

Lab Practical 2:
Apodiformes - Passeriformes
= Male and Female
*** = Specimen out only once**

Apodiformes

Apodidae

White-throated Swift

Trochilidae

Anna's Hummingbird

Black-chinned Hummingbird

Calliope Hummingbird

Coraciiformes

Alcedinidae

Belted Kingfisher

Piciformes

Picidae

Acorn Woodpecker

Downy Woodpecker

Lewis' Woodpecker

Northern Flicker

Nuttall's Woodpecker

Red-breasted Sapsucker

Red-naped Sapsucker

Passeriformes

Tyrannidae

Ash-throated Flycatcher

Black Phoebe

Cassin's Kingbird

Pacific Slope Flycatcher

Say's Phoebe

Western Kingbird

Western Wood Pewee

Laniidae

Loggerhead Shrike

Corvidae

American Crow

Clark's Nutcracker

Mexican Jay

Steller's Jay

Western Scrub-Jay

Alaudidae

Horned Lark

Hirundinidae

Cliff Swallow

Tree Swallow

Violet-green Swallow

Timaliidae

Wrentit

Paridae

Mountain Chickadee

Oak Titmouse

Aegithalidae

Bushtit

Sittidae

Pygmy Nuthatch

White-breasted Nuthatch

Troglodytidae

Bewick's Wren

Cactus Wren

House Wren

Rock Wren

Cinclidae

American Dipper

Regulidae

Ruby-crowned Kinglet

Turdidae

American Robin

Hermit Thrush

Swainson's Thrush

Western Bluebird

Mimidae

California Thrasher

Crissal Thrasher

Northern Mockingbird

Sturnidae

European Starling

Motacillidae

American Pipit

Bombycillidae

Cedar Waxwing

Ptilonotidae

Phainopepla

Parulidae

Common Yellowthroat

MacGillivray's Warbler

Orange-crowned Warbler

Townsend's Warbler

Wilson's Warbler

Yellow-breasted Chat

Yellow-rumped Warbler

Thraupidae

Western Tanager

Emberizidae

Abert's Towhee

California Towhee

Dark-eyed Junco

Golden-crowned Sparrow

Green-tailed Towhee

Lincoln's Sparrow

Sage Sparrow

Savannah Sparrow

Spotted Towhee

White-crowned Sparrow

Cardinalidae

Black-headed Grosbeak

Blue Grosbeak

Lazuli Bunting

Icteridae

Brewer's Blackbird

Brown-headed Cowbird

Bullock's Oriole

Hooded Oriole

Red-winged Blackbird

Tricolored Blackbird

Western Meadowlark

Yellow-headed Blackbird

Fringillidae

Cassin's Finch

House Finch

Lesser Goldfinch

Pine Siskin

Passeridae

House Sparrow

SKELETAL SYSTEM ANATOMY

In this section you will utilize skeletons and disarticulated bones to identify internal structures. Read the descriptions carefully. Written descriptions are usually more helpful than the pictures.

The skeleton of a bird is notable in two respects; (1) there is a strong tendency for adjacent bones to be fused, and (2) the skeleton is very light due to the pneumatic (hollow) nature of the bones. You should note these aspects as you examine the skeletons provided as well as any other displays that may be available. For convenience, the skeletal discussion to follow will be divided into (1) bones of appendicular skeleton, (2) bones of the trunk, and (3) bones of the head. You are responsible only for those bones listed in this discussion. Use the illustrations to help locate them.

The Appendicular Skeleton (Fig. 13)

Birds have the usual appendicular skeleton found in vertebrates, i.e. a pelvic girdle with hind limbs, and a pectoral with forelimbs. The girdles and limbs consist of three bones each on the left and right sides. Additional small bones are present in the feet and manus ("hands"; wings).

The skeletal system of the limbs is adapted to two modes of locomotion; the legs for bipedal locomotion (walking, hopping), and the wings for flight.

Pelvic Girdle and Leg Bones - The first three bones listed constitute the pelvic girdle, a fusion of bones similar in many vertebrates. The fusion of these three bones is referred to as the **innominate** bone. These bones arise separately, but all articulate to form a cavity for articulation with the femur called the **acetabulum**. The innominate is fused to the **symsacrum** (see below).

