

Nomina Anatomica Avium

An Annotated Anatomical Dictionary of Birds

Edited by
Julian J. Baumel

**Auszug, als offizielle Arbeitsgrundlage für
osteologische Einführungsübungen Aves**
Prepared by the International Committee for Avian Anatomical Nomenclature,
a committee of the World Association of Veterinary Anatomists.
Supported in part by the U.S. National Institutes of Health
(NIH Grant LM-2420 from the National Library of Medicine)

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1979

Academic Press
London, New York, Toronto, Sydney, San Francisco

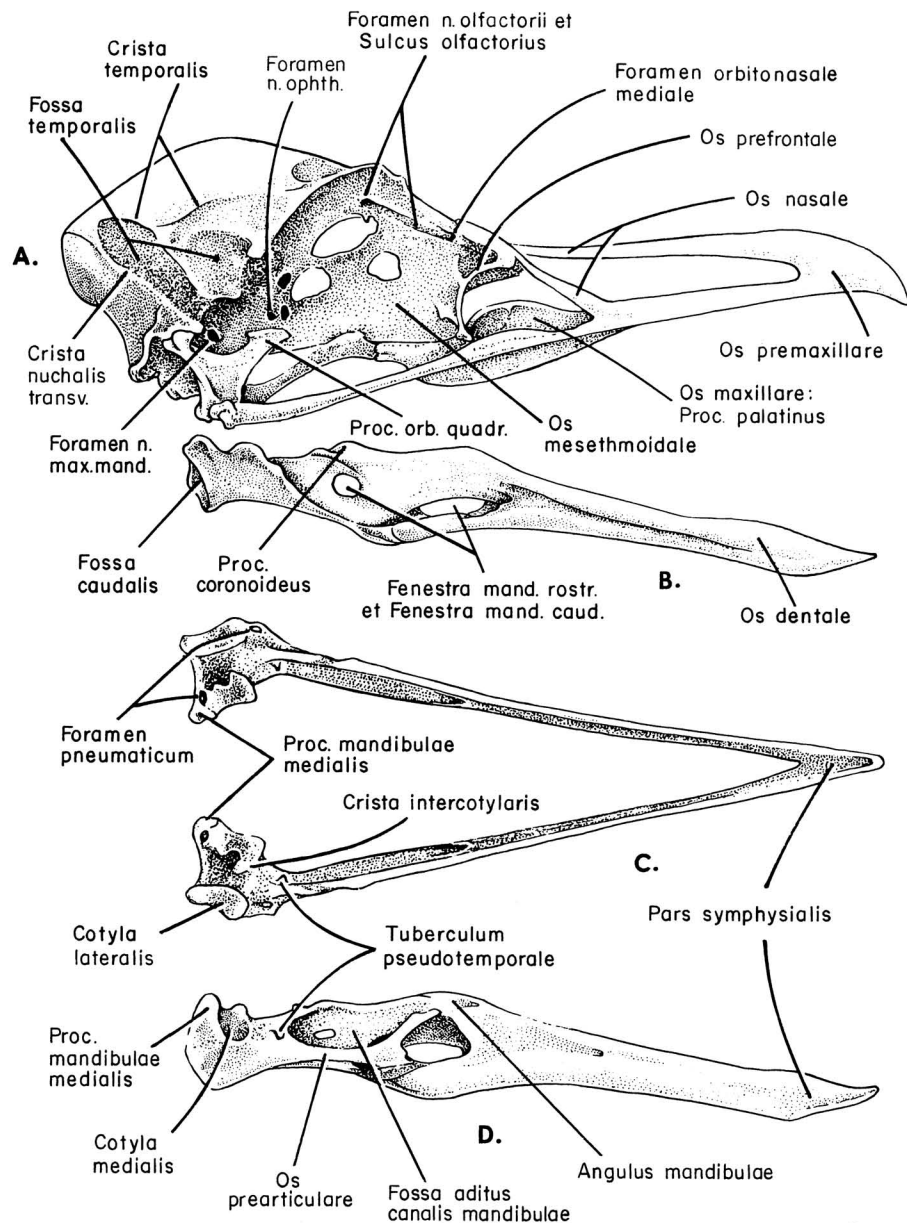


Fig. 1 Cranium and mandible of the gull, *Larus argentatus*. Original drawing, William P. Hamilton. A, cranium, right lateral aspect; B, ramus of mandible, right lateral aspect; C, mandible, dorsal aspect; D, medial aspect of left ramus of mandible. Observe that: (1) The Fossa temporalis of this species is subdivided by a pronounced crest (see Annot. 104); (2) The Sulcus of gl. nasalis (not labeled) is situated immediately caudal to the leader for Foramen n. olfactorii; (3) the proximal intramandibular elastic zone that crosses the rostral fenestra of the mandible demonstrates well several of the separate bony elements that make up the mandible (see Annot. 46 and Arthr. Annot. 48); (4) The retroarticular process is not a prominent feature in this species; however the caudal end of the mandible does possess a distinct Fossa caudalis (Annot. 51)

