CHAPTER SIX
BIRDS

Aves: Amniotic Endothermic Feathered Tetrapods

Birds belong to the class Aves (L., Avis = bird), in Gr. ornis=bird. The science deals with the study of birds is termed **Ornithology**. The single unique feature that distinguishes birds from other living animals is their feathers, which do not occur in other animals. In addition to feathers, **all** birds have the following: forelimbs modified to wings (although not always used for flight); hind limbs adapted for walking, swimming, or perching, keratinized beaks; and all lay eggs (oviparous). Thus, a bird may be described as a feathered, biped, flying vertebrate possessing wings. Monogamy is the general rule, although an alternative mate is often selected if one dies.

In general, people know more about birds than any other major group of animals. They attract attention because of their: flight; colorful plumages; springtime song; strange migrations; and considerable economic value to man.

Plumage and feather

Plumage (Latin: pluma "feather") is all feathers that cover a bird and the pattern, colour, and arrangement of these feathers. Feather is singular. "I found a feather on the ground." Plumage refers to all of the feathers on the bird.

Birds are designed as flying machine

Members of this class form a more **homogeneous group** than any other class of vertebrates and exhibit **less diversity** of structures. There is a great **uniformity** of structure among birds despite of high number of species (**Fig.1**). The reason for this great structural and functional uniformity is that: i. birds destined to be a flying machines, which greatly restricts morphological diversity, so the bird's morphology and entire anatomy are designed around flight, ii. where all occupied aerial environment at the time of their waking up.

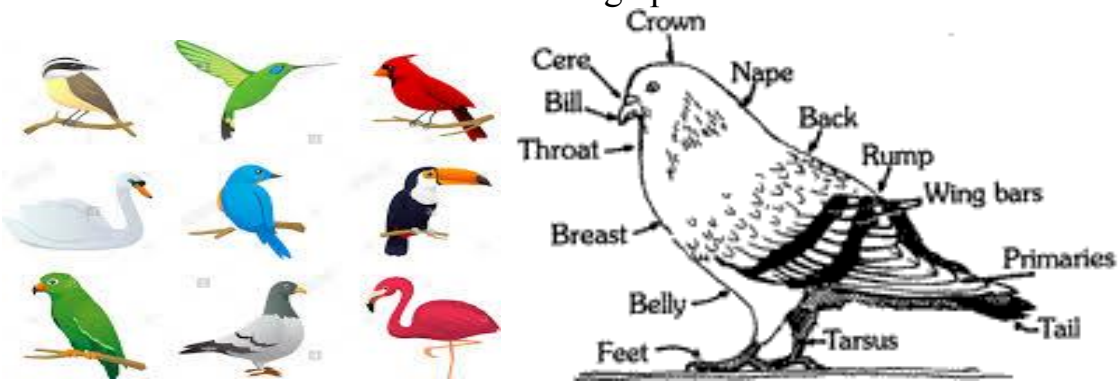


FIGURE 1. Different bird species showing great uniformity in structure.

Habitat

With more than **9700** species distributed over the world, in mountains and prairies, and on all oceans. Some birds live in total darkness in caves, finding their way by echolocation, and others dive to depths greater than 45 meters to prey on aquatic life. The "bee" hummingbird of Cuba, weighing only 1.8g, is one of the smallest endothermic vertebrates.

Aerial or flight adaptations

Adaptive features for flight include **(Figs. 2- 4)**:

1. Thin and loose skin responsible for extensive movement of the skeletal musculature.
2. Modification of the forelimbs to form wings and the presence of feathers increase the surface area of the wings.
3. Light, hollow, rigid bones. Endoskeleton shows the tendency of fusion. The synsacrum and pygostyle are a typical example of such fusion.
4. Long bones have become slender, and most bones including vertebrae, lack the central marrow which leaves cavities that contain air-filled extensions of air sacs from the highly specialized lungs.
5. Bones of the wrist, palm and digits are reduced in number.
6. Skull is lightened by a thinning of compact layers of the membrane bones.
7. Neognaths include all living birds, except the paleognaths, have large breast bone (sternum) and bear a prominent keel for muscle attachment. The power of active flight comes from large breast muscles that can make up 30% of a bird's total body weight.
9. Teeth do not develop, no urinary bladder develops.
10. Large intestine is shortened.
11. Loss of right ovary and oviduct in females of most species.
12. The perfectly streamlined spindle-shaped body of birds represents the sum of all its several adaptations. It is designed to offer minimum resistance to the wind.

