

Topography

The various parts of the bird's exterior are mapped and described as the topography. Obtain a prepared Rock Pigeon (*Columba livia*) skin and identify all the topographical features listed on the attached figures and indicated in the tables below. Make a drawing of your bird and indicate the locations of all features.

Topography of the Head

Name	Definition
Forehead, or frontal region	The region from the base of the bill posterior to a line drawn to the anterior angle of each eye. The ventral margin is a line drawn between the nostril and the nasal canthus.
Crown	The region just posterior to the forehead. The crown extends from the forehead back to the beginning of the cervical vertebrae of the neck. In crested birds the crown feathers are lengthened.
Lore	The lateral area of the head just posterior to the bill and anterior to the nasal canthus of the eye. The commissure of the mouth forms its lower border. Fleshly and naked of feathers in some birds, often brightly colored, especially during the breeding season.
Superciliary line	A contrasting stripe of feathers above the eye along the side of the head found in many birds (especially sparrows). The supercilium is the region immediately above the eye area.
Eye ring	Two to four tiny concentric bands of feathers surrounding the eye at the edge of the eyelids. Often colored in contrast to the plumage that surrounds the eye, forming a distinctive eye ring, as in the Swainson's Thrush. Absent in the pigeon family.
Narial feathers	Long feathers at the base of the maxilla (upper bill) and extending anteriorly to partially cover the nostrils; present in some groups, such as the crows.
Rictal bristles	Bristle like feathers around the corner of the mouth.
Auricular feathers	A wide lateral patch just ventral and posterior to the eye and covering the ear opening.
Malar region	A patch that extends posteriorly and ventrally from the mandibular ramus, ventral to the commissure of the mouth, and between the auricular feathers of the cheek and the throat feathers. (see male Northern Flicker, or Prairie Falcon).
Commissure, gape	The angle at which the maxilla and the mandible meet.
Nape	The dorsal surface of the neck.

Culmen	The central midline ridge running from the tip of the upper bill back to the base of the bill.
Gonys	The central midline ridge running from the tip of the lower bill back to the anterior end of the head.
Operculum	A soft fleshy structure at the base of the bill in pigeons and starlings that covers the external nares.

Topographic Terminology for the Thorax, Abdomen, and Back

Name	Definition
Ventral Regions	
Throat, upper foreneck, or gular region	Ventral region of the neck extending from just under and below the lower mandible to the anterior margins of the sternum and breast musculature.
Jugulum or lower throat	The most ventral, midline region of the throat.
Breast, chest, or pectoral region	Area of feathering that extends over the musculature of the breast, covering about $\frac{3}{4}$ of the surface of the breast muscles.
Abdomen	The most ventral area along the midline of the body, extending from the posterior $\frac{1}{4}$ of the sternum to the vent or cloacal area.
Crural feathers	The feathers that cover the tibial portion of the leg; visually contiguous with the feathers of the abdomen
Side or flank	The lateral portions of the bird's trunk, extending from the abdominal region up to the base of the wings
Axillary region	The base of the ventral wing, extending from the side out onto the ventral wing lining.
Under tail coverts, cris sum	The loose feathers that surround the cloaca, including the undertail coverts that cover the ventral base of the tail.
Dorsal Regions	
Nape	The dorsal surface of the neck, from the occipital region of the skull posterior to the base of the neck and beginning of the thoracic vertebrae.
Back	The dorsal region of the thorax; roughly, the area of the back between the wings.
Scapulars	The feathers that overlie the scapula bone at the base of the dorsal wing.
Rump	The region that overlies the pelvic bones; lateral boundaries are the flanks along the side of the body just anterior to the tail.
Upper tail coverts	A single row of feathers covering the bases of the tail feathers

Topography of the Wing

On the preserved (“pickled”) Rock Pigeons, identify the following areas and groups of feathers. Pluck one wing of the Rock Pigeons, leaving only remiges. Note that the wing has two prominent angles giving it the shape of the letter Z written backwards. The angle nearest the trunk, pointing toward the tail is the **elbow**. The portion of the wing between the trunk and the elbow is the **brachium**. The angle pointing forward is the **wrist** or the **bend of the wing**. The portion of the wing between the elbow and wrist is the forearm or **antebrachium**. The entire portion of the wing beyond the bend is the hand or the **manus**. Label the feathers on figure 2.