A key feature of the pelvic girdle in birds is that the pubis is retrograde, that is oriented toward the posterior of the animal. The only other vertebrates with this particular feature were the theropod dinosaurs.

Ilium

the entire dorsal part of the innominate. It is concave anteriorly and convex posteriorly.

Ischium

ventral to the ilium.

Pubis

long slender bone ventral to the ilium, projecting to the posterior. Note that the distal end tends to have a swelling (more noticeable in some specimens than in others). The swelling is called a **boot**.

Femur

a stout cylindrical bone whose proximal part bends inward. The prominent **head** is received by, and articulates with, the pelvic girdle. The **head** of the femur articulates with the pelvic girdle in the **acetabulum** (see above).

Trochanter

not a separate bone, but rather an irregular projection extending beyond the proximal end of the shaft of the femur for muscle attachment.

Patella

the kneecap, located at the distal end of the femur.

Tibiotarsus

a fusion of the tibia and some tarsals. This bone forms the main part of the middle of the leg along with fibula.

Fibula

only a splinter of a bone, mostly fused with the tibiotarsus.

Tarsometatarsus

the metatarsals and some tarsals are fused to form this elongated "ankle" bone from which the toes arise.

Phalanges

the bones of the digits (the "toe bones").

Pectoral Girdle and Wings (Figs. 13 and 14)

The pectoral girdle consists of three pairs of bones (coracoids, scapulars, clavicles) that support the wing:

Coracoids

stout bones that brace the shoulder against the sternum.

Scapulars

Flat, strap-like bones that brace against the ribs.

Clavicles

fused to each other for support. The fusion occurs anteriorly and forms the **furcula** (see below).

Furcula

this fusion of the two clavicles is popularly known as the "wishbone". During flight, the furcula acts as a spring. At the end of the power stroke of the wing, the clavicles are pushed medially. When the flight muscles are relaxed, the clavicles "spring" laterally, which helps elevate the wings (raise the wings.)

Foramen Triosseum

three of the bones above (coracoid, scapula, clavicle) unite to form this opening, through which the tendon of the supracoracoideus muscle (an important flight muscle) passes. The tendon inserts on the dorsal aspect of the humerus. This serves as a pulley which helps elevate the wings, but more importantly pulls the wing toward the midline as the muscle contracts. Thus, the muscle that helps elevate (dorsally) and supinate the wing (toward midline) is actually on the ventral side of the bird.

Glenoid Cavity

a cup where the coracoids and the scapulars come together. The cup is the point of articulation for the **humerus**.

Humerus

the short thick bone that attaches to the pectoral girdle.

Radius

the slender, straight bone that articulates with the humerus.

Ulna

more stout than the radius and parallel to it. The outer edge of this bone has small bumps (papillae) where the secondary flight feathers attach.

Carpals

the two squarish bones at the end of the radius and ulna. Actually a fusion of many carpals.

Metacarpals

once again, a lot of fusion here. These bones are similar in appearance to the radius and ulna and may look like one large bone instead of many small ones.

Phalanges

Bones of the digit (the "finger bones"). Only three digits persist in the manus (hand) of birds: digit one, at the junction of the carpals and metacarpals, and digits two and three, which are fused at the end of the wing.