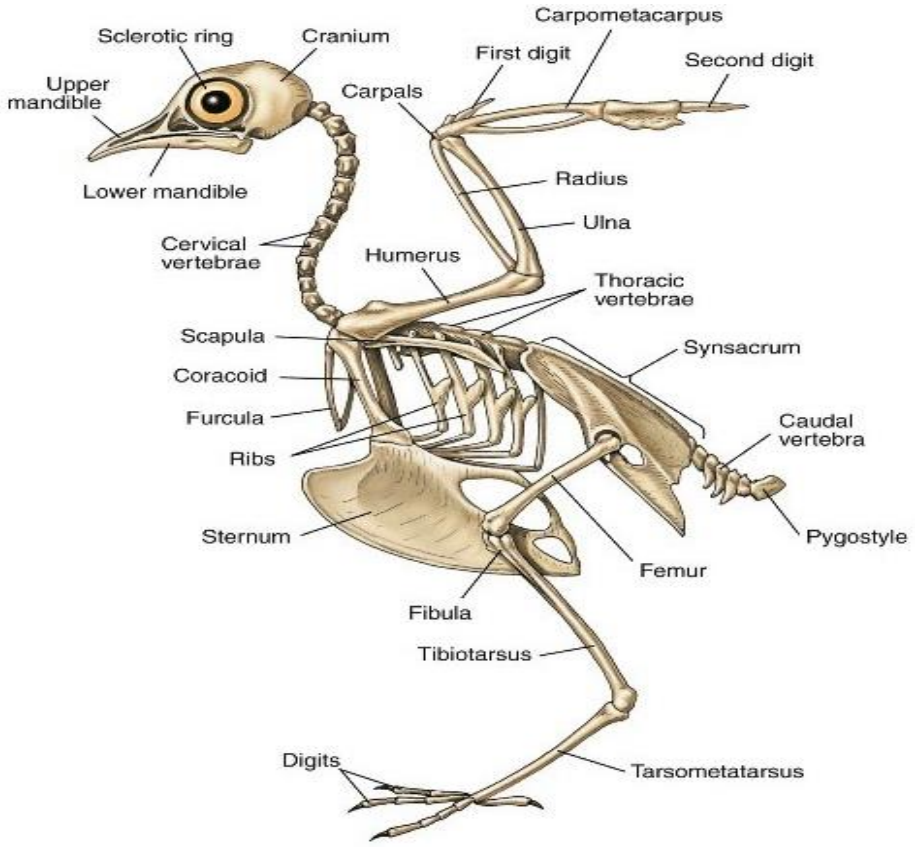


FIGURE 2: Bird's endoskeleton.

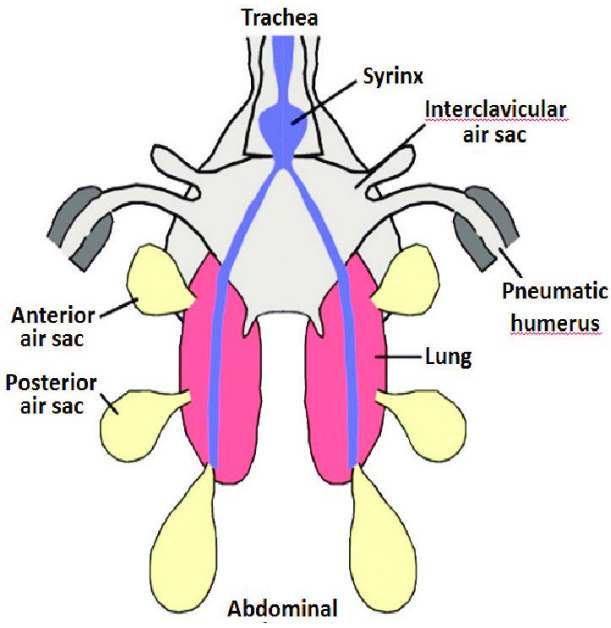


FIGURE 3: Bird's air sacs.

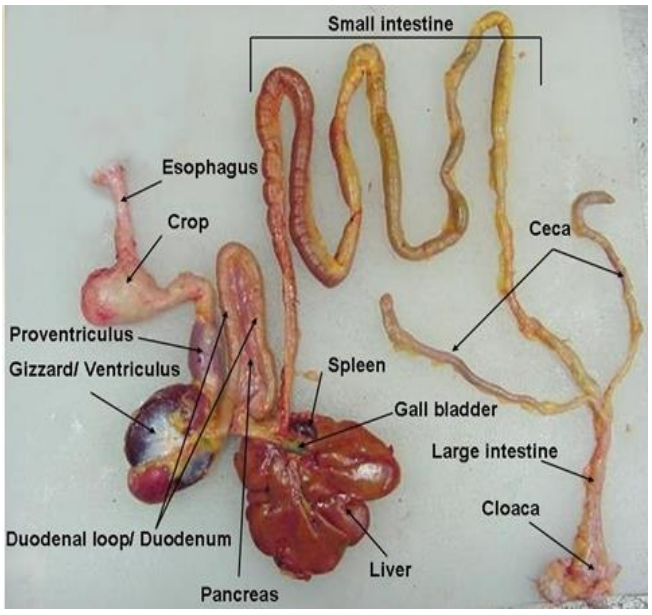


FIGURE 4: Bird's alimentary canal.

Great energy required for flight

In addition to all these adaptations in the body of the bird for flight purpose, flight at the same time needs enormous energy, the liberation of this great energy is based on: food, oxygen, and blood with quick circulation.

i**. Crude power** in the form of stored food grains is kept ready inside the crop, as shown in **Fig.(4)**.

ii. **Efficient respiration**: although the lungs are proportionately small, their efficiency is increased by the development of air sacs, that are developed from the lungs **(Fig.3)**, so the exchange of gases is very perfect in birds and the air sacs help to convey oxygen directly to many tissues.

iii**. Efficient circulation**: oxygen captured by the lungs can be delivered to the flight muscle quickly via the efficient circulatory system. The avian heart is relatively large with rapid beats, in comparison to other vertebrates. For example, the humming bird's heart beats about 600 times a minute, so oxygen easily and quickly reaches the flight muscles for continuous energy liberation during flight. Furthermore, the high proportion of hemoglobin present in the red blood corpuscles of avian blood is also responsible for its quick and perfect aeration.

Unique (special) characteristics of birds

1. Body covered by feathers.
2. Well-developed horny bill.
3. Lower larynx called syrinx (voice box).
4. Uropygial or oil gland for lubricating and preening feathers.
5. Synsacrum and pygostyle.
6. Special alimentary canal design, due to lacking teeth and eating solid food.
7. Shortening and lacking some body organs.
8. All bird species laying eggs (oviparous), in reverse to other vertebrate classes which include also ovoviviparous or viviparous species.

