section of blue at the base of the lower mandible. The tip, ridge and base of the upper mandible is yellow.

Ariel toucans (*Ramphastos ariel*) are found in Brazil, south of the Amazon River. They have a bright yellow-orange chest, red feathers on the abdomen, red or blue skin around the eyes (varying with location), and blue eyes. A yellow band is at the base of the blue-black bill.



Channel-billed toucans (*Ramphastos vitellinus*) have a black belly, upper parts, wings, and tail. The breast is yellow orange with a red breast band. The sides of the neck and throat are white. The bill is black with the base being yellow on the upper mandible and blue on the lower mandible.

Toco toucans (*Ramphastos toco*) are the largest (approximately 1.5 pounds or 0.7 kg), most widespread toucans in the wild. The orange (varying shades), ten-inch (25 cm) long bill makes it distinguishable with a large, black “apostrophe-shaped” spot at the tip of the upper mandible. The skin around the eyes is orange and the eyes are blue. The bib is white.



The public demand for these beautiful birds makes them extremely valuable in the pet trade industry. Their brilliant rainbow-colored plumes are used for souvenirs, tribal costumes, and rituals. Some tribes consider various parts of the toucans to contain physical and emotional healing abilities – they believe beaks and tongues cure a broken heart. Medicine men sometimes use the toucan to fly to the spirit world. They often appear on tribal totems, signifying a common ancestry. They are also hunted for their meat. However, in some tribes, eating toucan flesh can sometimes evoke curses from evil spirits.



Humans are the main threat to the Ramphastids. As habitat destruction continues, so does their chance for continued existence. It is important that we learn to appreciate the importance of these beautiful and entertaining birds that are the true symbol of the American tropics.

USEFUL VOCABULARY

Aves	the scientific name for birds
beak	the bill
bromeliads	type of epiphyte plant with a base cluster of tall leaves
burrow	a hole in the ground; proceed as if by digging
canopy	upper covering in the rainforest
chestnut	red-brown
courtship ritual	behavior or display prior to mating
coverts	patches of smaller feathers
crown	top part of the head
dimorphic	occurring in two distinct forms
disheveled	not in order, not neat
disperser	one who spreads
display	a pattern of movement or sounds associated with courtship, territory or defense
distribution	the range where a bird is found
fencing	the art of using a sword (or beak)
flock	a group of birds
frugivores	fruit-eaters
hatchling	a young animal newly emerged from an egg
inconspicuous	not prominent or readily noticeable
insectivore	insect-eater
iridescent	varying in color when seen in different light; brilliant
mantle	area on the back below the nape
markings	distinguishing symbols; patterns
mating rituals	patterns of movements or sounds associated with attracting a partner or mate
maxilla	upper bill
muddled	unclear, scrambled
nape	the lower back side of the neck
nesting period	length of time the young are dependent on others for food and care until they are able to feed themselves
New World	American continents
ocular	relating to the eye
Old World	those places known to Europeans before the Americas were discovered
orbital	of or relating to the eye socket

perch	place serving as a seat, such as an elevated limb or branch
plumes	feathers
porous	full of holes, vessels, or pores
regurgitate	eject matter by vomiting
roost	a shelter or perch on which birds rest or sleep
serrated	notched, like a saw
silhouette	the outline of a solid object
soft-billed birds	birds that eat soft foods
sortie	a sudden attack
tufts	a bunch of feathers or hair
writhe	move or act like a snake or worm, contort, coil, wiggle
zygodactyl	two toes in front and two behind

Birds of Prey

Falconiformes are commonly called raptors or birds of prey. Most hunt during the day (diurnal), though owls (Strigiformes), also birds of prey, hunt at night (nocturnal).

STRIGIFORME/Strigidae

Although often debated, two owl families are commonly recognized -- Tytonidae (barn-owls) and Strigidae (typical-owls). Strigidae is the larger of the two families of owls. Found on every continent except Antarctica (80% are found in the tropics), they are seen in most terrestrial habitats (approximately 95% are forest-dwellers). Most do not migrate (less than 10% have migratory populations within some part of their range), although some species do have seasonal habitat shifts.

Strigids range in size from 1.4 ounce to 8.8 pounds (40 gr to 4 kg). The face is round (heart-shaped in tytonids), and the eyes are large. Many species have thickly feathered legs. Their well-developed talons are sharp and hooked, with a smooth edge on the claw of the third toe (which is longer than the second toe). Their feet are zygodactyl with a reversible fourth toe. They have a large head and a short, hooked bill that points downwards. They have large wings and strong legs.

Strigid owls feed on a variety of prey, with small mammals forming a large part of the diet of some species. Many eat insects, some hunt birds or bats, and others prey on freshwater fish. Although some strigids hunt during daylight, all species are considered nocturnal. They use tree cavities, the ground, or underground burrows for their nests. They sometimes use the nests of other species. They usually lay four to seven eggs. Females incubate and care for the chicks and males bring food for the chicks and the female.

The Burrowing owl (*Athene cunicularia*) is a small owl with a round head and no ear tufts. The head, back, and wings are medium brown in color with white spots. The chest and belly are white to cream color with spots and bars. They have a prominent white chin stripe that is followed by a dark neck stripe. The eyebrows are white, the eyes and beak are yellow, and the legs are long and sparsely feathered. Females are darker than males. Burrowing owls are 8-11 inches (20-28 cm) in length, weigh between six to eight ounces (170-227 gr), and have a wingspan of 20-24 inches (51-61 cm).



They are the only owl that burrows in the ground. They are more visible than most owls because they are primarily crepuscular (active at dusk or dawn) but are sometimes active during the day. Burrowing owls often fly with irregular wing beats, making frequent long glides. They hover during courtship and hunting and flap their wings asynchronously (not up and down together). Much of their time is spent perched at the entrance of their burrow.