Fig. 13

LIMBS

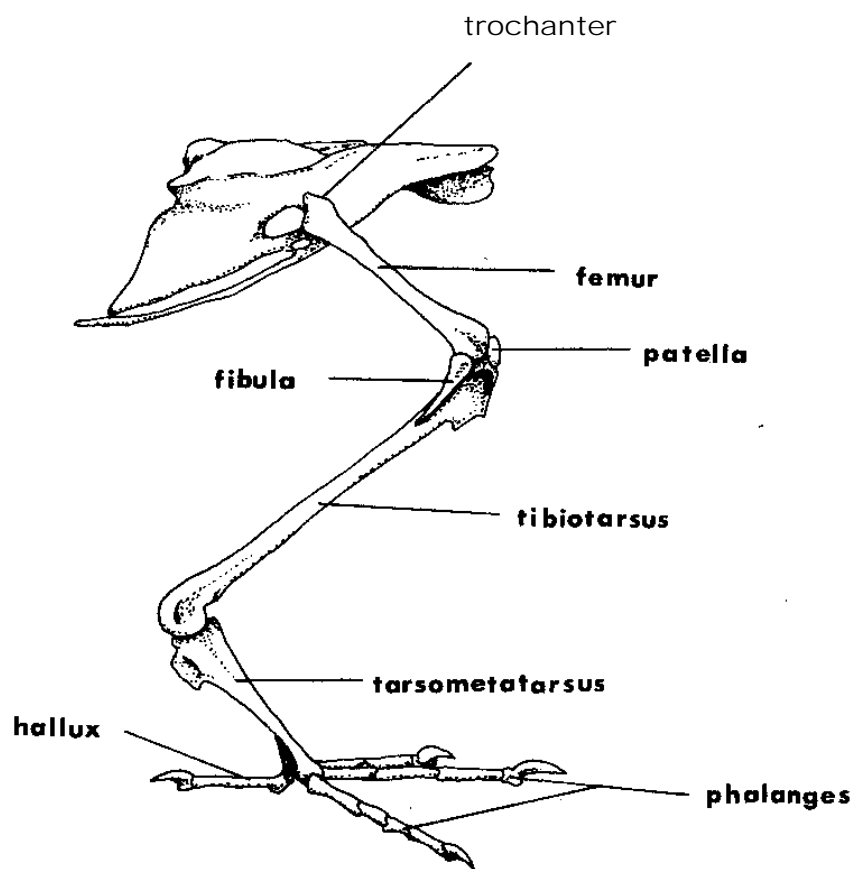