Classification of Aves

Traditionally, birds have been classified based on their morphology. Class Aves includes two subclasses:

Subclass I. Archaeornithes (Gr., archios = ancient, ornithos = bird)

Subclass II. Neornithes (Gr., neos = modern, ornithos = birds)

Subclass Neornithes in its turn classified into three superorders:

Superorder I. Odontognathae (Gr., odontos = teeth, gnathos = jaw)

Superorder II. Palaeognathae or Ratitae (Gr., Palaios = old, gnathos = jaw; L., = raft, no keel).

Superorder III. Neognathae or Carinatae (Gr., neo = modern, gnathos = jaw or L., carina = a keel).

Subclass I. Archaeornithes (Gr., archios = ancient, ornithos = bird)
This subclass includes most primitive fossil birds and is known from Bavaria, Germany. Its structure mixed between that of reptiles and birds.

The best known species of this subclass is ***Archaeopteryx*** (***Archaeornis***) ***lithographica***. One specimen is lying in the British Museum, London, the other lying in the Berlin Museum, Berlin **(Fig.5).**

Archaeopteryx was about the size of a crow, had long jointed tail bone feathers along each side. Thecodont teeth are on both jaws. The nostrils far forward, there was no beak. The skull was more similar to other reptiles than to modern birds. The cervical vertebrae were not saddle shaped at the ends as in today's birds, trunk vertebrae were not rigidly fused. Synsacrum, keel, and pygostyle were absent.

In many respects, this fossil bird showed distinct reptilian characteristics. The presence of feathers however, makes it imperative to classify it with birds. It definitely bridges the gap separating two groups of vertebrates, the Reptilia and the Aves.

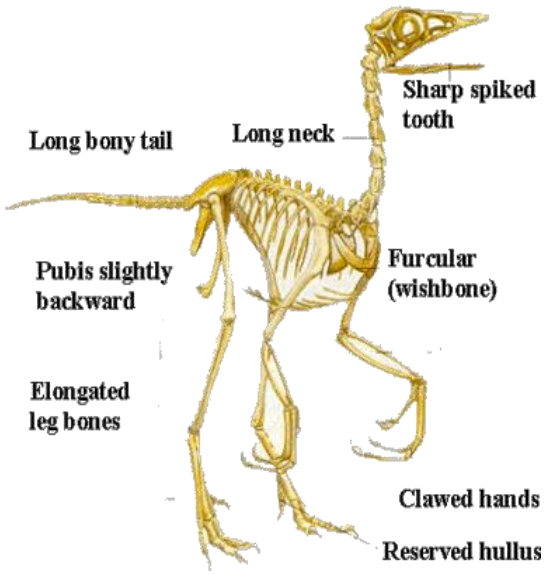


FIGURE 5: *Archaeopteryx sp.* endoskeleton.

Subclass II. Neornithes (Gr., neos = modern, ornithos = birds)
This subclass includes mostly modern as well as few extinct birds, which attributed to 3 superorders:

Superorder I. Odontognathae (Gr., odontos = teeth, gnathos = jaw)
It includes fossil toothed marine birds. The only known odontognaths are ***Hesperonis*** and ***Ichthyornis*** species. The ***Hesperonis*** fossils are known from Kansas, North America. ***Hesperonis*** was covered with small, hair-like feathers. It had vestigial wings, so it could not fly. It was a good diver. Its diet consisted of fishes caught with its sharp, pointed teeth. ***Ichthyornis*** with wings well adapted for flight was able to go far off shore to feed (**Fig.6).**

Hesperonis sp. ***Ichthyornis sp.***
FIGURE 6: Extinct toothed marine birds (odontognaths).

Superorder II. Palaeognathae or Ratitae (Gr., Palaios = old, gnathos = jaw; L., ratis = sternum flat).

The individuals of this superorder share the following characteristics:
1. Primitive structure of the palate, so named paleognaths.
2. Wings are greatly reduced.
3. Their sternum mostly lack keel so have no strong flight muscles (cann't fly).
4. Feathers without interlocking mechanism.
5. Pygostyle absent or reduced. The tail feather show no arrangement.

The characteristics of the members of the two extant superorders (Palaeognathae and Neognathae) are well studied from **Table 1.**

Palaeognaths or ratites are groups in 5 living orders ended by formes Latin "Forma", meaning "form", which is the standard ending for bird orders:

Order 1. Struthioniformes (Gr., struthio = ostrich; formes = form)
1. Legs long, strongly developed, each with two toes (3^{rd} and 4^{th}) with claws.

2. Wings are small; flightless, terrestrial, desert bird. Wing fingers are clawed used for defense.
3. Sternum lacks keel.
4. Pygostyle is absent.
5. Head is small and flat.
6. Head, neck, and legs sparsely feathered.
7. Height is nearly 240cm and weight 136.1kg. They are largest and heaviest living birds.

Examples: **True ostriches *Struthio camelus*** of Africa and western Asia (Arabia) **(Fig.7**).

African ostrich *Struthio sp.*

FIGURE 7: Ostrich, flightless bird (Ratitae).

Order 2. Rheiformes

1. Each leg bears three clawed-toes, which are webbed at the base.
2. Sternum lacks keel.
3. Head and neck partly feathered.
4. Female laid nearly fifty eggs in a nest and the male incubates them. Hatching requires forty days of incubation.
5. These running birds live in groups found in South America.

Example: ***Rhea americana*** (**Fig.8**).