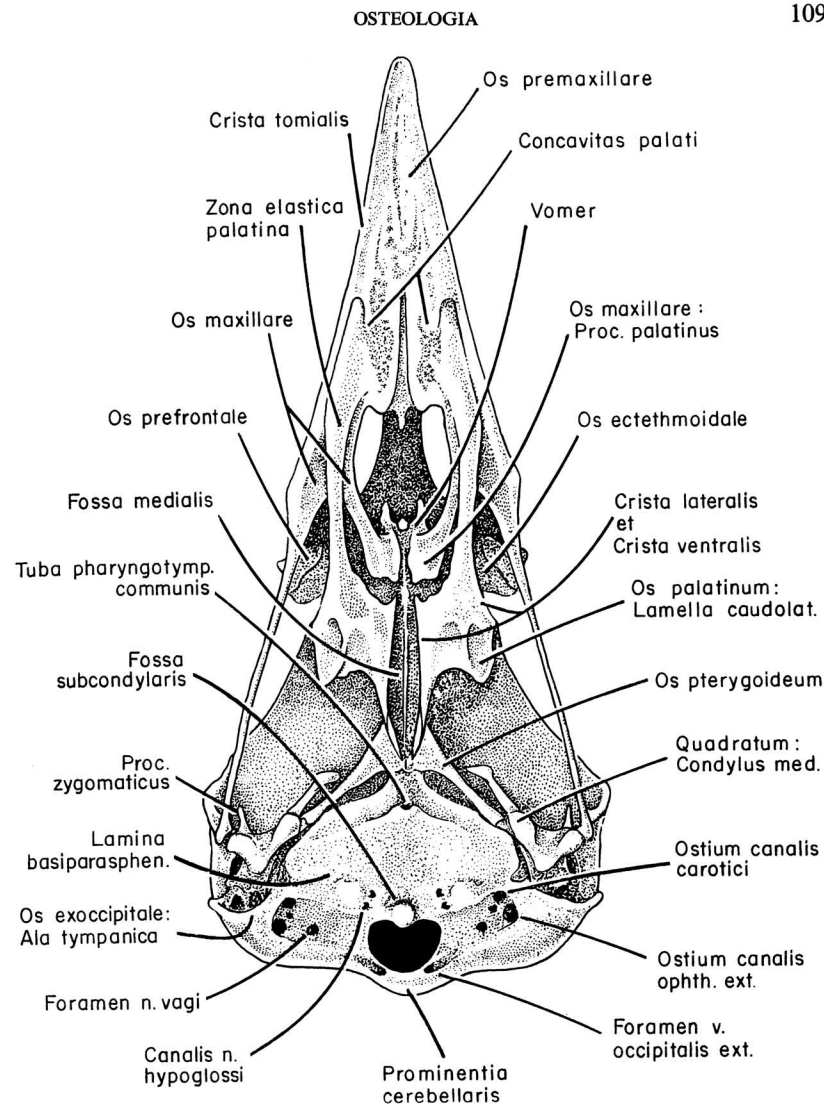


Fig. 2 Base of the skull, palate, and maxillary jaw of the crow, *Corvus brachyrhynchos*. Ventral aspect. Redrawn from Bock (1964). The leaders for Ostium canalis carotici and Lamina basiparasphe. cross the Proc. oticus quadrati of each side. The depression in which the openings for the A. carotis cerebialis and A. ophthalmica externa are located is the Fossa parabasalis (see Annot. 86). The Foramen n. glossopharyngealis is seen just caudomedial to the Ostium canalis carotici (not labeled). Abbreviations: basiparasphe., basiparaspheoidalis; ophth., ophthalmici; pharyngotymp., pharyngotympanica.

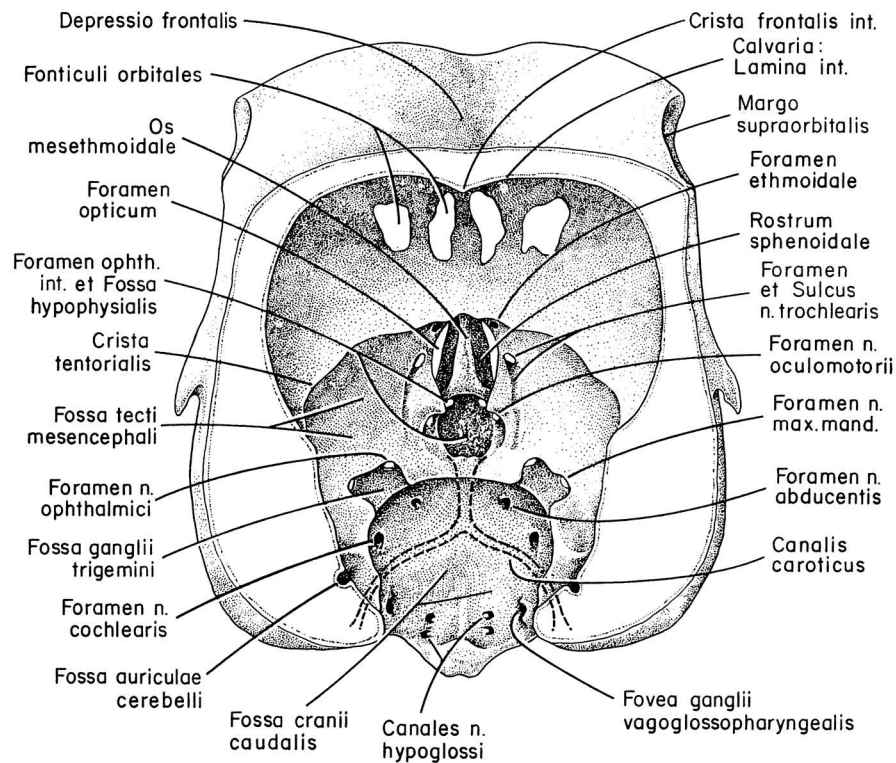


Fig. 3 Cranial cavity of the pigeon, *Columba livia*. Caudal view; transverse section through the Foramen magnum, section inclined dorsorostrally. Redrawn from Baumel (1968). (1) The Fossa cranii rostralis (perforated by the Fonticuli orbitales) houses the telencephalic hemispheres; (2) At its ventral end the carotid canal opens into the Fossa parabasalis on the Basis cranii externa and at its rostral end into Fossa hypophysialis (Annot. 99); (3) the proximal ganglia of both N. glossopharyngeus and N. vagus occupy a common depression in the floor of Fossa cranii caudalis, the Fovea ganglii vagoglossopharyngelii (Annot. 39). Abbreviations: Max.mand., maxillomandibularis; ophth., ophthalmicum.