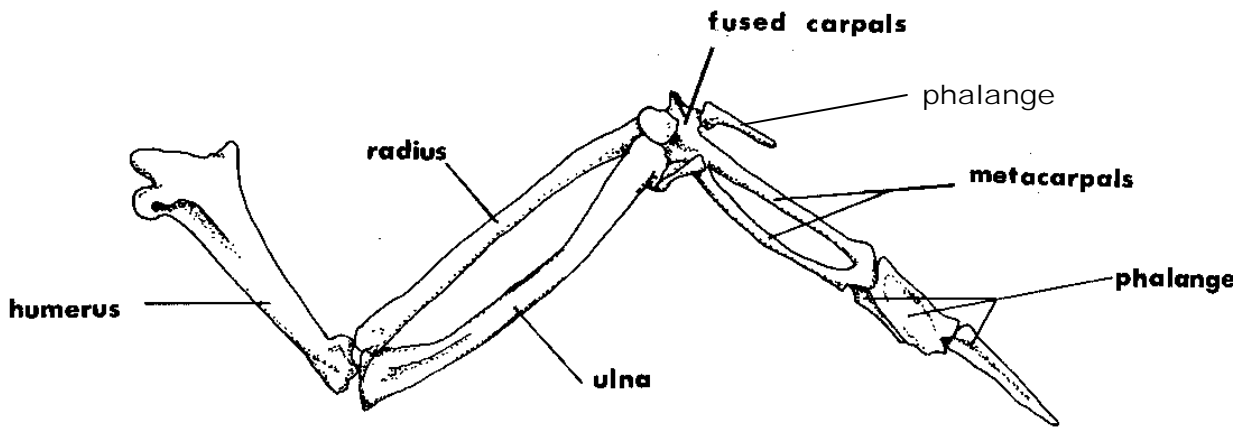
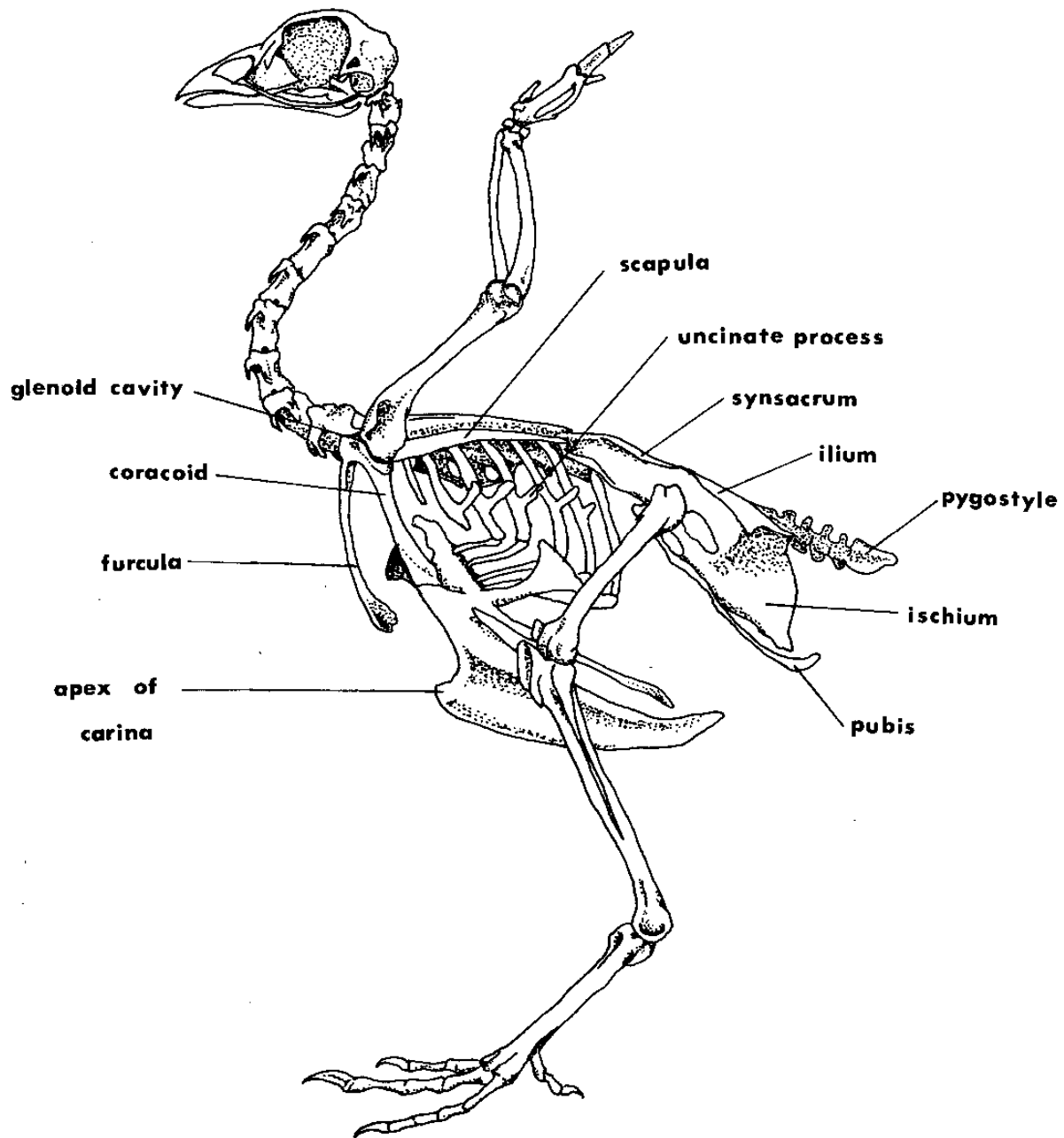