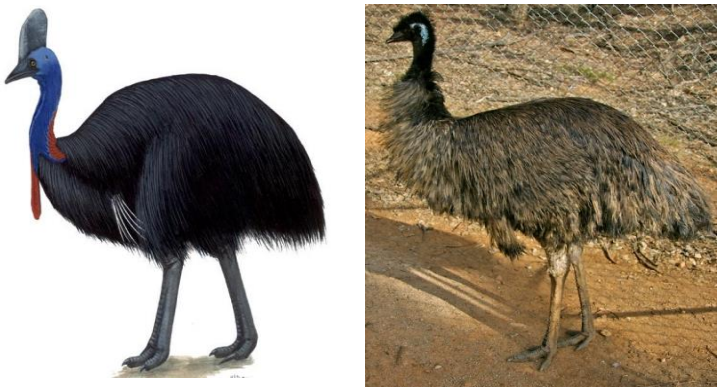
Rhea *Rhea americana*

FIGURE 8: Rhea (American ostrich), flightless bird (Ratitae).

Order 3. Casuariformes

1. Wings greatly reduced.
2. Head of cassowary bears a comb-like structure which is a keratinous, skin-covered casque.
3. Neck has incomplete lining of feathers. Tail feather are absent.
4. Legs are provided with three clawed toes.
5. Period of incubation is 60 days.

Examples: **Cassowary *Casuarius***, **Emu *Dromiceus* (Fig.9)**, both are Australia's two largest birds, and are related to South American rhea and African ostrich.



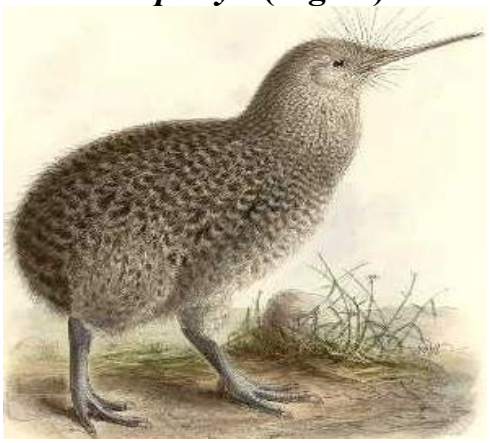
Cassowary *Casuaris sp.* **Australian Emu *Dromiceus sp.***

FIGURE 9: Cassowary and emu, flightless birds (Ratitae).

Order 4. Apterygiformes (Gr., a = not, pteryx = wing)

1. Feathers simple, hair- or fur-like.
2. Wings vestigial and hidden under the fur like feathers.
3. Sternum without keel.
4. Long beak with nostrils near the tip.

Example: **Kiwis** of New Zealand ***Apteryx* (Fig.10).**



Kiwi *Apteryx sp.*

FIGURE 10: Kiwi, flightless bird (Ratitae).

Order 5. Tinamiformes

1. Small terrestrial birds run and can fly a short distance.
2. Sternum is keeled, but the appearance of palate is palaeognathous.
3. Pygostyle is reduced.
4. Eggs incubated by the males.
5. Birds under this order are found in Southern Mexico, Central and South America.

Examples: Tinamous***Tinamus***, ***Endromia*** **(Fig.11).**

Tinamou *Tinamus sp.*

FIGURE 11: Tinamou, flightless bird (Ratitae).

Neognath Birds

All living birds are within the subclass Neornithes of the class Aves. The Neognathae include virtually all living birds, exceptions being their sister taxon Palaeognathae which contains the tinamous and the flightless ratites.

The number of known living bird species are approximately between 9000-10000 species. The molecular clocks suggest that neognaths originated 90 million years ago. Since then, they have undergone adaptive radiation producing the diversity of form, function, and behavior that we see today. Neognathae include order Passeriformes, the largest clade of land vertebrates, containing some of 60% of living birds and being more than twice as species as rodents and about five times as species as Chiroptera (bats), which two largest clade of mammals. There are also some very small orders.

The neognaths have fused metacarpals, an elongated third finger, and 13 of fewer vertebrae. They differ from paleognaths in features like the structure of their jawbones. Neognathae means new jaws.

Main differences between paleognaths and neognaths showing in the following table:

TABLE 1: Differences between Ratitae and Carinatae.

Structure	Palaeognathae or Ratitae	Neognathae or Carinatae
Distribution	Restricted, discontinuous	Cosmopolitan, found all over the world
Habitat	Terrestrial	Arboreal, Terrestrial or aquatic
Locomotion	Flightless running birds	Flying birds
Size	Usually large-sized	Usually small-sized
Wings	Reduced or vestigial	Well developed
Feathers	Without interlocking mechanism.	Interlocked
Rectrices	Absent or irregularly arranged	Regularly arranged in a fan-like manner
Oil gland	Usually absent	Present
Pygostyle	Small or absent	Well-developed
Sternum	Flat, vestigial or no keel	Well-developed mid-ventral keel
Syrinx	Usually absent	Present
Air sacs	Poorly developed	Well-developed
Copulatory organ	Present	Absent
Hatched young	Precocial, not dependent on parents	Mostly altricial, i.e dependent on parents

Bases for bird classification

The classification of birds involves the grouping of **birds into categories according to physiological similarities**, and more recently, by consideration of their genetic make-up. This classification is also known as taxonomy.

In classifying birds, most systematists have historically relied upon structural characteristics. Plumage characteristics include the number of various feather types; the preen gland (oil gland) . Characteristics of the bill and feet are also useful, as is the arrangement of bones in the palate and around the nostrils. The syrinx, and the deep flexor tendons of the toes as well as the condition of the young when hatched.

In bird classification, the Class Aves is split up into 23 orders. Birds in order all share very similar characteristics.

