

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 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 weigh 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. Penguins do not fly through the air but swim rapidly through water. Birds are the best-defined group of animals, largely due to :

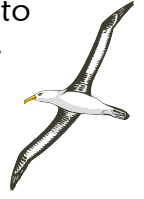
- feathers that are present on all birds (completely unique to birds)
- wings (modified front limbs) that are curved above and hollowed underneath, allowing for lift through the air
- streamlined form
- strong breast muscles for moving of wings
- lightweight, hollow bones
- keen ability to see and hear
- efficient circulatory system (four-chambered heart)
- effective respiratory system (air sacs in addition to lungs)

Feathers provide protection from heat, cold and rain, allowing birds to maintain a body temperature which, in most birds, is higher than in mammals. The number of feathers is dependent on the species and climate. The colder the temperature, the greater the number of feathers.



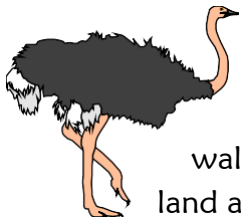
Feathers also provide protective coloration and resistance to wings and tail when flying. Feathers are important for recognition. Many male birds display their plumes, crests, patches, etc. during courtship rituals. Birds are among the most colorful of all animals. Colors make birds both easy and difficult to see. Cryptic coloration allows the bird to blend into the background. In addition to cryptic coloration, posturing also aids in camouflage, such as the bittern that stretches its head upward so the vertical neck markings help it merge into the reeds where it lives.

Countershading (underside is lighter in color than upperside) also helps some species blend into their background. Feathers are made from the protein keratin, which also makes up the body scales of reptiles and hair of mammals.



Birds spend considerable time keeping their plumage neat, clean and somewhat waterproofed. This is done by preening or combing their 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.



Hind limbs usually have four toes that have adapted to different ways of life -- water birds have webbed feet for swimming, perching birds often 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. Birds hop or run on land and many have reduced foot size and fewer toes. The larger 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 much as using 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 raising itself up.

Although generally specialized for flight, birds differ in form and action to adapt for life in particular environments. Styles of flight include: hovering, soaring, gliding, lifting, diving, etc. Tails assist in steering and braking. Takeoffs and landings are equally varied — some need a running start, others taxi across the water or 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. The lower mandible moves away from the upper mandible in order for the mouth to open. Some bills are quite flexible (snipes) and others are very hard (woodpeckers).

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 located 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. Large bright colored bills are often used by birds for displays. Waders may have a shovel-like bill for scooping; birds of prey have sharply pointed hooked beaks; and seed-eaters may have sharp-edged conical bills.

Birds have no teeth, therefore, food eaten by most birds is moved into a two-chambered stomach where digestive enzymes are found in the first one. 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. Small pebbles are swallowed and held in the gizzard to help grind the food so that it can be digested. The loss of energy when flying is extensive and requires not only large amounts of oxygen, but also lots of food. Some birds are required to 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, food and directional/locational calls.

The method of reproduction is oviparous, with an amnion and an allantois. 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.

Eggs are usually laid in a nest in trees, on land, in borrows or on the sides of cliffs. Some birds use a nest only once, others use the same nest year after year and some use abandoned nests of others. Most birds nest only once each year, however, a few species nest every two or three years and others can nest up to three times in one season.



Females usually lay one egg each day. Some birds lay only one egg each nesting season, others lay up to thirty or more, but the average number is three to five eggs. Eggs vary in color, shape and size – small bean size to 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). Many parents are quite busy with feeding and protecting their young. Most birds incubate and tend their own young. However, some birds that live in flocks may lay all their eggs in one nest that will be tended by all males and females. Other birds have separate nests but tend to the 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. Any movement between two areas is migration. Migration is probably 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 is to and from a familiar place (to roost). A seasonal migration involves a passing of one season at one place and a return to the same area at another season. A vertical migration involves such movement as summer on mountain tops and winter down in the 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 (herons, crows, hummingbirds and swallows) while most passerine birds migrate mainly 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 the geographical ranges in which they share and show relationships with other plants, animals and organisms.

The migration of birds has challenged experimental studies for years. It is believed that factors such as length of day, sudden temperature change and food supply may stimulate glandular action and thus initiate migration. Migration variances (stopping and starting times, length of time, rate, distance, specific route and weather) have all been documented to better understand what is learned and what is innate behavior.

Some groups seem to take routes that follow geographic features. 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 herons, storks, bitterns, shoebills, ibises, spoonbills, flamingos (sometimes in order Phoenicopteriformes)
Coliiformes	mousebirds
Columbiformes	pigeons, doves
Coraciiformes	rollers, kingfishers, hornbills, motmots, bee-eaters
Cuculiformes	cuckoos, anis, roadrunners, hoatzins, turacos (sometimes in the order Musophagiformes)
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
Passeriformes	(perching birds) 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
	Piciformes woodpeckers, toucans, jacamars, barbets
Podicipediformes	grebes
Procellariiformes	albatrosses, petrels, fulmars
	Psittaciformes parrots, macaws, lorries
Rheiformes	rheas (ratites)
Sphenisciformes	penguins
Strigiformes	owls
Struthioniformes	ostriches
Tinamiformes	tinamous
Trogoniformes	trogons

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 sluggish streams or ponds. Swans, geese and ducks (waterfowl) belong to the family *Anatidae*. They are often associated with marine or water habitats. They vary in size from more than 30 pounds (14 kg) to 10 ounces (284 gr).



Waterfowl can be found on all major continents and islands (except Antarctica). Some can 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 feed on small animals caught in flight. Diet therefore consists mainly of insects caught as they fly with their mouth open, skimming for food. The crested swifts or tree-swift (Hemipodidae) 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, such as the Black-chinned, Broad-billed, Violet-crowned and the Emerald.



CHARADRIIFORMES



This widespread group includes waders and all of the shorebirds (sometimes listed in thirteen families), skuas, jaegers, gulls, terns, skimmers and auks.

