

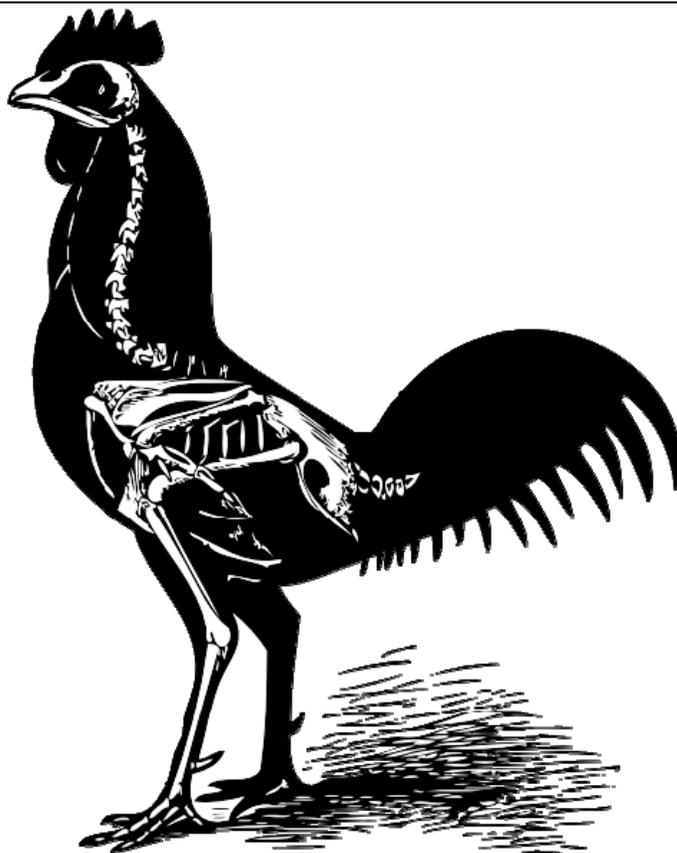
The avian skeletal system

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All animals have a skeleton to allow them to stand up and to protect their internal organs and tissues. The avian **skeletal system** looks similar to those of their mammalian counterparts, but there are some important differences. Many of these differences relate to the bird's need to be light enough to fly while still maintaining the needed body support.

Some important differences between the skeletons of birds and mammals are listed below.

1. Some of vertebral sections are fused together to provide the rigidity required for flight.
2. The **sternum** provides a large surface area for the strong attachment of the main flight muscles.
3. The size of the head has been reduced significantly when compared to other species. A large head would make flying more difficult.
4. The tail has been reduced to a very short section of fused bones called the **pygostyle** (sometimes referred to as the Parson's nose or the Pope's nose).
5. The ribs have been modified by the inclusion of the **uncinate process** which refers to overlying flaps projecting off the ribs connecting ribs to the ones beside them. This gives strength to the rib cage so that it won't collapse during flight.
6. The neck is quite long in most species to enable the bird to:
 - Protect the delicate tissues of the brain from too much jarring when landing - the flexibility of the neck acts as a shock absorber



- Aid in the reaching of food located on the ground - the rigid body makes this simple activity more difficult without this modification
- Aid in the adjustment of the center of gravity needed when the bird changes from the upright position of walking or perching to the more horizontal position of flight

The bones of birds are also lighter in weight than those of their mammalian counterparts. Some of the bones are hollow and actually act as part of the **avian respiratory system**. They are called **pneumatic bones** (pronounced New-Matic) and include the skull, humerus, clavicle, keel (sternum), pelvic girdle, and the lumbar and sacral vertebrae.