Orders of Neognath Birds

The number of known living bird species are approximately between 9000-10000 species. The neognath birds are grouped into several orders as follows:

Order 1. Sphenisciformes (Penguins)

1. Aquatic flightless birds are found exclusively in the southern hemisphere, some in Antarctica, and a single species on the equator.
2. Body is clothed in densely short and packed feathers.
3. Thick layer of fat beneath skin.
4. Wings are stiff flipper. Although penguins cannot fly, they swim remarkably well with the flipper.
5. Feet have a web and the short legs stout and sit so far back that the bird stands erect on land, they walk upright.
6. Most penguins lay two eggs in a clutch, although the two largest species, the emperor and the king penguins, only lay one egg.
7. Usually, the male stays with the egg and keeps it warm in a **brood pouch**, a flap of skin between his feet.
8. They feed on fish, crustaceans and mollusks and some are able to fast for months.
9. Represented by 17 species.

Examples: Penguins (Fig.12).

Emperor penguins *Aptenodytes forsteri*

Big-crested penguins *Endyptes sp.*

Little blue penguins *Endyptula mino*

FIGURE 12: Penguins. Their wings are stiff flippers, they swim well with the flipper and cannot fly.

Order 2. Apodiformes or **Micropodiformes** (Gr., apous = footless)

1. Worldwide except in the extreme north. Hummingbirds limited to New World (Central America).
2. Small birds, include two types of birds, which are very different in appearance, swifts and the humming birds.
3. Wing feathers **(Remiges)** are much elongated. This gives the wings their long and narrow shape.
4. Rapid-flying birds. One of the **fastest** of all birds include in this order, which is one species of **swifts**.
5. Feet short and weak.
6. In hummingbirds, the tongue is tubular and protrusible and wings can perform hovering movement at a speed of up to70 beats per second. The breast muscles, the breast bone, keel, and the heart are proportionately larger than in any other birds.
7. Humming birds are most beautiful birds and the smallest living bird is bee humming bird.
8. True swift are usually insect-feeders, but humming birds take nectar in addition to insects.
9. The swifts are highly aerial birds. They are superficially similar to swallows, but are not closely related to any passerine species. Indeed, the legs of swifts are small and weak so that a swift that lands on the ground may have difficulty taking off again. Non-breeding individuals may spend up to ten months in continuous flight without landing. Except when nesting!!.
11. Represented approximately by 425 species.

Examples: Swifts and hummingbirds (Fig.13).

Swifts *Apus sp.*

Humming bird

FIGURE 13: Two types of apodiform birds or Micropodiform birds.

Order 3. Anseriformes (L., anser = goose)

1. Members of this order are specialized for aquatic life. Distributed over most of the earth (Cosmopolitan). Capable of flying well.
2. Flattened bill (except in screamer) is externally covered by hard epidermis Provided with special tactile organ to help in selecting food. Screamer is a marsh birds with chicken-like bills.
3. All toes are webbed except in screamers they have almost no web on the feet but are still able to swim.
4. Feeding habit varies from vegetables to fishes.
5. Represented by 161 species.

Examples: Wild duck or mallarad, **Goose, Swan, Duck, Screamer** of South America **(Fig.14).**

Mallard *Anas sp.*

Geese *Anser sp.*

Swan *Cygnus sp.*

Duck *Anser sp.*

Screamer *Chauna sp.*

FIGURE 14: Some anseriformes species.

Order 4. Pelicaniformes (L., pelicanus = pelican)

1. Are aquatic birds, much modified for diving and fishing. The distribution is cosmopolitan.
2. Beaks are very long.
3. Wings are very long.
4. All toes are webbed and directed forward.

5. Represented by 63 species.

Examples: Pelicans, sea cormorant, Gannets, Darter or snakebirds (Fig.15).

Pelican *Pelecanus sp.*

Sea cormorant *Phalacrocorax sp.*

Gannet *Sula sp.*

Darter or snakebirds *Anhinga sp.*

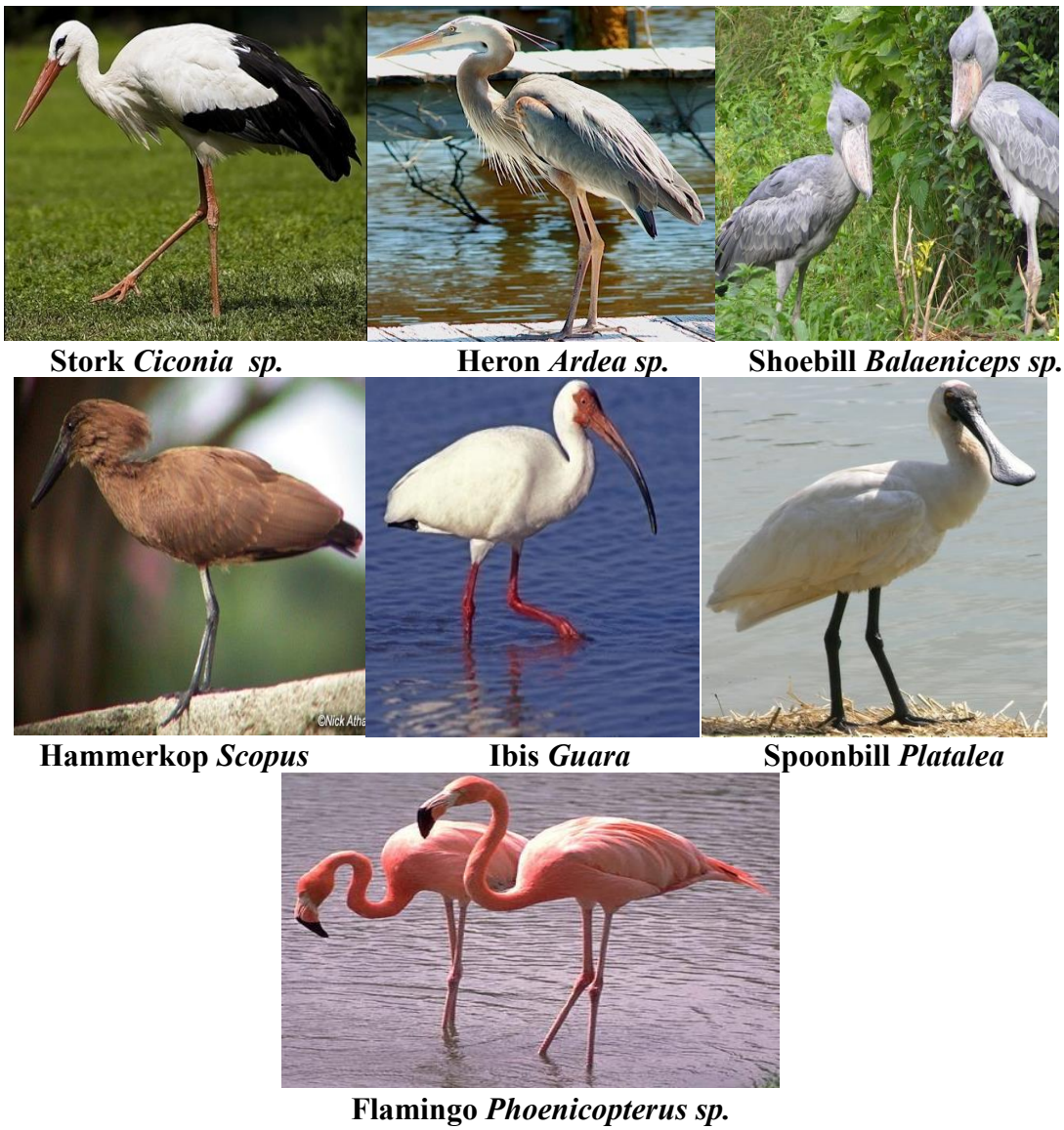
FIGURE 15: Diving and fishing birds (order Pelecaniformes).