- The family Jacanidae includes several species of jacana, also known as lily-trotters or lotus-birds. 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 all males take the major role in nesting and caring for their young. Some are polyandrous, which is quite 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, 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 breeding 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. Plumage is mostly black and white. They are all waterside birds, 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 somewhat 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, along with worms and mollusks. Their powerful bill allows for the opening of their prey with ease. They are unique in that they excavate nesting tunnels up to five feet (1.5 m) long that are honeycombed with tunnels. One, unusually large, white egg is laid 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 their ability to aggravate 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). Feathers are mainly black above and white below. 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 strange-looking bills for specialized feeding (such as the boat-billed heron). Night herons are short, stocky birds with shorter 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, 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 dig or 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 Hammerkop. The erected crest on the back of the bird's head and the stout beak give the species a “hammerhead” appearance.

Hammerkops feed on frogs, fish and invertebrates. Their huge, domed nests are up to six feet (1.8 m) in both height and width and weigh up to 110 pounds (50 kg). They are built of grass, reeds, sticks and varied plant matter 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 sometimes placed in a separate family (Phoenicopteridae). Their bright pink feathers and strong hooked bill allow for easy identification. Their legs and necks are proportionally longer to their bodies than in 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 Whale-headed stork is also known as the Shoe-billed stork — it actually looks as if 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 the large, long-legged, long-necked wading birds with large bills of various shapes — the storks. Storks have been studied more than the other waders. The Ciconiidae family is made up of approximately 17 species. 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 in order 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, the main prey of many are 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, somewhat large-headed and long-billed. Feathers are usually green above, white below and the 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 for the habit of rolling or somersaulting 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 with 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 elaborate, 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; 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 large cumbersome-looking bill is remarkable. Hornbills are able to 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. In order to reduce sanitation problems in the nest during this long period of incubation, the female hornbill is capable of defecating through the narrow slit at high speed. The young also learn this same procedure at some undetermined age. Some females undergo a complete molt while in the nest.

CUCULIFORMES

- Turacos (*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 in an effort 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 and twigs as they leave the nest. Hoatzins are named “stinky hannahs” because of their musky crocodile-like 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 the unique way they seize their prey - by plunging feet 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 tropic regions near rivers, lakes, swamps or other bodies of water throughout the world. Stick nests are made in tree tops or on the top of utility poles.
- The Sagittariidae is also a one species family — the Secretary bird. This African bird was named for the supposed resemblance of its black-tipped feathers that project outward from the head to that of a secretary with quill-style pens stuck behind his or her 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 other 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 the 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 because they have developed the same adaptations for a similar way of life. New World vultures are easily recognized by obvious physical differences such as the open nostrils on the sides of the beak and the elongated joint of the inner toe. The California condor is one of the best known in this family, largely because of its endangered status. A ten-foot (3 m) wing span makes it the largest of the North American flying birds. With a wing span 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 some 60 species, true falcons are often described as 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. Some distinct features found in accipitrids are: 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*) that 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 at the soil and pecking for seeds, fruits or arthropods.

- Guans, chachalaeas 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 the chachalacas. Chachalacas are named for their cackling “chachalaca” calls. Guans and chachalacas are mainly brown and quite plain; 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 fairly abundant. Tetraonids are mainly vegetarians. Phasianidae includes most “gamebirds” — pheasants, quail, francolins, partridges, snowcocks, peafowl and domestic chickens. They range in sizes 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 rather fat, heavy-bodied gamebirds with a small head connected to a long neck. Most are mainly gray or black, irregularly spotted with white. Even though some roost in trees, they are mostly terrestrial.
- Turkeys (Meleagridae) are large strong birds. Turkeys are New World birds that feed largely on grain, berries, seeds, along with some 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 or roatelos (Mesitornithidae) are rail-like birds found only in the rainforests of Madagascar. These thrush-sized birds are all endangered.
- Button-quails (Turnicidae) are quail-like ground-dwelling Old World birds. They are sometimes called bustard-quail or hemipode, meaning “half-foot” in reference to their lack of a hind toe.
- Plains-wanderer (Pedionomidae) is a one species family found only in Australia. It is similar to the button-quail but has a well-developed hind toe. These birds will usually “freeze” when frightened, rather than fly.
- Cranes (Gruidae) are long-legged, long-necked, large birds. 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 watching and very alert.
- 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 clucking hen, courlan and 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 rainforest 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 stance that is characteristically humpbacked.
- Rails, including gallinules and coots (Rallidae), are fowl-like in appearance and vary in size from that of a sparrow to the size of a large goose. Coots and gallinules or 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 are capable of diving. Diet includes frogs, worms, crustaceans and insects.

- The kagu (Rhynochetidae) of New Caledonia is quite endangered and close to extinction. It is heron-like with orangish bill and legs and has a large head 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 a long stout body, long slim neck and a rather small head. The wings are long, wide, and rounded. The long, graduated tail is made up of 16 feathers. 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 moustachial and superciliary 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 in the Neotropics where they can be found near water in forests, woodlands and often swampy places. Diet consists of insects, crustaceans and small fish. The wings are held open when displaying and tilted forward and the tail is fanned, filling in 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 or cariamas (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, contains approximately 60% of all bird species. The exact number of families varies from 50-75, with more than five thousand species. 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, pardalotes, 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 such as:

1. roost and nest in trees or cavities
2. zygodactyl feet (two toes in front, two toes behind)
3. usually lay white eggs
4. generally do not have down feathers (except Galbulidae)
5. most are colorful, even gaudy
6. many live in tropical areas
7. specialized bills and feeding habits



- Bucconidae are all found in the New World tropics. These birds can be seen streaking from their perch to grab insects and spiders in midair. They will also forage around swarms of army ants and often include lizards and small vertebrates in their diet. 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. Plumage is brightly colored (green, red, blue, yellow and black) and patterned. 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 river banks. 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 rather dull, olive-green or grayish birds with short or pointed tails and somewhat raised nostrils. Besides insects, wax is a feature of their diet and some species actually guide helpers (such as people,

baboons, genets, mongooses) to the hives. After the helper has opened the hive, the honeyguide feeds on bee grubs and wax. It is reported that some birds can enter the bee hives 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 to each nest. It is believed that 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, pointed to chisel-tipped bills. Nests are typically excavated tree cavities, often those of other species.