Burrowing owls feed on a variety of prey, modifying their food habits to fit the season and location. They are opportunistic feeders. Their diet consists primarily of large arthropods (beetles, scorpions, and grasshoppers). They also eat small mammals (mice, rats, gophers, ground squirrels and rabbits), reptiles, amphibians, other birds, and, unlike other owls, occasionally feed on fruit and seeds. Burrowing owls consume approximately 15% of their body weight each day. They are versatile hunters, chasing prey on the ground, grabbing insects in the air with their talons, and hovering in mid-air before swooping down on prey. They usually search for prey from perches and take food to their burrows to eat.

The eyes are not capable of moving in the eye sockets, though the head can rotate almost 270 degrees. Burrowing owls have good binocular vision but see only in black and white. Many sounds, including a “hoo hoo”, are made by adults, usually associated with breeding or territory defense. Adult sounds are often accompanied by head bobbing. Juveniles give a rattlesnake-sounding buzz when threatened in their burrows.

Athene cunicularia are predominately monogamous birds that live together in colonies with other burrowing owls. Nests are usually built in abandoned mammal burrows. After careful selection and renovation, the nest is lined with various dry materials and fecal matter. The fecal matter masks their odor, making detection by predators more difficult, and serves as insulation for the eggs. If there are no abandoned burrows, they use their bills and long legs to excavate a new burrow.

Burrowing owls have one of the largest clutch sizes of any North American raptor, sometimes containing as many as 12 eggs. The incubation period lasts 28-30 days. The female stays at the nest while the male feeds her during the early morning and evening by remaining near the nest site. After hatching, care of the young is often done by the male. The chicks stay in the burrow for 10-21 days, then they finally emerge. They gather their own food by eight to nine weeks of age. They reach sexual maturity at around one year of age.

Burrowing owls are often found in habitats with burrowing mammals, such as prairie dogs, gophers, skunks, and armadillos. They are found in grasslands, prairies, deserts, and open areas (including airports, golf courses and school campuses). They are found as far north as Saskatchewan and Alberta, Canada, and as south as the tip of South America (except the Amazon Basin). Burrowing owls, from the northern part of the U.S. and Canada, are

migratory.

Many eggs and young are lost due to predators such as other owls, hawks, snakes, badgers, skunks, foxes, cats, and weasels. They are threatened by limited suitable habitat, declining populations of burrowing mammals (meaning less available abandoned burrows), and pesticides. Burrowing owls are tolerant of non-threatening human activity, resulting in threats such as highway traffic, fences, domestic cats and dogs, or being shot.



The Eastern screech owl (*Otus asio*) is a small, nocturnal, woodland owl. There are two color morphs, a gray phase, and a red-brown phase. The gray morph coloring is mottled gray with rows of white spots at the shoulders and dense streaking and barring underneath. The face is light colored with a distinctive dark border. The red morph is similar, but red-brown plumage replaces gray. Sexes are alike in both morphs. Females grow to an average length of 9.2 inches (23 cm) and weigh approximately 7.3 ounces (207 gr). Males are smaller, reaching an average length of 8.2 inches (21 cm) and weight of seven ounces (198 gr).

Eastern screech owls fly rapidly with a steady wingbeat. They rarely glide or hover but may fly with erratic movements when in wooded areas. Their wings are broad, and the head is tucked when flying. When threatened, it stretches its body and tightens its feathers to look like a branch to avoid detection but takes flight when detected. In open roosts, gray-phase birds tend to roost next to a tree trunk whereas red-phase birds tend to roost in outer foliage, possibly because of thermal requirements.

The diet of the Eastern screech owl is the most varied of any North American owl and includes large insects, amphibians, reptiles, small mammals, small birds, crayfish, and earthworms. Communication calls vary significantly, including song-like trills, whines, barks, hoots, and peeps. They have elaborate courtship rituals. Pairs are monogamous for the most part, although occasionally a male will mate with two females. Two to seven eggs are incubated for 26-34 days. Eggs are incubated by the female, and the male cares for the female during this time. Young leave the nest after 28 days and usually leave parental care after ten weeks.

Eastern screech owls have the broadest habitat range of any North American owl. They are found in most habitats lower than 4,921 feet (1500 m) in elevation anywhere east of the Rocky Mountains from southern Texas to southern Canada.

The Spectacled owl (*Pulsatrix perspicillata*) is a very distinctive owl and is different from any other species in North or Central America. It has white eyebrows on its dark brown face. These light circles give them the appearance of wearing spectacles. A narrow white stripe around the upper throat divides the body's color, with the chest being dark brown. Its stomach is pale brown, and the backside is dark brown. The eyes are bright yellow, and the beak is cream colored. The juveniles have the opposite coloring, with a dark face and white plumage over the rest of the body.



As with most owls, the Spectacled owl is mostly nocturnal. They feed on bats, small birds (up to the size of jays), insects, tree frogs, small reptiles, small mammals, and crustaceans. Occasionally, they will take on skunks and opossums. When hunting, they usually perch on a branch to scan for prey and will pounce to the ground or swoop to grab prey. They have large eyes and excellent vision both day and night. They have various calls. Nesting usually occurs during the dry and early wet seasons. They use cavities in trees for their nests. Normally, two white eggs are found in each clutch, but only one usually survives. Incubation lasts approximately 36 days. Chicks fledge about six to eight weeks after hatching.

The Spectacled owl is found throughout southern Mexico to Central and north South America. They prefer dense tropical rainforests and gallery forests from sea level to approximately 5,000 feet (1524 m) in elevation. They are not known to migrate, preferring a local territory.