Order 5. Ciconiformes (L., ciconia = a stork)

1. Worldwide in distribution.
2. Beak is long. The bill of the flamingo is bent in the middle, and the edges of the lower bill cover those of the upper bill.
3. Neck is long.
4. Legs are long, naked and adapted for wading in marshes and mudflats.
5. Four toes are present in each foot, which are webbed only in some species (flamingos).

6. A bulky body with a short tail and large, broad wings.
7. Feed on amphibian and fishes.
8. Represented by 110 species.

Examples: Stork, Herons, Shoebill, Hammerkop, Ibises, Spoonbills, Flamingo (Fig.16).



Stork *Ciconia sp.* **Heron *Ardea sp.*** **Shoebill *Balaeniceps sp.***

Hammerkop *Scopus* **Ibis *Guara*** **Spoonbill *Platalea***

Flamingo *Phoenicopterus sp.*

FIGURE 16: Species represent different groups of ciconiformes.

Order 6. Charadriformes (L., charadrius = genus of plover)

1. The second large order after order Passeriformes in respect to number of species. They are small to medium size birds.

2. Live mainly on the ground, open watery places or marshes, cosmopolitan. Better-known members of the order fall into three groups

The first of these (the suborder Charadrii), collectively known as shorebirds or **waders** which includes sandpipers, plovers, lapwings, snipes, oyster-catcher, curlew and some less-familiar forms.

A second group, the suborder Lari, contains gulls, terns, skimmers, skuas, and jaegers. They are long-winged, the three anterior forward toes are webbed the backward toe is short.

The third and smallest suborder, Alcae, auks, and puffins. They are compact, streamlined marine birds with short, narrow wings and webbed feet. Alcids are adapted for swimming on the ocean surface and underwater.

3. Feed almost exclusively on insects, larvae, worms and crustaceans.
4. Represented by 366 species. A large group of birds which includes:
Examples: Snipes, Gulls, True Plovers, Lapwings, Curlews, Sandpipers, Crab plovers, Terns, oystercatchers, skuas, Puffins, Razorbills (Fig.17). Some authorities place the **jacanas** in this order.

Snipe *Capella sp.* **True plover *Charadrius sp.*** ***Lapwing Vanellus sp.***

Gull *Larus sp.* **Tern *Sterna sp.*** **Puffin *Fratercula sp.***

FIGURE 17: Some charadriform species.

Order 7. Gruiformes (L., grus = crane)

1. Primarily aquatic or terrestrial. Can swim, run and dive easily.
2. Long –legged birds and partially webbed feet.
3. Omnivorous birds.
5. Represented by 1960 species.

Examples: Bustards, Cranes, Limpkins, Trumpeters *Psophia*, Cariamas, Sun-bitterns, kagus, Rails, and coots (Fig.18).

Bustard *Otis sp.*

Crane *Grus sp.*

Kagu *Otis sp.*

Rail *Rallus sp.*

Coot *Fulica sp.*

FIGURE 18: Some species of the order Gruiformes.

Order 8. Coraciformes (L., corax = raven)

1. The order is a collection of very varied groups of small to medium in size. Their males and females with bright colors. Active by day (diurnal).
2. They are generally recognized by the having compact bodies, short to moderately long necks, large heads, rather long bills, small feet, and ample wings.

3. In some forms, three anterior toes or at least second and third toes are fused in some of basal joints. The first toe points backwards, as it does in many other birds.
5. Feed on worms, insects and fishes.
6. Represented by 218 species.

Examples: Hoopoes, great Hornbills, Grey Hornbills, Bee-eaters, Kingfishers, Rollers, Broad-billed Todies (Fig.19).