Woodpeckers excavate cavities for roosting and nesting in both live and dead wood. In addition to their specialized bill, a stiff tail for bracing, unique skull for cushioning and strong 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 their head. Sexes usually differ in most species, with females lacking color on their head. The wryneck is named for its ability to writhe and turn its neck in odd positions when disturbed at its nest. These movements resemble those of a snake and are often combined with a hissing sound to deter small predators. Unlike woodpeckers, wrynecks and piculets have soft-feathered tails that are not used for bracing. Wrynecks communicate by calls and note-like noises. They are often brownish in color with peppered and blotched patterns; sexes 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 use in fruit- and seed- eating. 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 (cere) of the upper mandible. This cere 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 and those that have harsh, raspy voices 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 longest and 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, Gold and blue and Military. Cockatoos have a crest of erect feathers on the head. Parakeets are small parrots with long tails. Lories 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 blubber that aids the plumage 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. 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. Most information about owls comes from examination of their pellets of indigestible material including teeth, fur, bones and fibers.

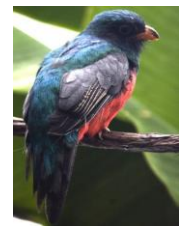
TINAMIFORMES

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



TROGONIFORMES

- Trogons (Trogonidae) are brightly feathered birds with delicate skin that is easily torn, allowing feathers to be lost. Many are brightly colored with much 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
crepuscular	like twilight
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 announcements
diurnal	active during the day
domestic	not wild, tame
down	the first covering on young birds; fluffy feathers with no shaft
echolocation	determine the location of something by measuring the time it takes for an echo to return to the sender
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 something at the most favorable temperature for its development
keratin	a 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 lends itself to a very formal look for most of the world's penguins.

Coloration, adaptation to the sea and behaviors all play a part in their survival. All penguins essentially have dark backs and white on their chest and belly, however, all species have distinguishing head patterns and markings. From above, dark backs are almost impossible to see against the black depths of the ocean and the white stomachs are difficult to see from below as they blend into the bright sunlight on the surface of the water. In addition to countershading, 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 more flipper-like for faster flying in the water. Water being more dense than air, penguins have developed wing muscles that are the largest and most powerful muscles found on birds. A blow by the wing of an Emperor penguin can break human leg bones. Penguins swim by flapping their wings in the motion of flight, often reaching swimming speeds up to 20 miles (32 km) per hour when hunting fish, krill and squid. When eating, they usually slow down to 5-10 miles (8 - 16 km) per hour. An average dive lasts only about one minute, however, Emperor penguins can stay underwater for 15 or more minutes, diving between 750 - 1,000 feet (228- 305 m). In order to breath while swimming,

penguins arc out of the water in a movement known as "porpoising". Penguins take in only enough air to keep their lungs from collapsing and breath out just as they re-enter the water. Porpoising carries the penguins farther through air than through water, using much less energy.

Penguins are able to 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 in order to see correctly. Penguins use their tail and feet as rudders for steering when swimming and for walking when out of water. This graceful underwater bird becomes quite awkward and rather comical with its waddle-like walk when out of water.

Penguins are capable of running in soft snow as fast, or faster than man. They sometimes save energy by "tobogganing" on their bellies, sliding on snow or ice by pushing with their wings and feet. Penguins seem to 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. A thick layer of fat or blubber just under their skin provides insulation in or out of the water. It is also an energy reserve during nesting season when penguins often go without food, losing one-third or more of their body weight. The colder the temperature, the thicker the layer of blubber.

In most birds, the feathers are arranged in rows or tracts, however, penguins have no such rows; feathers are in uniform distribution over their body. Penguins have more feather than most birds, approximately 70 feathers per square inch (10.8 per sq cm). Feather density and length varies to match the climate of particular species, with Antarctic species having the thickest feather covering. Like other species of birds, penguins "preen", thus helping to waterproof their plentiful feathers.

The molt usually begins shortly after breeding season and can last up to six weeks. During this time, they 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 in order 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, south to Antarctica and almost as far north as the equator. The Galapagos penguin is the most northern species found on the Galapagos Islands, located off the coast of Ecuador. The average life span of a penguin is 15-25 years, mostly determined by captive birds. Some individual birds live considerably longer.

Penguins are the most social of all birds. They choose one mate for an entire breeding season, for several consecutive 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, known as ecstatic displays.

While penguin calls may sound alike to humans, penguins are capable of detecting the vocalizations of their mates, parents and young.

Predators at sea include sharks, Killer whales and seals. Predators on land are eagles, gulls, feral cats and introduced species of foxes and dogs. Lizards and snakes also prey on eggs and hatchlings. The largest survival problems faced by 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.

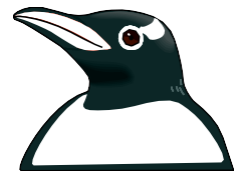
Species included in the stiff-tailed or brush-tailed group are Adélie, Gentoo and Chinstrap penguins. Pygoscelis, loosely translated from Greek, means "rump-legged". Smaller than King and Emperor penguins, this group is distinguished by the longer stiff spiky tail feathers and similar body contours.



Adélies, the best-known penguins, are black except for the white on the underside of the wings, the chin, belly, chest and legs. White eye rings make them look like little clowns. Adélies live on the Antarctic continent and its fringe 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 in order 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. Stealing pebbles is a full-time activity during the nest-building process.

The same male and female may mate for several years and sometimes even for life. Sometime during the first two weeks of November, Adélies will lay two eggs, two to four days apart. Hatching will take place in approximately 35 days. Three weeks after hatching, Adélie chicks leave the nest for the creche stage. This stage is similar to a group nursery in the rookery where all the young chicks stay huddled 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 long and sharp, allowing it 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, grass, etc. Gentoos are the most passive of all penguins -- a fact which has contributed to the survival of approximately only 40,000 in the world.





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

Temperate penguins (*Spheniscus* - latinized 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 unfeathered area around their eyes that radiates heat. Penguins also radiate heat by turning their unfeathered feet skyward. Their heads and backs vary in color from dark brown to black. Collectively, the four species in this group are sometimes referred to as Jackass penguins because of their loud hee-haw braying. This term is most commonly used when describing the Black-footed species. The Magellanic, Humboldt, Galapagos and Black-footed penguins tend to have larger beaks, are more slender 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 often 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 stomach.

The Humboldt or Peruvian penguin has only one black band but otherwise closely resembles the Magellanic. Humboldts inhabit island coastlines of Peru and Chile. Population decline of the Humboldts has resulted from overfishing of anchovies, their primary food source and the loss of guano nesting habitats. Penguin guano is mined for use as a natural fertilizer.