The Barred owl (*Strix varia*) is medium-sized, and the only typical owl found in the eastern United States with brown eyes (all others have yellow eyes). The head is round, and the pale face has dark rings around the eyes. The beak is yellow and almost covered by feathers. There are no ear tufts. The upper parts are mottled grayish brown. The underparts are light with markings - the chest has horizontal bars, and the belly is barred lengthwise. The legs and feet are covered in feathers up to the talons. The dark brown back is covered in white spots and the long tail is crossed with six or seven bands of pale brown.



There is no difference in plumage between the males and the females, though females are larger than males. Males are between 17-20 inches (43.2-50.8 cm) in length; females are 20-24 inches (50.8-60.9 cm). Males weigh 1-1.5 pounds (0.45-0.68 kg); females are 1.5-1.75 pounds (0.68-0.79 kg). The wingspan varies from 40-46 inches (101.7-116.8 cm) in males; 45–50 inches (114.3-127 cm) in females.

The Barred owl is a nocturnal hunter, using its keen senses of vision and hearing to detect prey. Its diet includes voles, mice, shrews, rabbits, rats, squirrels, bats, opossums, mink, weasels, small birds, snakes, frogs, and insects. Barred owls eat smaller prey immediately but will take larger prey to a feeding perch and tear it apart before eating. The Barred owl can be seen hunting before dark, particularly during the nesting season or on dark and cloudy days. It will often use a perch from which to dive upon its prey. They cannot catch birds while flying. They will also swoop down to the water's edge to catch amphibians and fish.

Barred owls are found in solitary sites for most of the year, only living in familial groups from the breeding season until the young leave the nest. They will call out to other members of the species in the area if disturbed. Their calls are very important in the mating ritual. Barred owls are monogamous, pairing for life. Though they prefer to nest in tree cavities, they have been known to use the empty nests of other animals. They lay a clutch of two to three eggs, and the female incubates them for 28-33 days while the male hunts for her. Nestlings are brooded by the female for three weeks and are fed by the male. The eyes of the young open after seven days, and at four to five weeks the young will leave the nest and move about to nearby branches. The young will fly at six weeks. Parental care is provided for up to six months.

They prefer deep, moist forests, wooded swamps, and woodlands near waterways with nearby open country for foraging. They roost during the day in densely foliated trees and trees with suitable cavities for nesting. The *Strix varia* is found throughout southwestern Canada, Washington, Oregon, and northern California. Its range extends throughout the eastern United States including Florida and Texas.

FALCONIFORMES

Accipitridae

Most of the well-known birds of prey are found in the Accipitridae family – hawks, buzzards, kites, Old World vultures, harriers, and eagles. The Accipitridae family is the largest (approximately 220 species) and most diverse of the Falconiformes. Accipitrids:

- usually kill prey with their feet
- build their own nests and lay eggs with green-lined shells
- uniform in structure, but vary in design, flying capabilities, predatory techniques, and size



All diurnal birds of prey eat some type of animal flesh. Accipitrids range in size from the small African sparrowhawk to the breathtaking, large Harpy eagle (*Harpia harpyja*) that lives high in the rainforests of Central and South America. Accipitridae are found on every continent except Antarctica.

Most diurnal birds of prey are not true migrators. The Pygmy falcon of Africa is one of the smallest birds of prey, weighing about 2 ounces (57 gr). The largest bird of prey is the Andean condor which weighs more than 30 pounds (14 kg), with a wingspan of ten feet (3 m).

Males and females of most species of Accipitridae are distinctly different (sexually dimorphic). Most diurnal birds of prey are usually similar in coloration, but females are often larger than males. They are usually round and taper at both ends (fusiform-shaped), reducing drag when flying. Their feathers are brown, rust, black, blue, white, or gray in color. Most diurnal raptors have juvenile and adult plumage.

The wings of most eagles are broad and rounded for high soaring on thermals or air currents. These wings do not necessarily produce much speed; therefore, they rely on surprise attacks for catching prey. Hindlimbs are sturdy and well-developed. The first toe usually points backward and the other three go forward. The toes are strong and sturdy. Each toe has a sharp talon (claw) that curves downward to help them catch their prey.

The eyes of diurnal birds of prey face forward on either side of the head. An upper and lower eyelid and a nictitating membrane protect the eye. The clear membrane closes to protect and moisten the eye during flight, without losing vision. Vision is their most important sense for hunting and protection. Their large eyes provide sharp, large images. The retina, with more rods and cones (sensory cells), allows for better visual acuity. They have more sensory cells in the upper half of the retina, helping them perceive images when looking toward the ground from a perch or when flying. However, when looking to the sky, they must turn their heads upside down. Like humans, they focus on objects through binocular vision but can detect movement at the edges of their visual range by using just one eye. It is estimated they see objects at a distance up to three times better than humans.

The beak is hooked at the tip and has sharp edges. The base of the beak is fleshy, soft, and lacks feathers, allowing for easy cleaning after feeding on meat. Birds of prey generally feed on game that average 12-50% of their own body weight. Larger species have been known to catch prey equal in weight to their own. One Harpy eagle caught a 13-pound (5.9 kg) sloth in South America.

The Harpy eagle (*Harpia harpyja*) is the largest and most powerful raptor in the Americas. Females typically weigh 14-20 pounds (6.5-9 kg). The male, in comparison, weighs only about 8.5-12 pounds (3.9-5.4 kg). It is 2.9-3.4 feet (0.89-1.04 m) long, with an approximate wingspan of 6.7 feet (2 m). The upper side of the Harpy eagle is covered with slate black feathers and the underside is white. There is a black band across the chest up to the neck. The head is pale gray and crowned with a double crest. The plumage of males and females is identical.