- Flight feathers (remiges)
 - Primaries – arising from the most distal segment of the wing (manus), numbered from the proximal to the distal
 - Secondaries – arising from the most proximal and middle segment of the wing (the brachium and antebrachium respectively), numbered from the distal to the proximal
 - Alular quills – three small flight feathers arising from the first digit along the leading edge of the wing
- Scapulars – arising from the shoulder
- Coverts – include all other feathers of the wing. Occur in rows overlying the bases of the remiges on both the lower and upper surfaces of the wing.

Propose at least one function for the coverts.

Observe the following structures:

Humerus – The short, thick bone at the base of the wing. As in reptiles and mammals, the avian humerus supports the other bones of the pectoral limb.

Radius and Ulna – The supporting bones of the forearm portion of the wing. Note the larger size of the ulna and the attachment of the secondary quills to the posterior surface of the ulna.

Carpometacarpus – In birds the distal wing skeleton is much reduced and simplified version of the standard vertebrate forelimb plan. The carpometacarpus is a fusion of

carpal (wrist) and metacarpal (hand) bones. Note how the carpometacarpus supports most of the primary remiges. Bony remnants of the second and third digits form the most distal portion of the wing skeleton.

Alula – Notice the tiny first digit at the bend of the wrist area in the wing. The first digit phalanges support three small flight feathers, collectively referred to as the alula.

Patagium – The tough fibrous sheet of tissue that connects the shoulder area of the wing to the carpal bones at the wrist.

Postpatagium – A tough band of tendinous tissue that envelops and supports the quills of all the wing remiges from elbow to wing tip. The fleshier humeral patagium connects the elbow to the thorax.

Feet

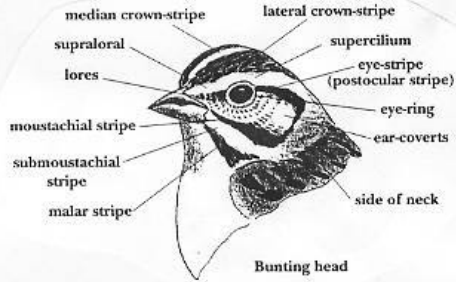
Bird feet are of several types depending on the arrangement of the toes and or the particular function the feet perform. The following ten types are commonly used as characters for distinguishing groups of birds. You should note that each type is subject to variation. Using the list below identify the foot types on display.

1. Anisodactyl – the hallux is behind and the other three toes are in front.
2. Syndactyl – the third and fourth toes (outer and middle) are united for most of their length and have a broad sole in common.
3. Zygodactyl – the toes are arranged in pairs, the second and third toes in front, the fourth and hallux behind.
4. Pamprodactyl – all four toes are in front, the hallux being turned forward.
5. Raptorial – the toes are deeply cleft, with large, strong, sharply curved nails.
6. Semipalmate – the anterior toes are joined part way by a small webbing.