Black-footed or Jackass 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. These penguins are called Black-footed because the bottoms of their feet are black. Jackass penguins lay two green eggs in holes dug in the ground. Black-footed penguins also burrow in the hard soil on the offshore islands, trying to escape the hot African sun and land predators such as wild cats and dogs. Galapagos penguins, living near the equator on the Galapagos Islands, are the most tropical of all penguins. These penguins have the largest areas of featherless skin on their faces allowing body heat to escape and keeping them from overheating. Galapagos penguins may either nest in burrows or

lava cracks, using the damp shady spots to also cool their chicks. The Galapagos penguin is about two-thirds the size of the other temperate penguins and has 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 odd-looking species. Even though the crested species share some common physical characteristics, nesting procedures and breeding cycles within the crested species vary greatly. Most crested species lay two eggs but discard the smaller first egg and incubate only the larger second egg.

Rockhopper penguins have an average height of 24 inches (61 cm). As their name indicates, they get around by hopping on steep rocky slopes. Rockhoppers can hop half their height in one leap. Unlike all other species that dive into the water headfirst, Rockhoppers jump in feet first. Female Rockhoppers, like Macaronis and Royals, take the first incubation stint before males (normally the males incubate the eggs before females). The crest of the Rockhopper goes up 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. Gray feathers can be seen at the base of their cheeks. The crests of the Erect-crested penguins are stiff, thick and brushlike.

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

The Emperor and King penguins form the group of large penguins. *Aptenodytes* means "featherless diver" which is not an accurate description of these birds. They are excellent divers and they are certainly not featherless. Kings and Emperors 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). Colored head markings around the cheeks and throat of the Emperor, known as auricular patches, are bright orange at the upper and back edges, fading to pale yellow at the front where they continue and merge into

the gold to yellow chest markings. Emperors also have a golden stripe on their bills. Emperors are unique in that they never come to land. After breeding on shelf ice, the Emperor lays its 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. Their auricular patches on their cheeks and throat look like a large bright orange comma or teardrop outlined in black, paling into a yellow bib before blending into the white chest. The peach 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 fleshy feet, covering it with their "brood pouch" which is something like a wrong-side-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 mustard-yellow eye that blends into the yellowish eye stripe. Hoihos have weaker bills and longer necks than other penguins.

Both species build their nests in seclusion rather than in the large colonial environment of the other species.



Fairy or Little blue penguins (*Eudyptula minor*) is the smallest species, sometimes weighing less than three pounds (1.4 kg), about the size of the average sea gull. The Fairy penguin is gray/blue rather than black on its head and back. *Eudyptula* is Greek for "good little diver." The Fairy penguin has a distinctly blue upperpart; the underbelly is white. The iris is gray-white and the bill is gray-black and pinkish 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 may be somewhat heavier and the bill is usually larger.

Like all species of penguins, they are highly adapted for life in the sea. The feathers are dense; modified wings are used as flippers; the tail is used for steering; the body is streamlined to glide through the water. Most adults are sedentary, remaining with the colony when not at sea. Adults forage at sea from dawn to almost dusk. They feed singly, not as a cooperative group. 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 average approximately 98 feet (30 m). Fairy penguins remain offshore until dusk, at which time they cross the beach in tight groups and head to their own burrows.

Fairy penguins are quite vocal and make a variety of calls for various situations. A "croon-like" call announces their territory at their burrow, "brays" often advertise for mates or to signal territory and "barks" are more common at sea. Most breeding pairs live in colonies, although some choose to nest

on their own. Both parents dig the burrow, with the male often contributing more than the female. The burrow, averaging 16 inches (41 cm) in length, is often dug in sand or other soft soil. Grass is collected for lining the nest. In some areas, they may 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

Fairy penguins are monogamous and usually return to the same colony each year, but often to different burrows. Parents actively defend their burrows, resulting in aggression such as posturing and calling, to slapping with flippers, pecking and shoving. Sexual maturity is reached at two to three years of age. Life-span averages about seven years.

Fairy 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). Fairy 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
blubber	the layer of fat found between the skin and muscle of animals that serves as an insulator and a food reserve
brood patch	skin on the underside of the belly that keeps eggs/chicks warm
brush-tailed	name given to the genus <i>Pygoscelis</i> ; their long tails are shaped like paint brushes
carnivorous	that which 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, giving out loud cries, etc.
fjords	narrow strips of sea bordered by cliffs
plumage	all of the feathers covering a bird
porpoising	the leaping out of the water in an arc while swimming
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:

- roost and nest in trees or cavities
- zygodactyl feet (two toes in front, two toes behind)
- usually lay white eggs
- generally do not have down feathers (except Galbulidae)
- most are colorful, even gaudy
- 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 the boat-shaped, colorful and patterned bill (sometimes half their body length) that makes the silhouette of the toucan quite distinguishable. In addition to the awesome bill, many Ramphastids have colorful chest, rump and/or ear patch feathers and bright bare skin around the eyes.

Although the bill and plumage may be gaudy, these birds are actually 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 honeycomb-like material supported by bony fibers. The upper mandible (also called the maxilla) is slightly curved downward and ends in a sharp tip. The edges of the bill are serrated.

These “gulpers” are able to reach out with their long bill, snip off a fruit with the tip, toss it backward into the throat and gulp it down. They can regurgitate the seed or pass the seed whole— either way, they are important seed dispersers in the forest. Toucans are considered soft-billed birds because they eat soft food. They prefer the ripest fruits and will select their food in the order of ripest to least ripe, based on color (darkest representing 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 needed 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 but they also get water from the cup-like centers of bromeliads or rain-filled hollows in trees. Their food tossing antics make them quite comical to watch.

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 toad-like croaks, peeps, barks, hollow rattles, yelping calls to mechanical clicks. Intensities of their various sounds range from quite soothing to earsplitting — some capable of being heard up to half a mile (0.8 km).

Toucans are gregarious, living together in pairs or small flocks of a dozen or so birds. They are quite agile and easily hop from branch to branch. Although they are accomplished fliers, they are rather weak fliers who 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 often sleep alone or with their mate, while the medium-sized and smaller birds prefer to sleep in groups. Toucans typically nest in cavities, often in dead palm logs or abandoned woodpecker nests. The log is hollowed out until it is deep enough to fit comfortably inside. They will continue to dig deeper each year. The only lining may be that of wood chips or regurgitated seeds.