The talons of the Harpy are up to five inches (13 cm) long. Their grip is so strong it can crush a monkey's skull. This species is an active hunting carnivore. Its main prey are tree-dwelling mammals such as monkeys, coatis, sloths, and sometimes other bird species such as macaws. Harpies hunt in and below the rain forest canopy, perching silently for hours in a tree, waiting to drop down on unsuspecting prey.

Flying below the canopy, Harpy eagles can reach speeds of 50 miles (80 kilometers) per hour. It dives down onto its prey and snatches it with outstretched feet. Its short, broad wings help the Harpy fly almost straight up, so it can attack prey from below as well as above. It can also turn its head upside down to get a better look at a potential meal. They have excellent vision and can see something less than one inch (2 cm) in size from 220 yards (0.2 km) away.

Harpy eagles are rather quiet eagles, although they are reported to make some sounds. They mate for life. The female lays two white eggs in a large stick nest high in a tree and, together with the male, they raise one chick every two to three years. After the first chick hatches (53-58 days), the second egg is ignored and fails to hatch. The chick fledges in about six months, but the parents continue to feed it for another six to ten months. The Harpy often builds its nest in the crown of the kapok tree, one of the tallest trees in South America.

Harpy eagles are found in tropical lowland forests from southeastern Mexico to northern Argentina and southern Brazil. This bird prefers large expanses of uninterrupted forest but will hunt in open areas next to forest patches.



The Guiana crested eagle (*Morphnus guianensis*), often referred to as “Churuco” (meaning monkey) by the local people, is a beautiful, large, slender bird that grows to 32-34 inches (81- 86 cm) in length and weighs approximately 6.5 pounds (3 kg). Crested eagles have a prominent fringe of feathers growing around the neck and a long, narrow, black occipital (back part of the skull) crest that is tipped with white. The crest is single and not divided. The sexes are alike except in size, with females being larger than males.

This large eagle has broad, rounded wings and a long tail that allows for maneuvering around forest trees in search of prey. The tail is black with three bars of gray and brown with a white tip.

Crested eagles occur in two forms – the less common dark phase and the light phase. The dark phase is mainly black with heavily banded black and white underparts. In the pale phase, the crown is grayish black, with the head, neck, and chest becoming pale gray. The mantle (back, scapulars and wings) is black or brown/black. The throat is white, and the underparts are white with faint cinnamon to pale, red-brown bars. Females are slightly darker on the head and breast than the males.

Crested eagles have both immature and adult plumage. Immatures are white on the lower parts and the head, and sometimes dusted with gray. The crest feathers are white at the base, turning black with a white tip. The crown is marbled black and white, and the tail is marbled white and gray. The tail also has seven to eight irregular black bars.

The Crested eagle gathers sticks to build a bulky nest high in a fork of a tall tree. They lay two eggs that hatch in the late rainy season (March-April). The male Crested eagle helps feed the female during incubation and both the female and hatchling for the first month after hatching.

The range of the Crested eagle is from Honduras to northern Argentina in tropical lowland forests where they fly high. They inhabit jungle areas near the coast or at the edge of rivers. Crested eagles are found alone or in pairs, perched for long periods of time on branches in the highest treetops. They feed on snakes (both arboreal and terrestrial), small to medium-sized mammals, arboreal rodents, marsupials, birds, and reptiles.



The Black and white hawk eagle (*Spizastur melanoleucus*) is black and white in color. The head, neck, and body are white, and a small crest forms a black patch on top of the head and the area around the eyes, particularly near the bill. The wings are black, the tail is brown with a white tip and four black-dark gray bands. The iris is orangish-yellow, and the feet are bright yellow with black talons.

The sexes are similar, but the female is larger. The Black and white hawk eagle is 20-24 inches (51-61 cm) long, with a wingspan of 43-53 inches (109-135 cm) and weighs approximately 1.8 pounds (0.82 kg).

Stick nests are built in the forest canopy, often at heights of 130 feet (40 m). The nest provides a view of the forest and open country. The Black and white hawk eagle's preferred technique of hunting is to fly high until it spots prey, and then to dive down to capture it. Its diet consists of mammals, toads, reptiles, and a wide variety of birds. There is little information available on the Black-and-white hawk-eagle's movements, reproduction, and population status. Its natural habitats are subtropical or tropical moist lowland and mountain forests. It is found throughout large portions of tropical America, from southern Mexico to northern Argentina.

Black hawk-eagles (*Spizaetus tyrannus*) are found in the New World. They inhabit partially forested areas, generally lowlands, although they can be found as high as 6,000 feet (1,829 m). They prefer semi-open areas, second growth forest, river areas, and forest ridges, but can be found in extensive forests. They are found from Mexico to Argentina and throughout Brazil.



The Black hawk-eagle grows to 22-28 inches (56-71 cm), with the female being larger. Overall, they are black in color but have a bushy occipital crest with white feathers. The undertail and underwings are barred with white. They have broad wings and a long, rounded tail. The tail has three gray bands with a brown/gray tip. The eyes are orange, and the feet are yellow. The juveniles are different in appearance. They have white feathers on the throat, forehead, supercilium, and on the tips of the crest. The head is mixed with both white and buff feathers, and the breast is streaked with brown and black. The belly is black and white.