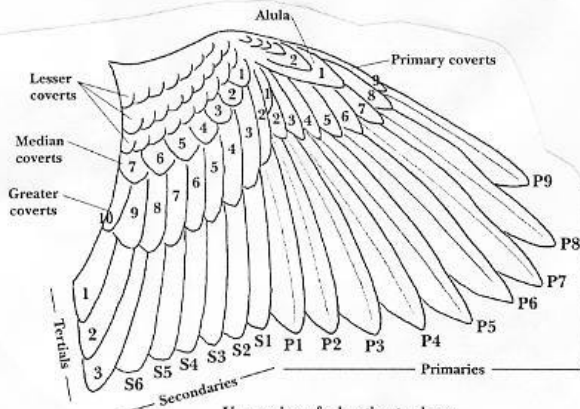
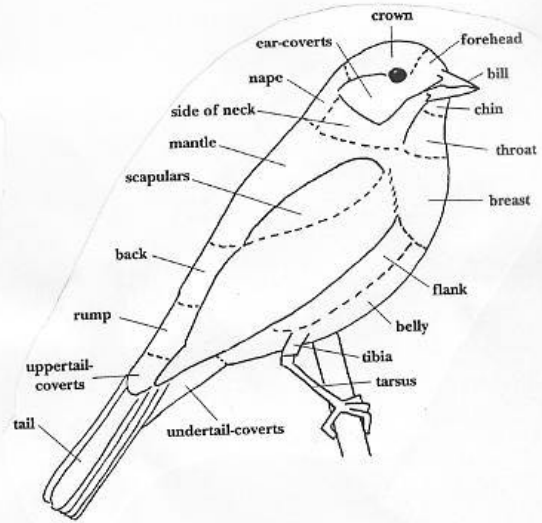
7. Totipalmate – all four toes are united by ample webs
8. Palmate – the front toes are united by ample webs
9. Lobate – a swimming foot with a series of lateral lobes on the toes.

Sometimes the foot may be palmate, but the hallux may bear a lobe.