Hoope *Upupa sp.* **Great hornbill *Buceros sp.*** **Bee-eater *Merop sp.***

Kingfisher *Ispidina sp.* **Roller *Coracias sp.*** **Broad-billed Tody *Todus sp.***

FIGURE 19: Brightly colored birds (order Coraciformes).

Order 9. Piciformes (L., picus = wood pecker)

1. Brightly colored birds. They live in woodland.
2. Bill is very hard and powerful.
3. Tongue is long and protrusible, and used for removing insects from beneath the bark.
4. The most important character is the occurrence of zygodactylous climbing feet, second and third toes are directed forward and the first and fourth are pointed backward.

5. They are usually insectivorous and wood-boring birds, but some forms may be vegetarians.
6. Most members prepare nest in holes, but **honyguides are brood parasites**, i.e. lay eggs in the nest of other to incubate their eggs and raise the young. All honeyguides in South Africa are brood parasites.
7. Represented by 355 species.

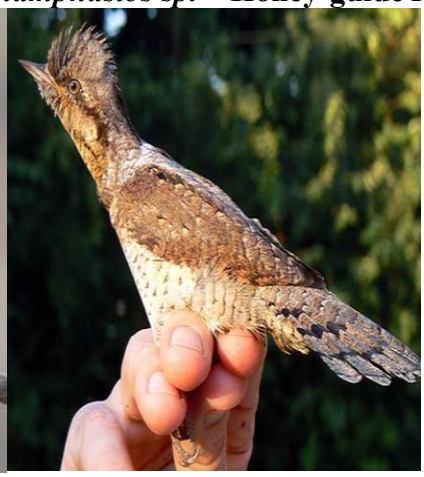
Examples: Toucans Honey-guides, Barbets, woodpeckers (Fig.20).

Woodpecker

Toucan *Rhamphastos sp.*

Honey-guide *Indicator sp.*

Barbet



Wryneck *Jynx sp.*

FIGURE 20: Brightly colored birds, they have climbing feet and the second and third toes are directed forward and the first and fourth are pointed backward.

Order 10. Strigiformes (Gr. Strix= owl)

1. They are found in all regions of Earth except Antarctica, most of Greenland, and some remote islands.

2. Most owls are solitary and **nocturnal** birds of prey. Specialized for hunting at night (nocturnal). However, not all owls are nocturnal. The burrowing owl is usually active during the day.
3. Large round eyes, face forward, can be moved up to 180°. Eyes are adapted for twilight and so contain mostly rods.
4. Ear opening is large, and their hearing is better than that of any other bird.
5. Beaks are well developed and curved; claws (talons) are very sharp and strong.
6. Feathers are loosely arranged and extend up to the digits.
7. Feed on small mammals, insects and other birds. although a few species specialize in hunting fish. Food is swallowed whole. The undigested food as hair, and bone discharged by a process like vomiting in form of pellets.
8. Represented by 186 species.

Examples: Barn owls, Long-eared owls, Fishing owls, Snowy owls (Fig.21).

Barn owl *Tyto sp.*

Long-eared owl *Asio sp.*

Fishing owl *Scotopelia sp.*

Snowy owl *Nyctea sp.*

FIGURE 21: Some species of owls. They have large round eyes, short bills and forward faces.

Order 11. Falconiformes (L., Falco= Falcon)

1. Found widespread over most of the earth and are lacking only in Antarctica and in some islands in the pacific.
2. Falconiformes are carnivorous (Bird of prey), hunting by sight during the day (diurnal) or at twilight. Thy feed mostly on vertebrates.
3. Retina of the eye contains mainly cones, power of vision is extremely sharp and are exceptionally long-lived.
4. Typically falconiformes have prominent hook-like beak with cutting edge. The lower beak remain enclosed by the sharply hooked upper beak to tear up the prey.
5. They also have strong legs, feet with hooked and pointed claws (talons), except vultures, and an opposable hind claw for capturing and holding onto prey.
6. Represented by 304 species.

Examples: American king vultures, Vultures, Secretary birds, Falcons, Osprey, sparrow hawks, Eagles, Kites, Buzzards (Fig.22).

Falcon *Falco sp.*

Eagle *Aquila sp.*

Sparrowhawk *Accipiter sp.*

Black vulture

American king vulture

Secretory bird

FIGURE 22: Some birds of prey.

Order 12. Cuculiformes (L., cuculus = cuckoo)

1. In all the members, the pattern of digits in the leg is the same, which are **zygodactylus**, where legs possess four-clawed digits, two directed anteriorly and others backwardly placed.
2. Good flyers and possess broad wings except roadrunners bad flyers.
3. Some species are parasitic (brood parasites), where the female always lays her eggs in the nest of other birds. Other species build a nest of twigs on a tree branch.
4. They are feed on insects and other small invertebrates, but roadrunner feed also on rattlesnakes and koels are unusual among the cuckoos in being largely frugivorous as adults.
4. Represented by 150 species.

Examples: Cuckoos, Asian koels (*Eudynamys scolopaceus*)**, anis, Roadrunners, Touracos (Fig.23).**

Cuckoos, Asian koels are brood parasites.

Touracos which are African birds sometimes put into a separate order called Musophagiformes.