A stick nest of approximately 4.5 feet (1.4 m) in diameter is built in trees about 45 feet (14 m) from the ground. Rather than being supported by a fork of branches, the nest is supported by dense tangles of vines. The male and female perform courtship displays, including flight with contact and roll-overs. They lay one egg, with incubation being 44-46 days. Fledging takes approximately 71 days after hatching. The young have a long dependency period, therefore permitting adults to nest only every third year. They are common in suitable habitat, but because of tourism, cattle ranching, and the lumber industry, they are losing their habitat.



The Ornate Hawk-eagle (*Spizaetus ornatus*) is a large, powerful raptor that grows to 24 inches (61 cm), with the female being approximately 25% larger than the male. The adults have a distinctive long crest with a black crown. They have black upperparts and white underparts barred with black. The throat is rimmed with black-tipped feathers, and each side of the head and the neck is chestnut. The flight feathers are marked with white and black bars. The feet and cere are yellow and the eyes are orange. The juvenile has a different appearance. The upperparts are dark brown, with pure white underparts, head, and neck, except for black tips to the crest feathers and black bars on the sides. The eyes are pale yellow.

The Ornate Hawk-eagle is found in humid tropical and subtropical forests. Their range is from Central Mexico to northern Argentina and Paraguay. They are also found on the islands of Trinidad and Tobago. They can occasionally be found as high as 8,000-9,000 feet (2,400-2,700 m). These forest eagles prefer the presence of open areas.

To prepare for egg laying, a nest made of sticks is built in the fork of a tree. Courtship begins 1-2 months before egg laying and includes high pitched screaming calls and flying together. The male performs a diving display while the female is perched. They lay only one egg and incubation time is 48 days. Fledging takes approximately 66-93 days. One parent, usually the male, feeds the young while it stays close to the nest for up to one year after fledging. Their diet consists of mainly medium to large sized birds, such as guans, Little blue herons, parrots, macaws, toucans, chachalacas, some small tree-dwelling mammals, and occasionally some reptiles. The largest survival problem is heavy deforestation caused by humans.



USEFUL VOCABULARY

asynchronously	not at the same time
binocular vision	use both eyes to see
camouflage	a disguise or concealment
carrion	dead or rotting flesh
convergent evolution	the development of similarities in different species living in different areas but under similar ecological constraints
crest	a prominent tuft on the head of an animal
marsupials	animals that do not develop a true placenta and usually have a pouch on the abdomen
raptors	birds of prey
ruff	a fringe of feathers growing around or on the neck
savanna	a flat grassland in tropical or subtropical regions
scapular	relating to the shoulder or shoulder blade
sedentary	not migratory
supercillum	eyebrow or region of the eyebrows

Waders

CICONIIFORMES / PHOENICOPTERIFORMES / BALAENICIPITIFORMES

Most Ciconiiformes are large wading birds with legs and bills shaped to fit their feeding behavior. They prey mainly on fish, amphibians, and insects.

Ciconiiformes are found in all habitats throughout the world except near the North and South Poles. Many are gregarious and migratory. Historically, the order Ciconiiformes has been primarily three families (Ardeidae, Threskiornithidae and Ciconiidae). Recent DNA research has resulted in some changes both in orders and families. Shoebills (family Balaenicipitidae) are sometimes found in the order Balaenicipitiformes, and flamingos (family Phoenicopteridae) are sometimes placed in a separate order Phoenicopteriformes.

Ardeidae

The Ardeidae family includes herons, night herons, and bitterns. Most herons have short, straight bills, except for a few species with bills for specialized feeding (such as the Boat-billed heron). Night herons are short, stocky birds with short legs and thick bills. They feed mainly at night and roost quietly in high trees. Bitterns are quiet and inconspicuous. They often use cryptic stances, such as standing erect with their bill pointed upward, to resemble tall, slim vegetation. Some move slowly as if being blown by the wind. They depend on camouflage to avoid predators.

The adult boat-billed heron (*Cochlearius cochlearius*) has a black crown, long crest, and large, dark eyes. The face, throat and breast are white; the lower underparts are rufous with black flanks; and the wings and lower back are pale gray. The massive, scoop-like bill is mainly black. Immature birds have brown upperparts and brown-tinged white underparts and lack a crest. Adults are approximately 21.5 inches (55 cm) long and weigh an average of 21 ounces (595 gr).



The nocturnal heron roosts during the day in large groups of up to 50 birds. They are solitary at night when fishing at the water's edge. They use their large bill to scoop up shrimp, insects, frogs, and fish, usually standing very still when feeding. They nest in small colonies, normally laying two to four pale blue eggs in a nest made of twigs.

Boat-billed herons are found from Mexico to Brazil on the margins of freshwater rivers and lakes, as well as in swamps and mangroves along coastal rivers.



The Yellow-crowned night heron (*Nyctanassa violacea*) has a gray body with brown and white wings. The face is black and white, and the crown is pale-yellow. The eyes are large and red, and the bill is thick and black. The yellow legs turn pink/red during breeding season. Males and females are similar in appearance, but females are usually smaller. The juveniles have gray plumage, with buff spotting on the underside until about two years of age, when they attain adult plumage.

The Yellow-crowned night heron is a stocky, medium-sized bird. Adults are 22-28 inches (56-71 cm) in length; wingspan is 42-44 inches (107-112 cm) and they weigh 1.4-1.8 pounds (0.64-0.82 kg). They are territorial and use their claws and bill for defense. Though usually nocturnal, they occasionally search for food during the day. They wade in shallow water in tidal creeks and tide pools, and prey on crustaceans, fish, amphibians, aquatic insects, snails, and small snakes.

They often nest in colonies in dense vegetation. Nests, made of sticks, weeds, or roots may be built on platforms in trees, in shrubs overhanging water, or even on the ground. They lay three to five pale blue-green eggs which are incubated for 21-25 days. Both parents incubate the eggs and care for the young, who fledge after 25 days. One brood is common per season, however, two broods per season can occur.