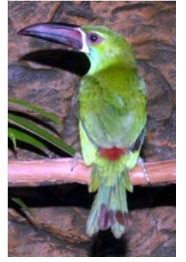
They lay one egg each day, for two to four days. Incubation lasts 15-20 days but is not begun until they have laid the last egg. The eggs are white when laid but turn gray after nine or ten days. Both parents take turns sitting on the eggs and caring for the young. Unlike most birds, Ramphastids are 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, but 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, as the name implies, have a red rump. The blue-green tail has some reddish-brown tips. The patch at the base of the mandible, 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. Eye skin 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 brighter, lighter grassy green. The green tail becomes blue just before the chestnut tips. The beak is mostly yellow on the top mandible except a few black spots; bottom mandible is black. Eyes are reddish-brown with black/brown facial skin around the eyes. There are many subspecies, many of which are mostly green.

Groove-billed toucanets (*Aulacorhynchus sulcatus*) are similar to Emerald toucanets in both habits and appearance, although they are usually found at somewhat lower elevations. As implied by the common name, the bill is grooved. The upper mandible and the tip of the lower mandible are reddish-brown. The remainder of the beak is basically black. Ocular area and feathers at the base of the mandible are blue. The throat is pale gray, with the remainder of the body being grass green; underparts are brighter and 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 breast feathers. It is the only species in the Bailloni genus.

Selenidera (all dimorphic)

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



Spot-billed toucanets (*Selenidera maculirostris*) 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 breast 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. Their tails are 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 coverts. A red band with yellow above and below is near mid 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; lower mandible is black.

Curl-crested aracarís (*Pteroglossus beauharnaesii*) are unique and rather strange looking birds due to the curled up 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 chestnut to off-white.





Many-banded aracaris (*Pteroglossus pluricinctus*) are unique in appearance in that they somewhat resemble a bee. The sexes are quite different, with the males sporting a maroon patch of feathers over the ears (absent in females). It is similar to 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 the aracaris. It is somewhat 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; front part is caramel. The eye skin varies from gray to blue-green and the iris is whitish-yellow. The throat, ears and nape are chestnut and the head is black. A red belly band broadens at the sides.



The **Pale-mandibled aracari** (*Pteroglossus erythropygius*) is similar in appearance to the Collared aracari (breast and beak are different). The beak is mainly ivory-orange in color. A horizontal black stripe is 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 uniformly ivory with “teeth-like” markings outlined in black.



The head and neck of the **Collared aracari** (*Pteroglossus torquatus*) are black with a reddish-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; upper mandible is ivory with a black ridge and tip. The slender breast and belly are muddled-looking 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; black neck and head. Wings, back and tail parts 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 aracarids.



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 rarely seen birds are found in Colombia and Ecuador in humid mountain forests to an altitude of 10,500 feet (3,200 m).



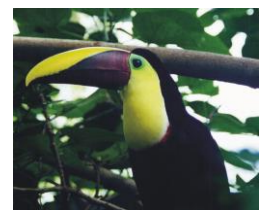
Ramphastos



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 actually on the abdomen. The breast is more orange in color, with yellow on the sides; throat is yellow. The bill is green (often called the Green-billed toucan) with red highlighted maxillary “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 reddish-brown. The bare 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 red breast band); black wings, belly, upper parts and tail (tail is accented with yellow and red feathers). Ear tufts are white. The black bill is green in the center with a ridge of yellow; 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 coverts are white and yellow). Throat and breast are yellow, with a red breast band. 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 whitish-yellow with a thin red breast band at the bottom and a black belly. 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 breast, red feathers on their abdomen, red or blue eye skin (varying with location) and blue eyes. A yellow band is at the base of the bluish-black bill.

Channel-billed toucans (*Ramphastos vitellinus*) have a black belly, upper parts, wings and tail (some red tail coverts). 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 (0.7 kg) and most widespread in the wild. The orange (varying shades), ten-inch (25 cm) long bill makes it quite discernible with a large, black “apostrophe-shaped” spot at the tip of the upper mandible. The bare skin around the eyes is orange and the eyes are blue. The bib is white.

The public demand for ownership of these beautiful and intriguing birds makes them extremely valuable in the pet trade industry. Their brilliant rainbow-colored plumes are used for trinkets, 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 as a means to fly to the spirit world. They are symbolic in many native tribes, often appearing 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. Man is their major predator, but Ramphastids are a natural enemy of many raptors.

Most Ramphastids are not endangered, but they are all at risk. 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 – who are the true “symbol” of the American tropics.

USEFUL VOCABULARY

Aves	scientific name for birds
beak	the bill
bromeliads	type of epiphyte plant with a basal cluster of tall leaves
burrow	a hole in the ground; proceed as if by digging
canopy	upper covering in the rainforest
chestnut	reddish-brown
courtship ritual	behavior or display prior to mating
coverts	patch 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, territorial or defense announcements
distribution	spacing or apportioning
drumming	making a rhythmic sound
fencing	the art of using a sword (or beak)
flock	a group of birds
frugivores	fruit-eaters
gaudy	showy; flashy; flaunty
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; nuchal

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
Old World	ocular of or relating to the eye
orbital	those places known to Europeans before the Americas were discovered
perch	of or relating to the eye socket
plumes	place serving as a seat, such as an elevated limb or branch
porous	feathers
rattle	full of holes, vessels or pores
regurgitate	a short, light metallic sound
roost	eject matter by vomiting
serrated	a shelter or perch on which birds rest or sleep
silhouette	notched, like a saw with teeth
soft-billed birds	the outline of a solid object
sortie	birds that eat soft foods
spooked	a sudden attack
tufts	scared, frightened
writhe	a bunch of feathers or hair
zygodactyl	move or act like a snake or worm, contort, coil, wiggle
	two toes in front and two behind

Birds of Prey

Falconiformes are commonly called raptors, or birds of prey. Because they hunt during the day, they are known as diurnal birds of prey. Owls (Strigiformes) are also birds of prey but they hunt at night (nocturnal).