Asian koel *Eudynamys scolopaceus* **Cuckoo *Cuculus sp.*** **Ani *Cratophaga ani***

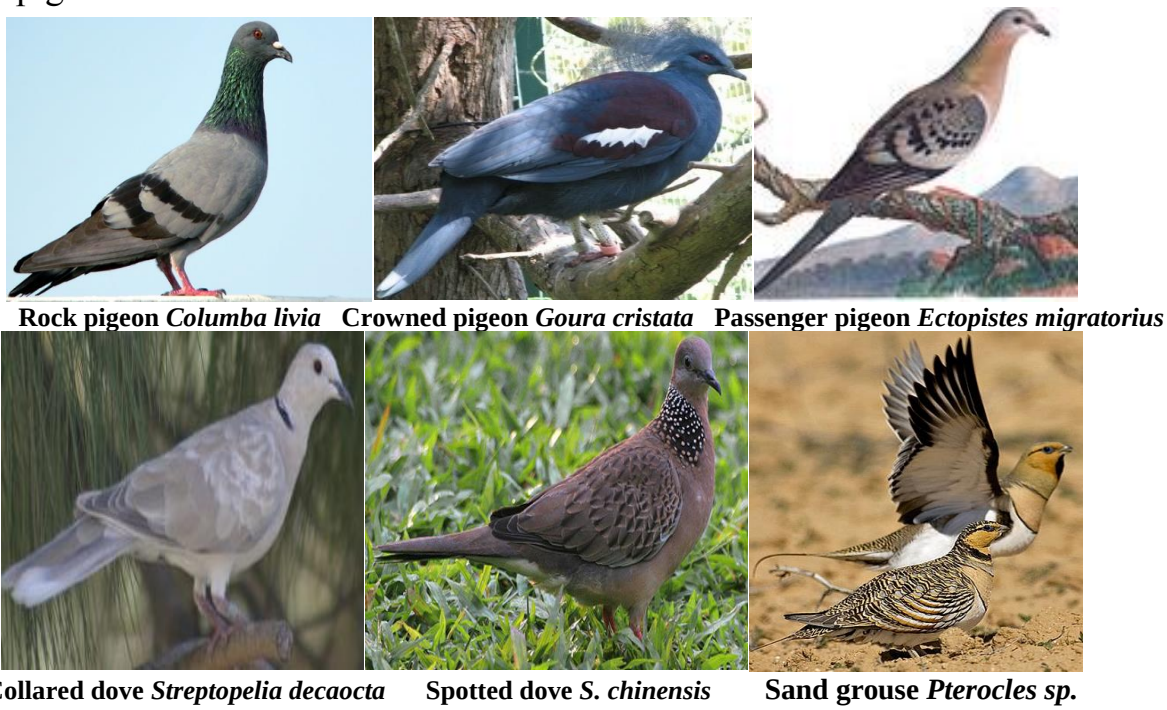
Roadrunner *Geococcyx sp.* **Touraco *Tauraco sp.***

FIGURE 23: Cuckoo and its relatives.

Order 13. Columbiformes (L., Columba = dove)

1. Basal part of the weak beak has a covering of soft skin **(cere)** that bears longitudinal slit-like nostril.
2. Well-developed wings make them good flyers.
3. Small legs. Each foot has four toes, three of which are forwardly directed and one is backwardly directed, all with straight claws.
4. Feed on grains and fruits.
5. Represented by 310 species, include: pigeons, doves, sand grouses.

Examples: Blue rock pigeon, green pigeon, crowned pigeon, passenger pigeon, collar dove, Spotted dove, sandgrouse (Fig.24). Both dove and pigeon can be called pigeon.



Rock pigeon *Columba livia* **Crowned pigeon *Goura cristata*** **Passenger pigeon *Ectopistes migratorius***

Collared dove *Streptopelia decaocta* **Spotted dove *S. chinensis*** **Sand grouse *Pterocles sp.***

FIGURE 24: Some species of pigeons, doves and sandgrouse.

Order 14. Galliformes—Landfowl (chickenlike birds) (L., gallus= a cock)

1. Non-migratory in habit.
2. Beaks are strongly built and arched, most suitable for picking up grains and seeds.
3. In most members, the wings are short and round, for this reason, these birds cannot fly well, but all are good runners.
4. Powerful clawed legs used for scratching the soil to search food.
5. Adult male Galliform birds have a sharp, horny spur on the back of each leg, which they use for fighting other males.
6. Three toes are anteriorly directed and one is posteriorly directed.

7. Sexual dimorphism is present in size; coloration or secondary sex characteristics.
8. Represented about 290 species.

Examples: Hoatzin, Curassows, Guinea fowls, Turkey, Patridges, quail, pheasant, Jungle fowl, Peafowl, Grouse (Fig.25).

Guinea fowl *Numida sp.*

Turkey *Meleagris sp.*

Chukor *Alectoris sp.*

Quail *Coturnix sp.*

Pheasants

Jungle fowl *Gallus sp.*

Peacock and peafowl *Pavo sp.*

Patridge *Francolinus sp.*

Seesee *Ammoperdix sp.*

FIGURE 25: Galliform species.

Order 15. Passeriformes (L., passer = sparrow)

1. Passeriformes is the largest of all the bird order and orders of land vertebrates, containing some 60% of living birds. Sometimes known as perching birds.
2. Most passerines are smaller than members of other avian orders. The heaviest and largest passerine is the thick-billed raven.

3. The passerine family Corvidae, which includes crows, ravens, rooks, jackdaws, jays, and magpies, has been found to contain the most intelligent birds. Based on the brain-to-body ratio.
4. The foot of a passerine has three toes directed forward, without any webbing or joining, and one toe directed backward. Digits are typically arranged to allow gripping of the perch (perching birds).

Examples: Listed in Fig.(26).

House sparrow *Passer domesticus* **Cardinal *Richmondina sp.*** **Yellow warbler *Dendroica sp.***

Starling *Sturnus vulgaris* **Bird of paradise** **Raven *Corvus corax***

Jackdaw *Corvus monedula* **Crow *Corvus sp.*** **Magpie *Pica pica***

White wagtail *Motacilla alba* **Swallow *Hirundo rustica*** **Lark *Galerida cristata***

FIGURE 26: Some common types of passerines.