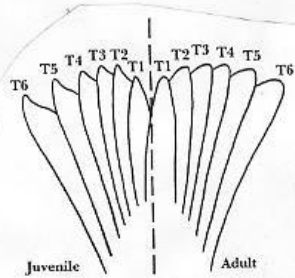
Avian Topography



Bunting head

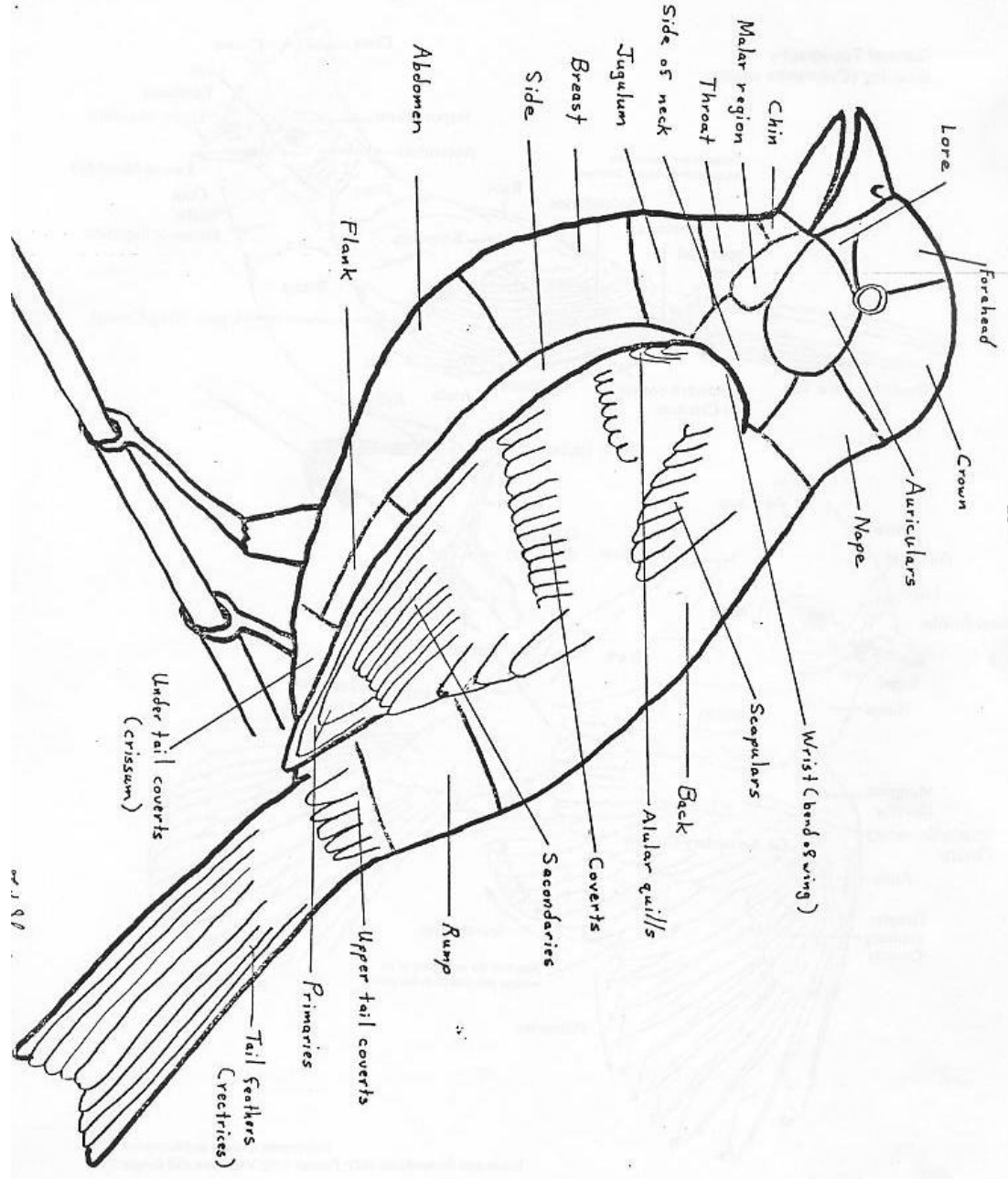


Upperwing of a bunting to show feather numbering



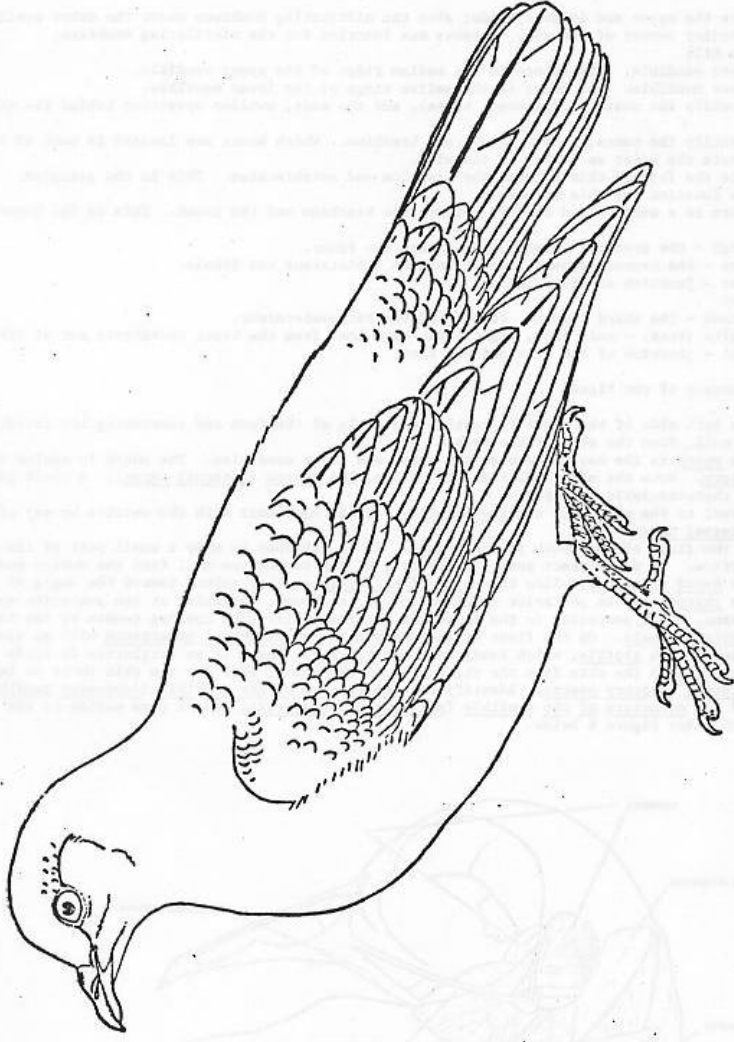
Bunting tail showing feather numbering. Note difference in feather shapes between juvenile (left) and adult (right).