As a migratory bird, the Yellow-crowned night heron can be found as far north as Pennsylvania and as far south as southern Brazil. They inhabit mangroves and coastal areas, freshwater marshes, wooded swamps, and thickets.

Balaenicipitidae

The family Balaenicipitidae, which includes only one species, has been included in several orders, including Balaenicipitiformes, Pelecaniformes, and Ciconiiformes. The Shoebill stork (*Balaeniceps rex*) is also known as the whale-headed stork. Being entirely gray, the Shoebill is easily recognized with a bill that resembles a hook-tipped Dutch clog.



The many-colored, hooked bill is 8-12 inches (20-30 cm) long, four to five inches (10-13 cm) wide and has cutting edges. The head is large in proportion to the body. It has yellow eyes and extremely long toes. Males and females have similar coloration with a small crest of white tufts sticking out of the back of the head. The tail is rounded. The tan beak often has dark spots. The legs are skinny and long, and like the legs of most wading birds, the feet are unwebbed.



The Shoebill stork stands 3.5-5 feet (1.07-1.5 m) tall, weighs an average of 12.3 pounds (5.6 kg), and has an average wingspan of 7.7 feet (2.35 m). Males are slightly larger than females and have longer bills. They feed mainly by ambush, standing motionless for long periods of time before collapsing on the prey in a unique manner for a large fish-eating bird. The bill is held pointed down vertically, giving the bird the benefit of binocular vision, a helpful feature for locating prey. The “collapse” is unexpectedly swift, generally lasting less than a second and is performed with immense power. The bird flaps forward and plunges its enormous bill down simultaneously. A reinforced beak and skull act as a shock absorber.

Shoebills spend most of their day fishing. Their favorite foraging spots include waters low in oxygen where fish surface frequently. The large bill engulfs the fish along with a large amount of water and vegetation. The water and vegetation are removed by manipulating the mandible side to side. The fish is decapitated by the sharp edges of the bill. Their preferred prey includes lungfish, tilapia, bichirs, and catfish. They also eat immature monitor lizards and crocodiles, frogs, water snakes, rodents, and small birds. The wings are held aloft during hunting to help with balance while the bird walks across unstable matted vegetation.

Partially nocturnal, Shoebills tend to be slow but also strong flyers, frequently soaring through the air. They are solitary, silent birds. Even breeding pairs will feed at opposite ends of their territory. Shoebills have powerful wings which allow them to take off almost vertically. If food is readily available, shoebills do not need to

migrate. However, in some regions, they move seasonally between feeding and nesting zones. They usually roost on the ground near water but occasionally roost in trees. Shoebills are docile and tolerant of humans. Like most storks, Shoebills can often be seen and heard making sounds by clapping the bill.

The nesting season begins with the end of the rainy season as the water level starts to drop. Nests are built on islands or floating vegetation where the water is deep and less likely to dry up as the dry season progresses. After trampling the selected area, plant matter is gathered and woven in, strengthening the nesting area. Shoebills normally lay two eggs at intervals of up to five days, with only one egg surviving to fledge. Incubation lasts approximately 30 days. Both parents are involved in turning the eggs. They also keep the eggs cool by covering them with water carried in their beaks and placing wet weeds on top of each egg. Chicks are also cooled with water provided by their parents. Upon hatching, both parents care for the chicks. Fledging occurs between 95-105 days. Sexual maturity is around three years.

Shoebills are found in wetlands areas (freshwater swamps, dense marshes, and areas of papyrus, reed, and grass beds) in East-Central Africa, southern Sudan (White Nile Sudd), Uganda, Tanzania, and Zambia.

Ciconiidae

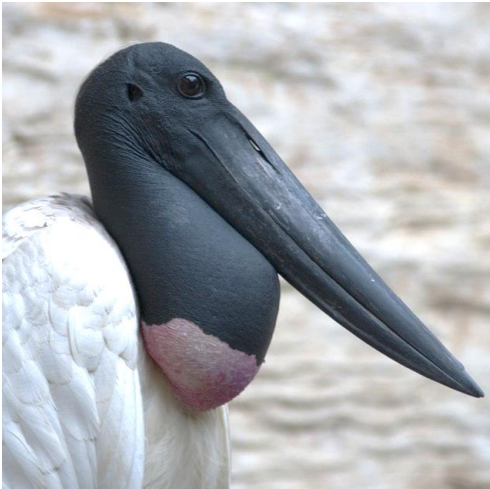
The Ciconiidae family consists of nineteen species of storks. Storks are large, long-legged, long-necked wading birds with large bills of various shapes. The toes are webbed except for the hind toe. The plumage is predominantly white and black, and the face, head and neck are bare on most species. Males and females are alike in color, but males are larger.

Adults don't make vocal noises except when selecting nest sites and during courtship. For this, they use their large mandibles to make sounds. Platform nests are built from sticks in trees and on ledges and buildings. Males and females share all nesting duties, including incubating eggs and feeding chicks. Eggs are incubated for 28-36 days, and after hatching, the chicks remain in the nest for 50 to more than 100 days in the largest species.

The word "Jabiru" was derived from the South American Indian word "Yabiru" which means "blown out by the wind." This name refers to the loose, brilliant, red skin of the lower neck on the Jabiru stork (*Jabiru mycteria*), which becomes inflated during danger, anger, or courtship.