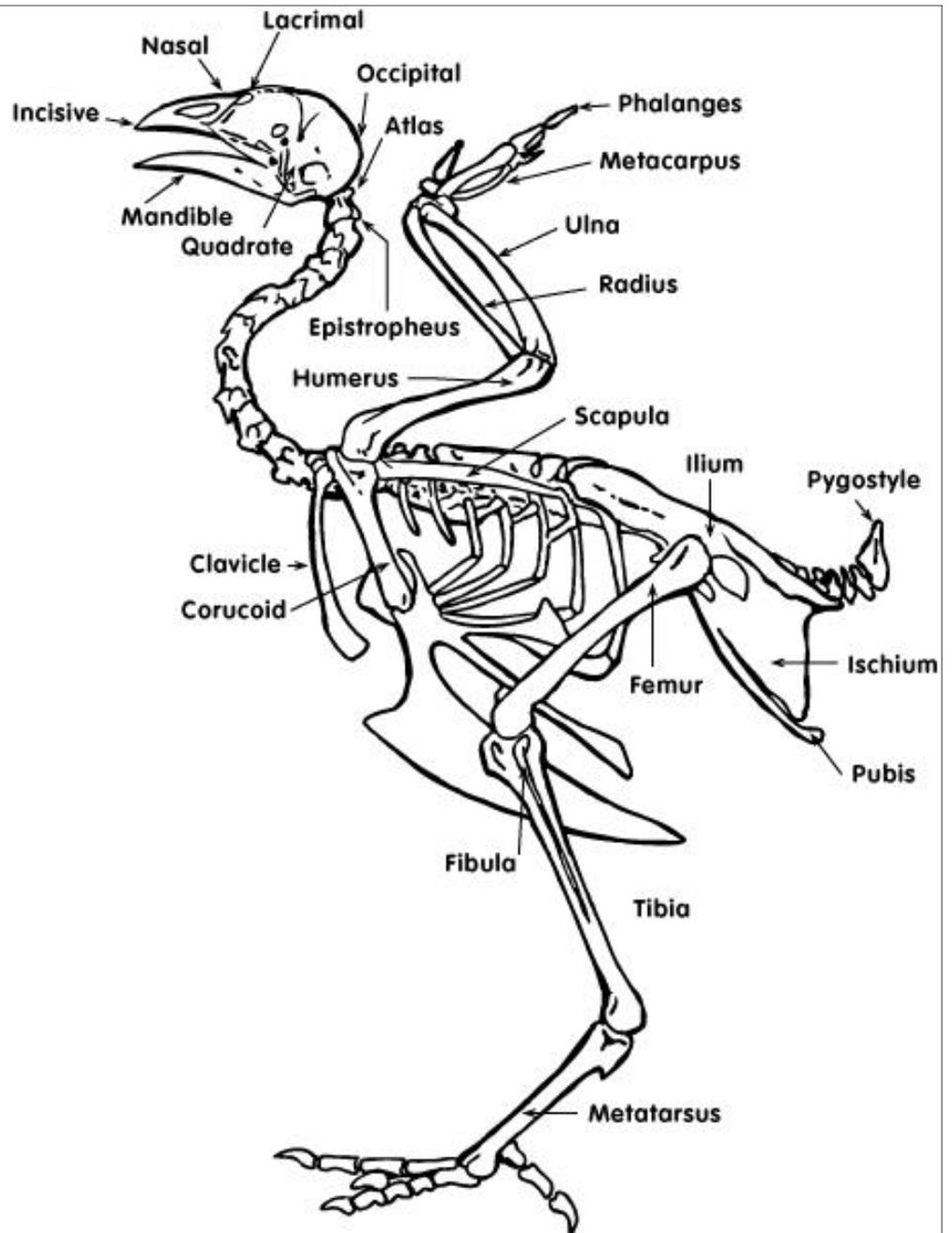


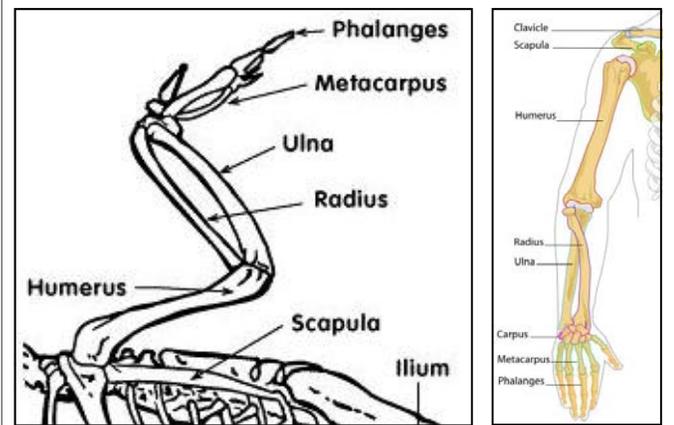
Figure 1. A labeled diagrammatic representation of the chicken skeleton