Fig. 14

SKELETON (chicken)



Trunk (Fig. 14)

Vertebral Column - The vertebral column of birds is generally very flexible due to the structure of the individual vertebrae. The main body of each vertebrae (the **centrum**) is convex dorso-ventrally, concave from side to side on the anterior end. In order to see that the centrum is convex dorso-ventrally, look at the vertebrae from the side (lateral view). The reverse shape occurs posteriorly. This condition is called **heterocoelus** and it allows the vertebrae to articulate like two saddles fitted together. Look at the skeletons provided, especially in the neck region, and also examine any loose vertebrae that may be available.

Synsacrum

A fusion of the last few thoracic, all of the lumbar, all of the sacral, and the first few caudal vertebrae. Reduction of flexibility in this location is necessary to allow increased strength. When the powerful flight muscles contract, a large torque is applied to the back. Without this fusion of bones, the back would break.

Pygostyle

the last several vertebrae are free and mobile, with the last vertebra taking on a plowshare shape (i.e. it comes to a point); called a pygostyle, this last vertebra is the site of attachment of the retrices.

Sternum

one of the most highly specialized parts of the avian skeleton; has a large **carina** (keel) which provides a large surface area for the attachment of flight muscles. In addition to the carina, the sternum of the typical bird has several processes which brace and strengthen. When the carina is large, the sternum is termed **carinate**. A **ratite** sternum occurs in flightless birds. The ratite sternum lacks the carina.

Ribs

some of the ribs do not attach to the sternum and may fuse together ventrally; **uncinate processes** occur on all but the first and last ribs - their function is to give rigidity to the rib cage and serve as sites for muscle attachment.

Skull (Figs. 15 and 16) - use illustrations and loose skulls to identify these structures. Read the descriptions very carefully, the sutures (boundaries between the bones) are often fused and not visible.

The bones that make up the **cranium** enclose the brain and are firmly fixed in position. They consist of:

Occipital

the base or rear of the cranium. The large opening through which the spinal cord passes is the **foramen magnum**. This bone also has an **occipital condyle** which is a ball-like structure for articulation the spinal column. Notice that birds have a single occipital condyle. Mammals have two.

Parietals

a pair of broad, squarish bones that form the back of the cranium as well as the posterior of the roof; bordered on their anterior by the **frontals**.

Frontals

another pair of bones that complete the roof of the cranium and the upper margins of the orbits (eyesockets).

Squamosals

one on each side of the head, forming the posterior edges of the orbits and bordering the lateral edges of the frontals and parietals to complete the roof of the cranium. Behind the orbit, you should notice a depression in the bone. The depression is the origin for large muscles moving the lower jaw, and this depression is in the squamosal.

Sphenoid

a triangular bone forming the base of the cranium; the base of the triangle borders the occipital and the apex projects anteriorly. This bone actually consists of four different parts, but you don't have to know them.

The following structures are not part of the cranium, but are associated with the bones of the cranium:

Optic Foramen

not part of the cranium, this is an opening in the base of each orbit through which the optic nerve passes to the brain.

Interorbital Septum

parts of the sphenoid extend forward and up to form a vertical plate which separates the orbits; may be thick and may have one or more openings between the orbits.

Orbitonasal Septum

another thin plate which separates the orbits from the nasal cavities.

Bones of the Face (Figs. 15 and 16)

includes all the structures anterior to the cranium. Due to the relative size of a bird's eyes and orbits, the face is set somewhat anterior to the cranium, not below it as in a typical mammal, for example, you.

Upper Mandible

the upper half of the beak. Consists primarily of the **premaxilla** and **maxilla** (discussed below).

Lower Mandible

the lower half of the beak. Consists of five bones (the suture lines between these usually cannot be distinguished):

Articular

most posterior; articulates with the skull.

Angular

on the ventral surface; braces the articular.

Surangular

the posterior, lateral face of the jaw.

Dentary

anterior, lateral face of the jaw. In reptiles, this bone would have the teeth.

Splenial

most of the medial surface of the jaw.

Zygomatic Bars

slender bones that extend from the base of the upper mandible to right below the orbits; each consists of three parts:

Quadratojugals

make up most of the zygomatic bars, starting (posterior) at their attachment below the orbits.

Jugal

the anterior ends of the zygomatic bars; much smaller than the quadratojugals.

Maxillae

where the jugal bones fuse to the skull; makes up the posterior part of the upper mandible.

Premaxillae

a pair of bones which fuse to form the tip of the upper mandible; made up of three projections:

Frontal Processes

form the culmen.

Dentary Processes

project back to the maxillae to form the tomia.

Palatal Processes

form part of the palate in the roof of the mouth.