STRIGIFORME/Strigidae

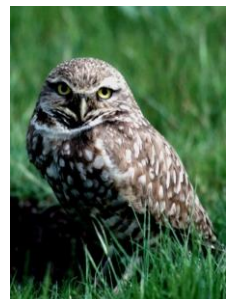
Although often debated, two owl families are commonly recognized -- Tytonidae (barn-owls) and Strigidae (typical-owls). Strigidae is the larger of the two families of owls. Although found on every continent except Antarctica (80% are found in the tropics), they can be found in most terrestrial habitats (approximately 95% are forest-dwellers); most are non-migratory (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). Their facial disk is round (heart-shaped in tytonids), and their eyes are relatively large. Many species have thickly feathered legs; their well-developed talons have a smooth edge on the claw of the third toe, which is longer than the second toe. They have a large head, big, slightly elongated eyes and a short, hooked bill that points downwards. They have large wings and strong legs. Their talons are sharp and hooked and their feet are zygodactyl with a reversible fourth toe.

Strigid owls feed on a variety of prey, with small mammals forming a large part of the diet of some species. Many feed on 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 nests of other species or tree cavities; some nest on the ground, some use underground burrows. Four to seven eggs are usually laid. Females incubate and care for the chicks, although some males will bring food for chicks and female.

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



The Latin word “*cunicularia*” means miner or to mine – a good description for the only owl that lives on the ground in burrows. They are more visible than most owls because they are primarily crepuscular (active at dusk or dawn) but are sometimes active in daylight. Burrowing owls often fly with jerky, irregular wing beats, making frequent long glides. They hover during courtship and hunting and may 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) though small mammals (mice, rats, gophers, ground squirrels and rabbits) are also eaten. They will also eat reptiles, amphibians, 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 in capture methods – chase prey on the ground, grab insects in the air with their talons and hover in mid-air before swooping down. 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, however, the head can rotate almost 270 degrees. Burrowing owls have keen binocular vision but see only in black and white. Many sounds, including a “who who” 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 sometimes live together in colonies with other burrowing owls. Nests are usually built in abandoned mammal burrows. After careful selection and some renovation, the nest is lined with various dry materials, particularly fecal matter, believed to mask their odor (making detection by predators more difficult) and also serve 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 in close proximity to 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, when they finally emerge. They gather their own food by eight to nine weeks of age. They reach sexual maturity at approximately one year of age.

Burrowing owls are often found in habitats with burrowing mammals, such as prairie dogs, gophers, skunks and armadillos. They can be found in grasslands, prairies, deserts and open areas (including airports, cemeteries, golf courses and school campuses), from as far north as Saskatchewan and Alberta, Canada, south to the tip of South America (except the Amazon Basin). Burrowing owls, from the northern part of the U.S. and Canada, are migratory. There is a high rate of eggs and young that are lost due to predators such as other owls, hawks,

snakes, badgers, skunks, foxes, cats and weasels. Overall morality rate is estimated to be approximately 35% percent. This species is listed by IUCN as of Least Concern and CITES Appendix II, however, it is considered endangered in many areas due to limited suitable habitat, control and loss of burrowing mammals (affecting the number of available abandoned burrows) and pesticides (both directly and indirectly). Burrowing owls are tolerant of non- threatening human activity, resulting in additional threats such as highway traffic, fences, domestic cats and dogs or even being shot.

The **Eastern screech owl** (*Otus asio*) is a small, nocturnal, woodland owl. There are two color morphs, a gray phase and a reddish-brown phase. The gray morph coloring is mottled gray with rows of white spots at the shoulders and dense streaking and barring underneath. The facial disk is light colored with a distinctive dark rim. 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 tend to be slightly smaller, reaching an average length of 8.2 inches (21 cm) and weight of seven ounces (198 gr).



Eastern screech owls fly quite rapidly with a steady wingbeat. They rarely glide or hover, but may fly with erratic movements, when maneuvering through wooded areas. Their wings are broad and the head is held tucked in, giving the bird a stubby appearance when flying. When threatened, it will stretch its body and tighten its feathers in order to look like a branch stub to avoid detection, but will take flight when it knows it has been 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 from song-like trills, whines, barks, hoots to 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 26-34 days. Eggs are incubated by the female, however the male helps care 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. They are listed by IUCN as of Least Concern.

The **Spectacled owl** (*Pulsatrix perspicillata*) is a very distinctive owl and is not similar to any other species in North or Central America. It has white eyebrows and lores (the space between the eye and the base of the bill) on a dark brown facial disk (the circular area distinct to most owls). 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 buff and the backside is dark brown. The eyes are bright yellow and the stout 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 extremely large eyes that aid with their vision at night, but can also see very well during the day. They have various combinations of calls and hoots. 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 (begin to fly) 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 the only typical owl found in the eastern United States which has 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 but the belly is barred lengthwise. The legs and feet are covered in feathers up to the talons. The dark brown back is spotted with white and the long tail is crossed with six or seven sharply defined bands of pale brown. There is no difference in plumage between the males and the larger females.

The Barred owl is a medium-sized owl. 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. Diet includes voles, mice, shrews, rabbits, rats, squirrels, bats, opossums, mink, weasels, small birds, snakes, frogs and insects. Barred owls usually eat their prey on the spot but will take larger prey to a feeding perch and tear it apart before eating. The Barred owl can sometimes be seen hunting before dark, particularly during the nesting season or on dark and cloudy days. It will often use a perch from which it dives upon its prey. They cannot catch birds on the wing. They will also swoop down to the water's edge to catch frogs, other amphibians and occasionally fish.

They 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 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. Although they prefer to nest in tree cavities, they have been known to use empty nests of other animals. A clutch of two to three eggs will be laid in the nest; the female incubates the altricial eggs for 28-33 days, while the male hunts for her. Nestlings are brooded by the female for three weeks, and 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 where they find heavy mature woods with nearby open country for foraging. They roost during the day in densely foliated trees, trees with year-round leaves for winter roosting 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.

FALCONIFORME / 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.

Some distinct features found in accipitrids are: 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. 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.

The majority of 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).