Another important type of bone in the avian skeleton is **medullary** (pronounced Med-U-Larry) bones. These include the tibia, femur, pubic bone, ribs, ulna, toes and scapula. Medullary bones are an important **source of calcium** when hens are laying eggs. Egg shells are primarily made of calcium and a hen mobilizes 47% of her body calcium to make an egg shell. When in production, a commercial-type laying hen cannot obtain enough dietary calcium to allow for daily egg production. Without medullary bone to draw calcium from, the egg shells would be very thin and weak.

While there are some important differences between the skeletons of birds and other animals, there are also several similarities. Both have the same general skeletal structure.

Figure 2 on the next page compares the bones of a chicken wing with that of a human arm. Both have a humerus, radius, and ulna. The main difference is that the phalanges that make up the fingers of people are fused in birds to allow for the attachment of feathers.

Figure 2. Comparison of the chicken (left) and human (right) arm bones



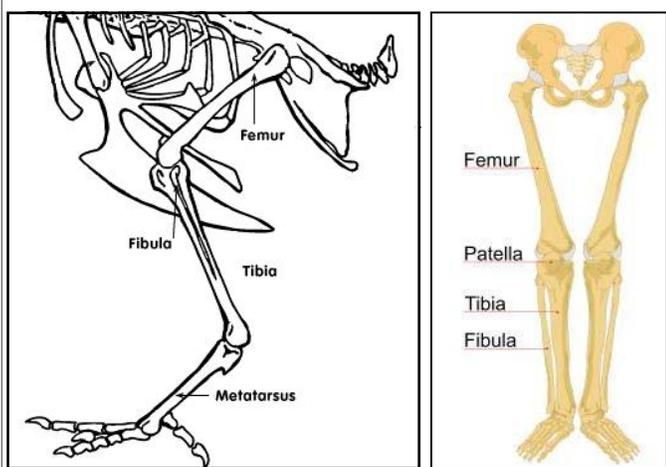
The common joints of the arm are easily identifiable in both the chicken and humans.

- Joint between humerus and scapula = shoulder
- Joint between humerus and radius/ulna = elbow
- Joint between radius/ulna and metacarpus = wrist.

Similarly, Figure 3 compares the bones of a chicken leg with that of a human leg. Again, they both have a femur, fibula, and tibia. The femur of a chicken holds the thigh meat while the fibula/tibia combination holds the meat of the drumstick. Comparing the leg joints is not quite as obvious as with the arm.

- Joint at the top of the femur = hip
- Joint between femur and the fibula/tibia = knee
- Joint between fibula/tibia = ankle

Figure 4. Comparison of the chicken (left) and human (right) leg bones.



The metatarsus of a chicken is known as the **shank**. The chicken walks up on its toes.

SUMMARY

Aside from the obvious role of **structural support**, the chicken's skeletal system has two additional functions: **respiration** and **calcium transport**.

The skeletal system of a chicken is compact and lightweight, yet strong. The tail and neck vertebrae are movable, but the body vertebrae are fused together to give the body sufficient strength to support the wings. There are two special types of bones which make up the chicken's skeletal system: the pneumatic and medullary bones.

The **pneumatic bones** are important to the chicken for respiration. They are hollow bones which are connected to the chicken's respiratory system and are important for the chicken to be able to breath. Examples of pneumatic bones are the skull, humerus, clavicle, keel (sternum), pelvic girdle, and the lumbar and sacral vertebrae.

The **medullary bones** are an important source of calcium for the laying hen. Calcium is the primary component of egg shells and a hen mobilizes 47% of her body calcium to make an egg shell. Examples of medullary bones are the tibia, femur, pubic bones, ribs, ulna, toes, and scapula.

**WHEN RESTRAINING BIRDS,
REMEMBER THAT THEY CAN
SUFFOCATE IF THE BREAST
BONE IS NOT FREE TO MOVE IN
AND OUT!**

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