Nasals

each one forms the posterior margins of the external **nares** (nostrils).

Hyoid Apparatus

the bones of the tongue. Specialized in some species, like woodpeckers, for certain feeding strategies that require substantial extension of the tongue.

SKULL (pigeon)

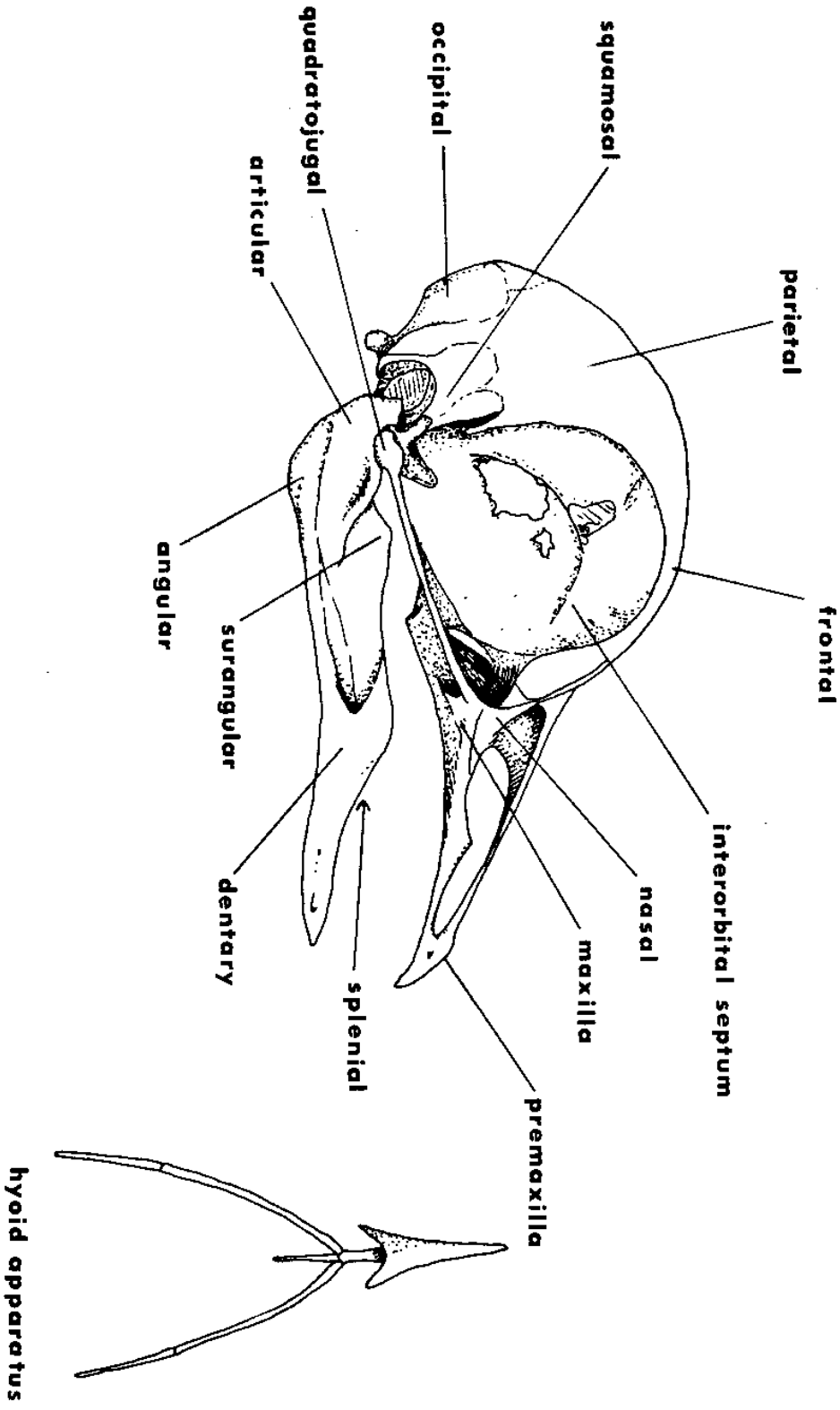


Fig. 15

SKULL (pigeon)

