

## DIGESTIVE SYSTEM

- No teeth, lips, labial and intermaxillary glands.
- The tongue is thin, long and covered with a keratin.
- **Terminal part of the digestive system; receives genital ducts and ureters**

**Ceca:** Located at the end of the small intestine

- Well developed in herbivorous bird
- Serve as fermentation chambers

# CIRCULATORY SYSTEM

- BIRDS ARE **THE FIRST WARM-BLOODED** VERTEBRATE ANIMAL.
- THE FIRST GROUP WHICH **PULMONARY (LUNG) AND SYSTEMIC (BODY) CIRCULATION ARE SEPERATED** WITHIN THE VERTEBRATE ANIMALS.

The right ventricle pumps blood to the lungs

The left ventricle pumps blood to the rest of the body

Heart with 4 chambers

The relatively large hearts because of may be necessary to meet the high metabolic demands of flight.

Heartbeat is extremely fast

# RESPIRATORY SYSTEM

Differs radically from the lungs of other vertebrate animals because of **adapted for meeting the high metabolic demands of flight.**

- The finest branches of the bronchi are developed as tubelike **Parabronchi** through which air flows continuously
  - **9 interconnecting air sac** located in pairs in the thorax and abdomen
  - Even extended by tiny tubes into the centers of the long bones
  - During inspiration, the air filled in the air sac;
  - During expiration air used in the lungs exhaled
- Thus, capillaries in the lungs always come into contact with air containing high oxygen content.**

Birds produce sound through the **syrinx (sound box)**

- There are several membranes called as **tympanic membrane** attached to syrinx.
- When the air flows over them the membranes are vibrated and generate sound.
- Also, there are sets of muscles which changed the shape and length of these membranes, resulting in different sounds depending on their shape and tension.

# Why Birds Make Sound?

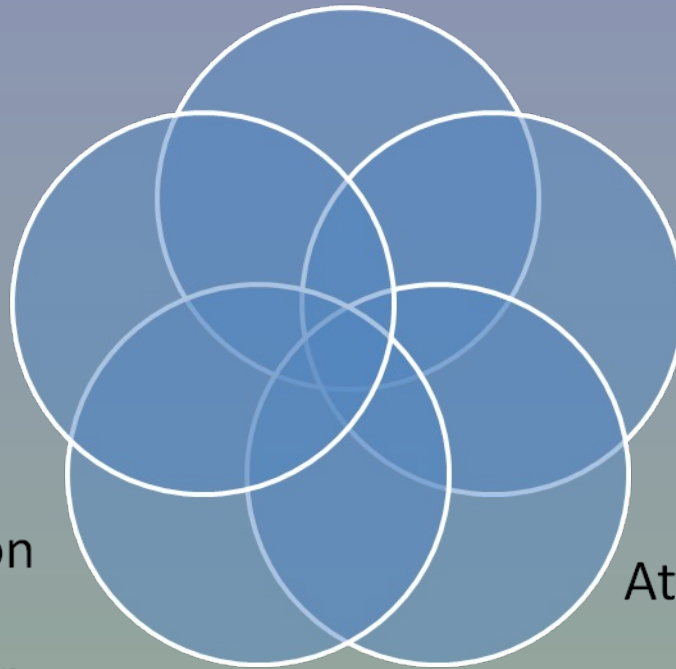
Gathering  
(Forming a Flock)

To inform the  
danger

Report  
breeding/spawn  
ing areas to  
other birds

Communication  
between  
mother, father  
and offspring

Attracting opposite  
sex during the  
breeding season



# EXCRETORY SYSTEM

Urine is formed in the relatively large, paired metanephric kidneys by glomerular filtration followed by selective modification of the filtrate in the tubule.

Urine passes by of **ureters** to the **cloaca**.

- The role of bird kidneys is **filtration, excretion or secretion, and absorption**.
- They filter water and some substances (glucose, salt, etc) from blood, such as waste products of metabolism and ions, that are voided in the urine.
- Kidneys also play an important role **in conserving water and reabsorbing needed substances**.

- The functional unit of the kidney is the **nephron**.
- Avian kidneys have two kinds of nephrons. A **reptilian-type**, with no loops of Henle are located in the cortex, and a **mammalian-type** with long or intermediate length loops, are located in the medulla.
- In birds, only a small percentage of nephrons (15-25%) contain a loop of Henle (i.e., looped nephrons).
- Like reptiles, birds excrete their nitrogenous wastes as **uric acid**.
- There is no urinary bladder in any bird except **ostrich**.
- Salts entering the body in various ways in the sea birds are expurged with **salt gland** located above each eye

## NERVOUS SYSTEM and SENSE ORGANS

The senses of **smell and taste** of some birds are poor, but relatively well developed such as carnivorous birds.

Optic lobes are well developed

Olfactory lobe is small enough

12 pairs of cranial nerves

- Bird's have good hearing.
- The ear consists of three regions: **External ear; middle ear; inner ear.**
- **External ear;** a sound-conducting canal extending to the eardrum
- **Middle ear;** containing a rod-like **columella** that transmits vibrations.
- **Inner ear;** containing the organ of hearing, the **cochlea (shorter than mammal)**



# REPRODUCTIVE SYSTEM

- Separate sexes
- Internal fertilization; external development
- During most of the year the **testes** of males are tiny, bean-shaped structure.
- At the breeding season, they enlarge greatly (about 300 times).
- Most of species lack a copulation organ (penis).
- Swift and hawk have got copulation organ and copulate in flight
- The vas deference which parallel to the urethra is connected to the cloaca.
- **In females** of most birds, **only left ovary and oviduct develop.**
- Eggs discharged from the ovary enter the expanded end of the oviduct, where fertilization occur.
- Several hours later, while eggs are passing down the oviduct, albumin or egg white, from special glands is added to them
- Further down the oviduct, shell membrane, shell, and shell pigments are also secreted around the eggs.

# MIGRATION AND NAVIGATION

Birds that migrate to the warmer regions at the beginning of winter and return to the old breeding zones in the spring are called the **Migratory Birds**.

Reasons to migrate birds;

- Breeding
- Finding food
- Reducing energy
- Photoperiodism-Sunlight

- The migration time of birds is under the control of the endocrine system.
- Most migratory birds have well-established routes trending north and south.

# NAVIGATION

Magnetic field change

The position of the sun and the  
star in the sky

Insinctive

Wind

Odor

# CALSSIFICATION OF LIVING BIRDS

- About 9.000 birds species recorded in the world
- About 465 birds species recorded in Turkey.

**Class:** AVES

**Superorder:** Paleognathae

Modern birds with ancestral archosaurian plate

**Orders**

Struthioniformes; Rheiformes;

Casuariiformes;

Apterygiformes; Tinamiformes

**Superorder:** Neognathae

Modern birds with felxible palate

**25 orders** (Ansriformes; Galliformes; etc.)