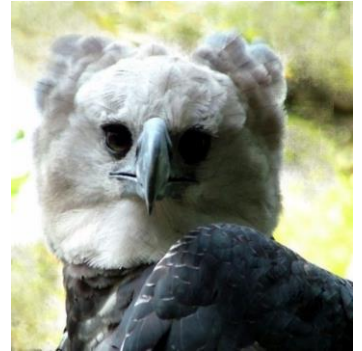
Males and females of most species of Accipitridae are distinctly different (sexually dimorphic). Most diurnal birds of prey are usually similar in coloration but females are often larger than males in size. Diurnal birds of prey are usually round and taper at both ends (fusiform-shaped), which reduces drag when flying. They usually have feathers that 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. Each toe has a talon, or claw, made of a tough protein (keratin) and are usually curved downward. The toes are strong and sturdy with sharp talons for catching and carrying 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, fluid-spreading membrane can close to protect and moisten the eye when flying, without losing vision. The excellent vision of diurnal birds of prey is the most important sense for hunting and protection. The proportionally large eyes provide sharper and larger visual 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, to look up in the sky, they must turn their heads upside down. Like humans, they focus on objects through binocular vision (use two eyes to see) but can detect movement at the edges of their seeing 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 made of bone and covered by horny keratin plates. It is hooked at the tip and has sharp edges. The base of the beak is fleshy and soft, forming the cere. The cere, which lacks feathers, allows for easy cleaning after feeding in meat-eating Falconiformes. Birds of prey generally feed on game that average 12-50% of their own body weight. Larger species have been known to catch prey their own weight. A recorded Harpy eagle catch was that of 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 male and female 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 or possibly even certain human bones. This species is an active hunting carnivore. Its main prey are tree-dwelling mammals such as monkeys, coatis and sloths; it may also attack other bird species such as macaws. Harpies hunt in and below the rain forest canopy; they perch silently for hours in a tree, waiting to drop on unsuspecting prey.

Flying below the canopy, the birds are capable, in a serious chase, of reaching speeds of 50 miles (80 kilometers) per hour. The eagle 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 its potential meal. They have excellent vision and can see something less than one inch (2 cm) in size from a distance of 220 yards (0.2 km).

They are rather quiet eagles, although they are reported to make sounds such as wails, croaks, whistles, clicks and mews. Harpy eagles mate for life. The female lays two white eggs in a large stick nest high in a tree and together 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 adjacent 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 nuchal ruff (a fringe of feathers growing around or on the neck) and a long, narrow black occipital (back part of the skull) crest that is tipped with white. The crest is single, not divided. The sexes are alike except in size, with females being larger than males.

This very large eagle has broad, rounded wings and a very long tail (longer than that of the Harpy eagle) that allows for maneuvering around forest trees in search of prey. The tail is black with three broad bars of gray and brown and 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 brownish/black. The throat is white and the underparts are white with faint cinnamon to pale rufous (reddish-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 builds a bulky, stick nest high in a fork of a tall tree. It is believed that two eggs are laid (but only one may be raised) 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 soar high. They inhabit jungle areas near the coast or at the edge of the rivers. Crested eagles are usually 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*), as indicated by its common name, is black and white in color. The head, neck and body are white; a small crest forms a black spot on top of the head and the area around the eyes, particularly near the bill, is also black. The wings are black; tail is brownish with a narrow 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 wing span 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 stick nest provides a lookout view of forest and open country for the birds. Its preferred technique of hunting is to soar high until it has spotted its prey and then dive down on 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 montane forests. It is found throughout a large part 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. They are black overall in color but have a bushy occipital crest with white feathers. The undertail and underwings are also barred with white. They have broad wings and a long, rounded tail. The tail has three gray bands with a brownish 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 stomach 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 display; including flight with contact and roll-overs. One egg is laid, with incubation being 44-46 days. Fledging, acquiring the feathers necessary for flight, takes approximately 71 days after hatching. The young have a long dependency period, therefore permitting adults to nest only every third year. They are fairly 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 flanks. 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 some open areas.



To prepare for egg laying, a nest made of sticks is built high in the fork of a tree. Courtship begins 1-2 months before egg laying; includes high pitch screaming calls and soaring through the air together. The male will perform a diving display while the female is perched. Only one egg is laid and incubation time is 48 days. Fledging, acquiring the feathers necessary for flight, 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 that they face is heavy deforestation caused by humans.

USEFUL VOCABULARY

asynchronously	not up and down at the same time
binocular vision	use two eyes to see
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
crest	a showy tuft on the head of an animal
marsupials	animals that do not develop a true placenta and that usually have a pouch on the abdomen
nuchal	back of the neck region
occipital	back part of the skull
raptors	birds of prey
ruff	a fringe of feathers growing around or on the neck
savannas	a flat grassland in tropical or subtropical regions
scapulars	relating to the shoulder or shoulder blade
sedentary	not migratory
stance	standing posture
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 largely been made up of three families (Ardeidae, Threskiornithidae and Ciconiidae) although, recent findings, many based on DNA, have made 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 strange-looking bills for specialized feeding (such as the Boat-billed heron). Night herons are short, stocky birds with shorter 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, resembling tall, slim vegetation. Some even 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 (thus the common name), is mainly black. Immature birds have brown upperparts and brown-tinged white underparts and also lack the crest. Adults are approximately 21.5 inches (55 cm) long and weigh an average of 21 ounces (595 gr).



The nocturnal heron roosts by day, usually 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 bluish white 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 mottled brown and white wings. The face is black and white and the pale yellow crown sweeps back as a plume. The eyes are large and red; bill is thick and black. The yellow legs, turn pinkish-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. Usually nocturnal, they can sometimes be seen searching for food during the day. Prey is usually found by wading in shallow water in tidal creeks and tide pools, where they 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 are occasionally raised.

As a migratory bird, the Yellow-crowned night heron can be found as far north as Pennsylvania and as far south as southern Brazil, where they inhabit mangrove and coastal areas, freshwater marshes, wooded swamps and thickets. They are listed as Least Concern by IUCN.

Balaenicipitidae

The monotypic (only one species) Balaenicipitidae has been included in various orders, such as Balaenicipitiformes, Pelecaniformes and Ciconiiformes. The **Shoebill** (*Balaeniceps rex*) is also known as the Whale-headed stork. Being entirely gray, the Shoebill is easily recognized, even without its most distinguishable feature which gives it its name – 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 small crest of white tufts sticking out from the back of the head. The tail is rounded. The tan beak often has dark spots. The legs are skinny and long, like the legs of most wading birds; 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); 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 manner unique for a large fish-eating bird. The bill is held pointing down vertically, giving the bird the benefit of binocular vision, a particularly important 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 during these violent thrusts.