FIG. 1. Topography 13



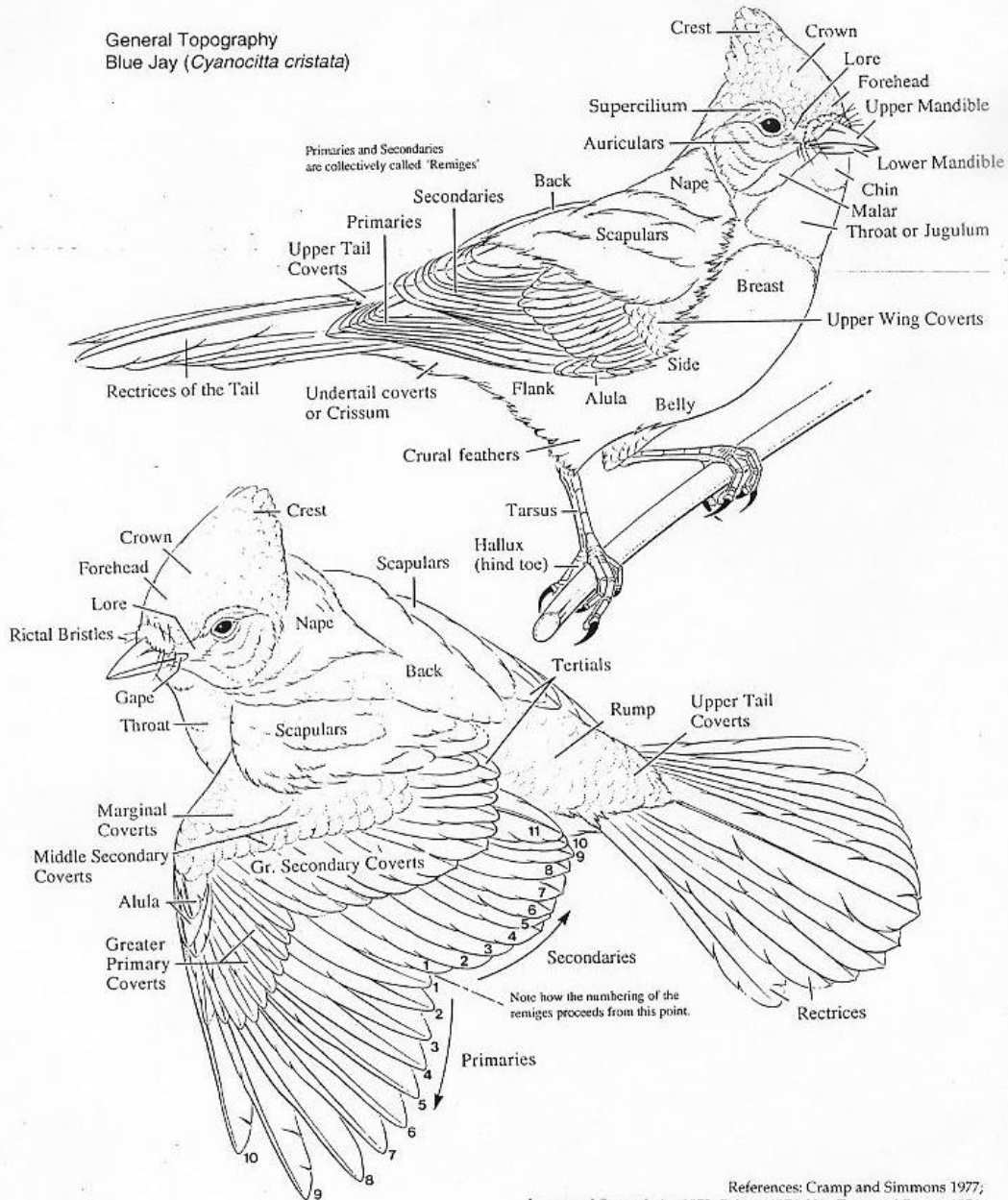
W. J. P.