This is the only stork with all white flight feathers (primaries and secondaries), including the wings and tail. The black head and neck are bare except for the gray tuft of feathers on the back of the crown. The neck skin is silky and very smooth. The upper portion of the black neck adjoins a band of loose pink skin. This pink skin is an inflatable sac that blows up and turns bright red when the bird becomes angry or excited. Individual birds can

be identified by the order of the red/black connection on the neck. A small patch of bare skin can sometimes be seen on the chest if the Jabiru is standing very erect, taking off in flight, or displaying. The feet and legs are black, and the iris is brown. Molting results in beautiful white plumage in the breeding season. The sexes have similar plumage, but females are slightly smaller, with more upturned, thinner bills.



The Jabiru is an energetic, 47-59-inch (119-150 cm) tall stork with a large, upturned bill. Its wingspan is almost eight feet (2.4 m) across. Their long primary feathers are among the longest of any living bird. Jabirus are graceful fliers that fly with their legs and neck extended. In flight, the Jabirus, are like American white pelicans but larger, with an extended neck and legs and completely white wings. Its wing structure shows that it is a gliding bird, preferring to use rising air currents or strong frontal winds to gain height and then glide gently in the desired direction. Jabirus quickly become airborne when lifting off from the top of trees. However, on the ground, they must first run, alternating

between slow flaps of the wings and gliding, to become airborne.

Jabirus are generally considered “voiceless,” however, a coughing sound has been heard during their up-down head motions used in greeting displays and copulation. Loud bill-clatters can be heard during displays and when they are frightened. Fledglings are vocal when wanting to be fed. Although they are birds of the open country, they prefer nearby wooded areas for nesting and roosting. Jabirus eat while standing or walking slowly. The neck is extended, and the bill is pointed downward. They stab at food they can see and probe for things they cannot see, such as buried eels. Jabirus feed primarily on fish and eels but may eat insects, snails, mussels, crabs, frogs, small mammals, and snakes.

Jabirus nest individually in broad-leaved trees away from other Jabirus. It is easy to see their nests in dead trees, giving the impression this is their preferred nesting location. However, a live tree provides an additional advantage for both the parent bird and its young. Since the nesting period includes a large part of the hot, dry season, the shade of a tree reduces the need for water to lower body temperature, particularly that of the hatchling. Adults can often be seen standing in the nests during the hottest time of the day, with their babies shaded by their large bodies. Jabirus, both adults and young, defecate onto their legs to reduce heat by evaporation. This natural cement-like liquid also makes the nests firm and sturdy.

The large nest is made of sticks and usually built in the fork of a tall tree. An old nest blown down by the wind provides materials for new nests. Large flat nests, up to six feet (1.8 m) across and ranging from extremely shallow 11.8 inches (30 cm) to 4.9 feet (1.5 m) deep, are made of big branches woven together with smaller

twigs and lined with grass. Water is transported by the male Jabiru and allowed to drip from its half-opened bill, apparently to soften the platform material and enable it to be reworked. The structure and consolidation of materials in the center of the nest make it quite safe for the adult bird to stand when caring for the young.

These nests are built to allow for use by other animals as well. Many birds, such as the Monk parakeet (*Myiopsitta monachus*), use the Jabiru nest as a foundation for their cylindrical-shaped nests that are attached to the base of the Jabiru nest. The parakeet nests hang downward and do not interfere with the basic structure. Beehives are sometimes attached to the nest. Nests are often reused for several years, with the fine material providing the lining being replaced each year. After fledglings leave the nest, the parents do remain to defend the vacant nest. The nesting season in Venezuela is determined by seasonal rains. Jabirus nest from the latter part of the rainy season into the dry season. Sticks for the nests are usually gathered by the male and positioned in place by both birds. Both parents incubate and feed the hatchlings, as well as defend the nest while in use.

Three to five dirty, white eggs are laid. The eggs are approximately three inches (7.6 cm) in length and 2.3 inches (5.8 cm) wide. Initially, the chicks are unable to stand, and although they have a powerful beak, they cannot effectively protect themselves. They are protected by their parents until they can stand and are strong enough to defend themselves. After this stage, parents leave the hatchlings alone while hunting for food, returning at various intervals to feed them. It is believed that parents do not sleep in the nests after the hatchlings are able to stand. Jabiru parents stand at the edge of the nest and regurgitate food onto the floor of the nest rather than directly into the fledgling's bill. Any food discarded or not eaten by the young is eaten by the adult, keeping the nest clean.

Water is also provided to the young in the same manner as food. Standing near the edge of the nest, the adult allows a continuous dribble to drop from its half-opened bill. Water is essential in controlling the body temperature of the fledglings. The fledgling period is believed to be 10-11 weeks. Hatchlings are covered with white down that is thickest on top of the head, back, and stomach. As the juvenile develops, the down becomes grayish in color, mixed with yellow. The beaks are straight. Juveniles develop white plumage during the first two years.

Some natural predators of the Jabiru are anacondas, jaguars, and crocodiles. They are found in southern Mexico and on south into tropical South America, east of the Andes. Jabirus are usually nonmigratory in South America, but those that live in the northern ranges of Mexico, migrate south toward Belize, where they stay from November to June. They prefer shallow marshes, wet meadows, rivers, ponds, and pastures, both inland and along the coast.

Phoenicopteridae

The flamingo is believed to be one of Earth's oldest birds, with footprints being found in the Andes, estimated to be seven million years old. The family Phoenicopteridae (flamingos) includes five or six species. These large pink to scarlet, web-footed waterbirds have a long neck, long legs, and a unique down-curved bill for filter-feeding. They prefer brackish or saltwater where they feed on brine shrimp.

Their beaks are adapted to separate mud and silt from the food they eat and are easily used upside-down. The filtering of food items is assisted by "lamellae" (hairy structures which line the mandibles and the large rough tongue). The bill is opened and as the lower mandible closes, mud and water are pumped out through the slits and the microscopic food is then swallowed.