Shoebills spend the majority of their day fishing. Favorite foraging spots include waters low in oxygen, where fish must surface more often. The fish, along with a large amount of water and vegetation, is engulfed in the large bill. The water and vegetation are removed by manipulating the mandible side to side and the fish is decapitated by the sharp edges of the bill. The preferred prey includes lungfish, tilapia, bichirs and catfish. They will also eat immature monitor lizards and crocodiles, frogs, water snakes, rodents and even small birds on occasion. Wings are occasionally held aloft during hunting to assist in balance while the bird walks across unstable matted vegetation.

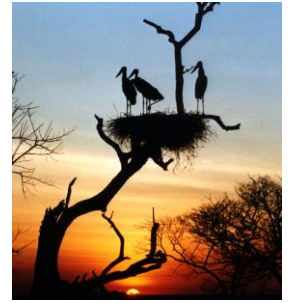
Partially nocturnal, it tends to be sluggish but is also a strong flyer and frequently soars. Shoebills tend to be solitary, silent birds. Even breeding pairs will feed at opposite ends of their territory. Shoebills have powerful wings which allow them to take off almost vertically. They are somewhat reluctant to fly, but can be seen soaring on thermals over their territory. Food permitting, shoebills are non-migratory. However in some regions, they can be found moving seasonally between feeding and nesting zones. They can be found roosting in trees, but are usually found on the ground near water. Shoebills are very docile and tolerant of humans. Like most storks, Shoebills can often be seen and heard “bill-clattering.”

Nesting season begins with the end of the rainy season as the water level starts to drop. Nests are built on true 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 (sometimes only one egg and on occasion, three are laid) at intervals of up to five days, with only one egg surviving to fledge. Incubation lasts approximately 30 days and is shared by both parents who turn the eggs and keep them cool by covering with water carried in their enormous bucket-beaks and adding wet weeds on top. Chicks are also cooled by dousing and permitted to drink water from their parents. Upon hatching, chicks are cared for by both parents. Fledging occurs at 95-105 days. Sexual maturity is believed to be 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 includes the large, long-legged, long-necked wading birds with large bills of various shapes -- the storks. Storks are best known because of the white species that supposedly “delivers babies.” Storks have been studied more than the other waders. The Ciconiidae family is made up of nineteen species. The stork family consists of large waders with webbed toes except for the hind toe. The plumage is predominantly white and black, and the face or entire head and neck are bare on most. Males and females are alike in color, but males are larger.



Adults make low vocal sounds while selecting nest sites and during courtship, but otherwise are voiceless. They use their large massive mandibles to make rattling and clacking 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 the 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 wings and tail. The black head and neck are bare-skinned except for the gray tuft of feathers on back of the crown. The neck skin is silky and very smooth. The upper portion of the dull black neck adjoins a band of loose pink skin. This pink skin is an inflatable sac that blows up and turns scarlet red when the bird becomes angry, or physically/sexually 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 a beautiful white plumage in the breeding season. The sexes have similar plumage, but females are slightly smaller, with more upturned and thinner bills.

It is an energetic, 47-59-inch (119-150 cm) tall stork with a massive, slightly upturned bill. The wingspan of the Jabiru is the second-longest of any New World bird -- almost eight feet (2.4 m). The longest wingspan is that of the Andean condor (*Vultur gryphus*). The enormous wings of the Jabiru aid in flying. The long primary feathers involved in flying are among the longest feathers of any living bird. Jabirus are graceful fliers that fly with legs and neck extended. In flight, the Jabirus, are similar to American white pelicans, but larger, with extended neck and legs and all white wings. Wing structure indicates that the Jabiru 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. The loose sac of skin on the neck makes the neck look as if it is partly withdrawn. Jabirus quickly become airborne when lifting off from the top of tall trees, however, on the ground, a running start is necessary for take-off, with alternating slow flaps and gliding, allowing this big bird 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 frightened. Fledglings are also quite vocal when wanting to be fed. Although they are birds of 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 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 singly in broad-leaved trees away from other Jabirus. Data indicates they have no preference for dead trees. It is much easier to see and photograph their nests in dead trees, perhaps giving the impression this is their usual nesting location. 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 the birds' 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 towering tree. An old nest blown down by the wind often provides materials for a new nest. Due to the size of both nest and birds, nests are usually found in trees with trunks large enough to support such weight. 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. Bee hives 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, it is believed that neither parent continues 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 can not effectively protect themselves. They are protected by their parents until they are able to 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. Parent Jabirus 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, thickest on top of the head, back and stomach. As the juvenile develops, the down becomes grayish in color, mixed with yellowish tinges. 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 uniquely 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; zoo-fed flamingos may be given food with the additive canthaxanthin.



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 the thousands, which is called a pat. They can walk easily through the shallow waters and run well when threatened. As 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, in order 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 tiny 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 is elongated; legs are long; long bill is sickle-shaped and decurved in ibises and straight and flattened in the 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 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, sometimes in formation. Nesting is usually 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 blackish-blue. It is a wading bird, so the 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 grayish-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; weight is approximately three pounds (1.35 kg). The male is larger than the female and also has a longer, thicker bill. 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 and mangrove-covered islands and shore areas near river mouths. Usually three to five eggs are laid and incubated 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 mud areas. Native to northern South America, from Venezuela to eastern Brazil, they prefer mud flats, estuaries, shorelines and shallow bays. They are listed as Least Concern on the IUCN Red List.

The **Roseate spoonbill** (*Ajaia ajaja*) is unmistakable with its long-legs, long neck and long, gray spatulate (spoon-tipped) bill. Adults have a bare, greenish-yellow head, white neck, breast and back and are otherwise a deep pink. Typical 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. A lot of time is spent in shallow water feeding, sweeping its open bill from side to side in the water as it sifts up food such as small fish, shrimp, mollusks, snails and insects. They attain their pink coloration from the pigments of the crustaceans that they eat. Touch receptors in its bill help locate prey.

USEFUL VOCABULARY

adjoins	abuts, next to
aerial	of or relating to air
avian	of, relating to, or derived from birds
forelimbs	front legs of an animal with four legs
graceful	having beauty of form, movement
inflatable	blown up, increase beyond what is normal
monotypic	containing but 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