Plate I

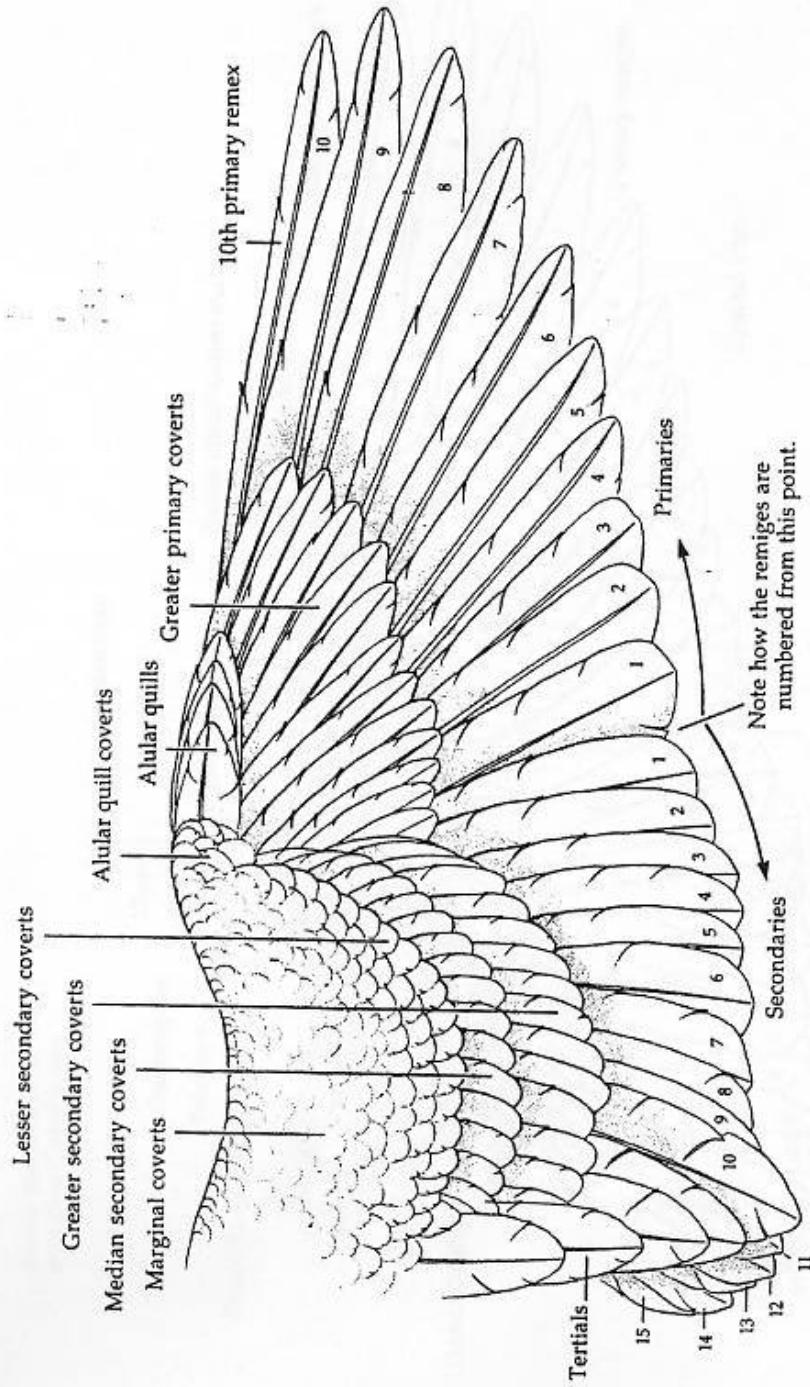


COMMON PIGEON

General Topography
Blue Jay (*Cyanocitta cristata*)