The flamingo's characteristic pink coloring is caused by the beta carotene in their diet. The source of this varies by species, but shrimp and blue-green algae are common sources.



The plumage of the Caribbean flamingo (*Phoenicopterus ruber ruber*) is a distinctive pink, but with black on the flight feathers (the long feathers at the tips of their wings). They also have a black tip on their beak. Like other species of flamingos, their pink coloration comes from the food they eat, such as brine shrimp, algae, small fish, and other crustaceans.

The Caribbean flamingo, a large bird with long legs and neck, stands five feet (1.5 m) tall and weighs approximately four to eight pounds (1.8 - 3.6 kg).

Caribbean flamingos are very social birds, often flocking in groups of thousands. They can walk easily through shallow water and run well when threatened. A characteristic of all wading birds, *P. ruber ruber* often rest standing on one leg. They feed with their head upside down, with the tongue pumping water through the bill to sift out food. They feed on insects, aquatic invertebrates, and small fishes. Caribbean flamingos eat larval and pupal forms of flies and brine shrimp as their main food. Caribbean flamingos spend 15-30 percent of the day preening to distribute oil throughout their feathers.



The male Caribbean flamingos have a goose-like call. Some flamingos mate for life and some have multiple partners. They produce one white egg that is laid on a mud mound nest in shallow water. In addition to mud, the nest is made from straw, feathers, and small stones. The nest is quite large, sometimes one foot (0.3 m) high.

Both parents incubate the egg which takes 27-31 days to hatch. The young are born with gray feathers and red

beaks. Both male and female flamingos produce a "milk" due to the action of a hormone called prolactin. It is produced in glands lining the upper digestive tract, not just the crop. Both parents nurse their chick, and young flamingos feed on this milk for about two months until their bills are developed enough to filter feed. After four to seven days, the chicks can stand and walk, but are able to swim immediately after hatching. The distinctive, black-hooked bill develops in approximately three months, at which time the chick can feed itself.

Caribbean flamingos are found in lagoons, mudflats and shallow lakes in the Yucatan, parts of the West Indies, Bahamas, Galapagos Islands, and the northernmost tip of South America. Florida also has a large colony of approximately 900 birds.

Threskiornithidae

Members of the Threskiornithidae family (ibises and spoonbills) have long, broad wings and are strong fliers. The body and legs are elongated. The long bill is curved in ibises and straight and flat in spoonbills. They range in size from 18-40 inches (46-102 cm) in height and one to nine pounds (0.45-4.1 kg) in weight. They are found almost worldwide, near areas of standing or slow-flowing fresh or brackish water, although ibises are sometimes found in drier areas.

Threskiornithids are diurnal, spending the day feeding on invertebrates and small vertebrates. Ibises feed by probing and spoonbills by swinging the bill from side to side in water. They are gregarious, feeding and roosting in trees near water and flying together in formation. Nesting is in small groups or alone in spoonbills, and colonial in ibises.



The Scarlet ibis (*Eudocimus ruber*) is unmistakable due to its brilliant scarlet coloration. Only the wingtips are a glossy black-blue. It is a wading bird, so its legs are long and thin, and the feet are partially webbed. The neck is long and slender, and the bill is long, thin, and curved downward. If the diet is deficient in carotenoid pigments, the plumage will turn pink. Juveniles are a dull gray-brown.

Adult Scarlet ibises reach 22-30 inches (56-76 cm) in length from the tip of the bill to the end of the tail. Their weight is approximately three pounds (1.35 kg). The male is larger than the female and has a longer, thicker bill. The wingspan is 3-3.2 ft. (0.9-1 m).

This is a highly communal species with large congregations at nesting and feeding sites. They are strong fliers but are usually seen wading in shallow water as they look for prey. Food is found by rooting through the mud with their long, curved bills. Their diet includes crustaceans, mollusks, fish, insects, and small snakes.

They congregate in colonies of several hundred at breeding time, nesting on dense brush, mangrove-covered islands, and shore areas near river mouths. They lay three to five eggs that incubate for 19-23 days. Both parents incubate and care for the young. Nests are usually made of mud, sticks, and vegetation and located near lakes, on islands, in slow-flowing rivers, swamps, and muddy areas. Native to northern South America, from Venezuela to eastern Brazil, they prefer mud flats, estuaries, shorelines, and shallow bays.

The Roseate spoonbill (*Ajaia ajaja*) is easily identifiable with its long legs, neck, and gray spoon-shaped bill. Adults have a bare, greenish-yellow head, white neck, breast, and back and are otherwise a deep pink. Spoonbills are approximately 31 inches (80 cm) tall, weigh 3.3 pounds (1.5 kg), with a 47-inch (120 cm) wingspan.

Roseate spoonbills are very social. They live in large colonies with other spoonbills, ibises, storks, herons, egrets, and cormorants. They fly in flocks in long diagonal lines with their legs and neck stretched out. They spend time feeding in shallow water, sweeping their open bills from side to side in the water as they sift up food such as small fish, shrimp, mollusks, snails, and insects. They obtain their pink coloration from the pigments of the crustaceans that they eat. Touch receptors in the bill help locate prey.



USEFUL VOCABULARY

adjoins	abuts, next to
aerial	of or relating to air
avian	of or relating to birds
forelimbs	front legs of an animal with four legs
graceful	having beauty of form or movement
inflatable	blown up, increase beyond what is normal
monotypic	containing only one representative or species
mutualistic	a relationship between organisms of different species in which each member benefits
non-migratory	a resident, does not move to other sites
solitary	secluded, or existing alone
terrestrial	relating to land, as opposed to the sea or air