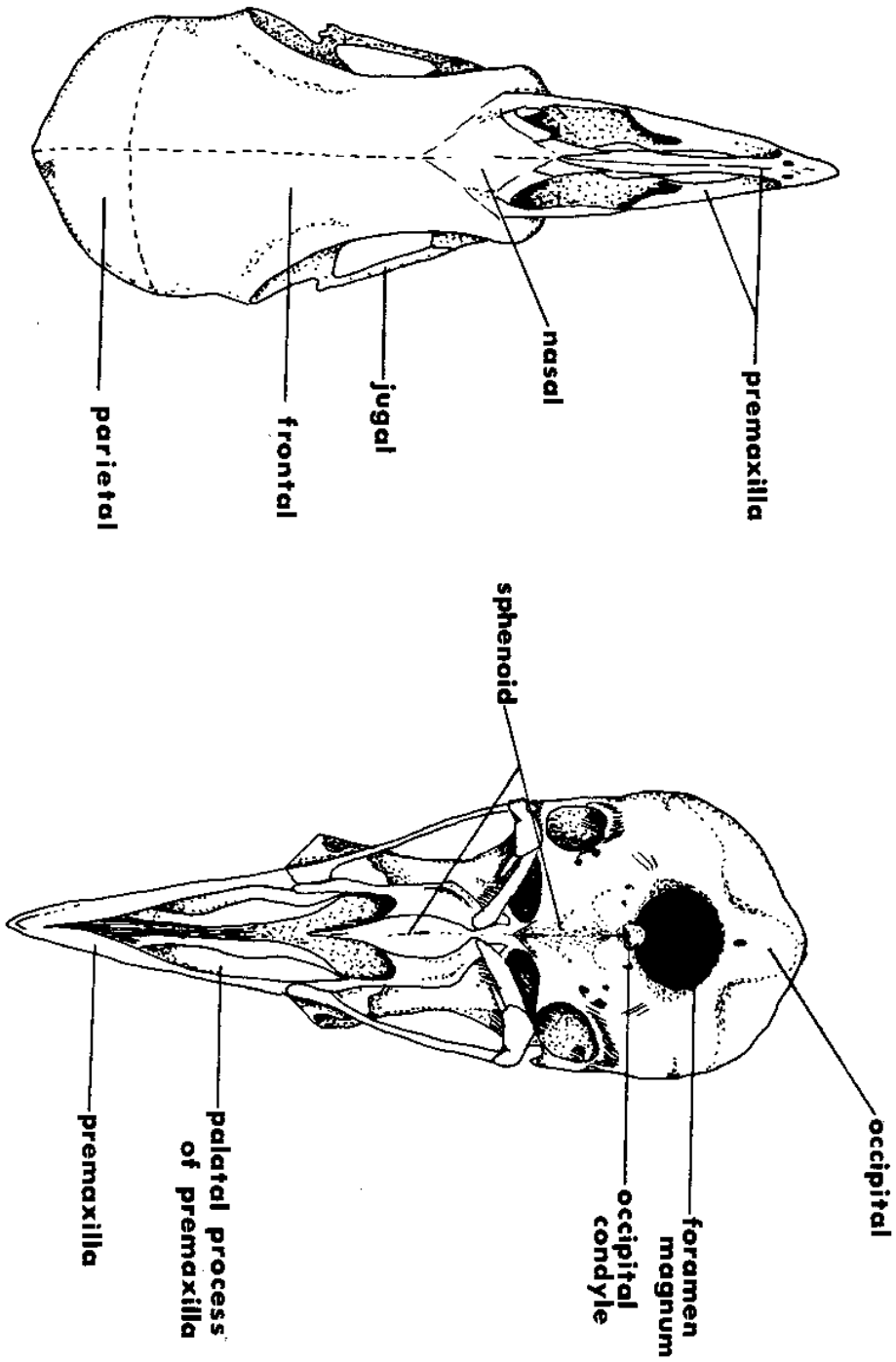


Fig. 16