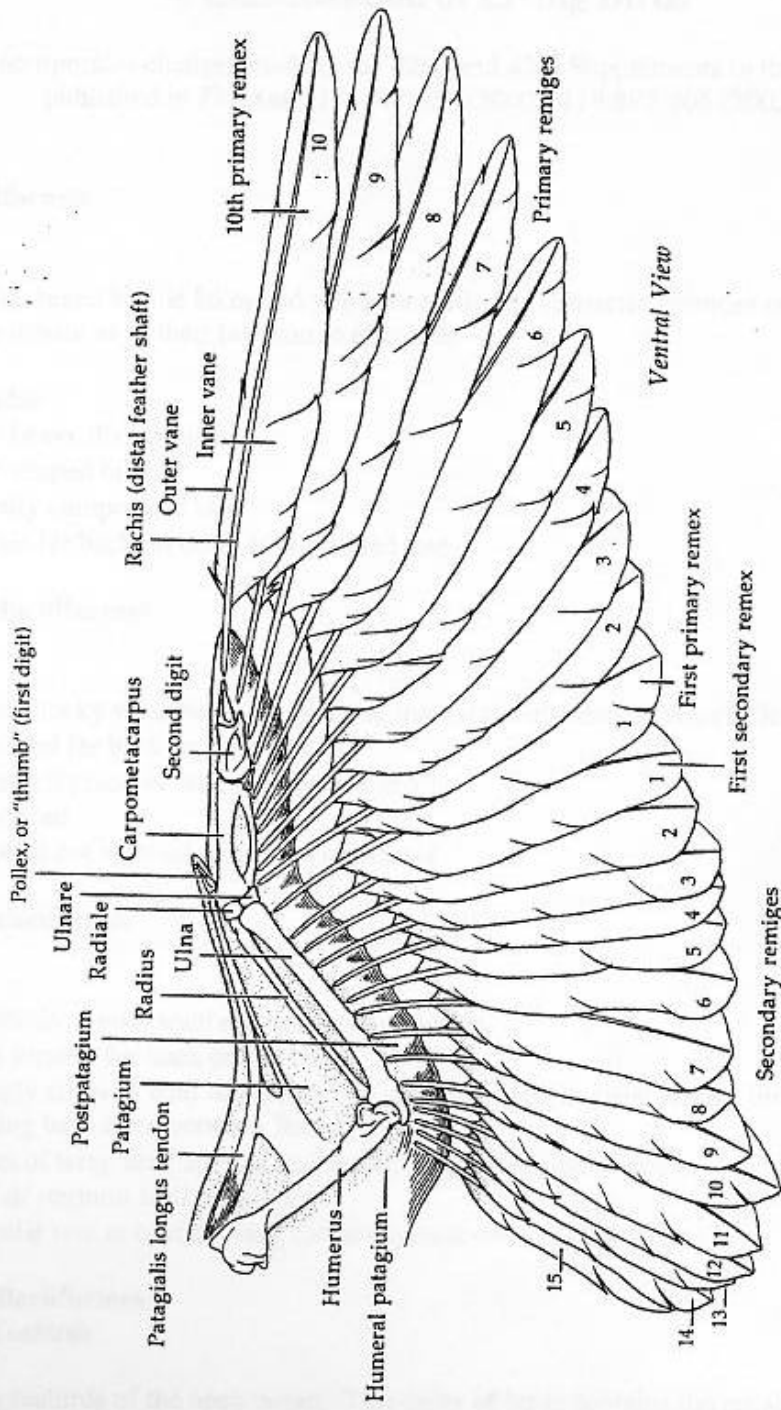


References: Cramp and Simmons 1977;
Lucas and Stettenheim 1972; Palmer 1976; Van Tyne and Berger 1976.



Note how the remiges of the wing are numbered: the primary remiges are numbered from the most proximal remex attached to the manus outward to the outermost primary; the secondary remiges are numbered in the opposite direction, with the numbers increasing in the more proximal secondary remiges.

Internal Structures of the Wing
Rock Dove (*Columba livia*)



The bones of the avian wing have been extensively fused and reduced in number. This results in a strong, light inner framework capable of supporting the major flight feathers. The wing skeleton must efficiently transfer the power of the flight muscles to drive active flight. Note how short and thick the humerus is in the modern pigeon wing. The humerus must bear the main force of the pectoralis major, the massive breast muscle that powers the downstroke phase of active flight. If the humerus were less sturdy it could not bear up against the huge lever forces generated by flight.