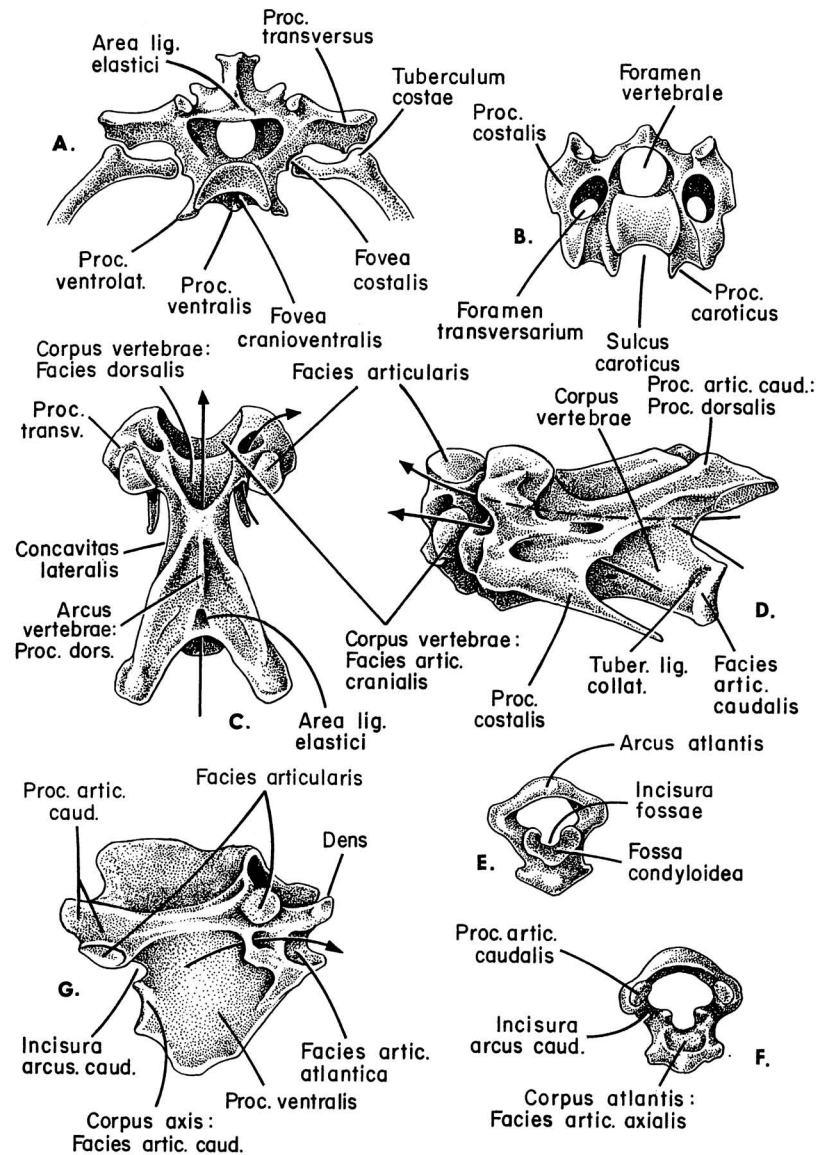


Fig. 4 Features of the cervical and thoracic vertebrae. See Figs. 5, 11 for illustrations of Notarium, Synsacrum, and caudal vertebrae.

A, Thoracic vertebra 2, *Larus*, cranial aspect; redrawn from Boas (1929).

B, Cervical vertebra 9, *Gavia*, cranial aspect; redrawn from Boas (1929).

C, Cervical vertebra 9, *Meleagris*, dorsal aspect; redrawn from Ghetie, et al. (1976).

D, Generalized cervical vertebra, craniolateral oblique view of left side; redrawn from Ghetie et al. (1976).

E, Atlas, *Meleagris*; cranial aspect, redrawn from Harvey, et al. (1968).

F, Atlas, *Meleagris*, caudal aspect; redrawn from Harvey, et al. (1968).

G, Axis, *Meleagris*, right lateral aspect; redrawn from Ghetie, et al. (1976).

Arrows in Figs. C, D, and G traverse the vertebral foramina and the transverse foramina.

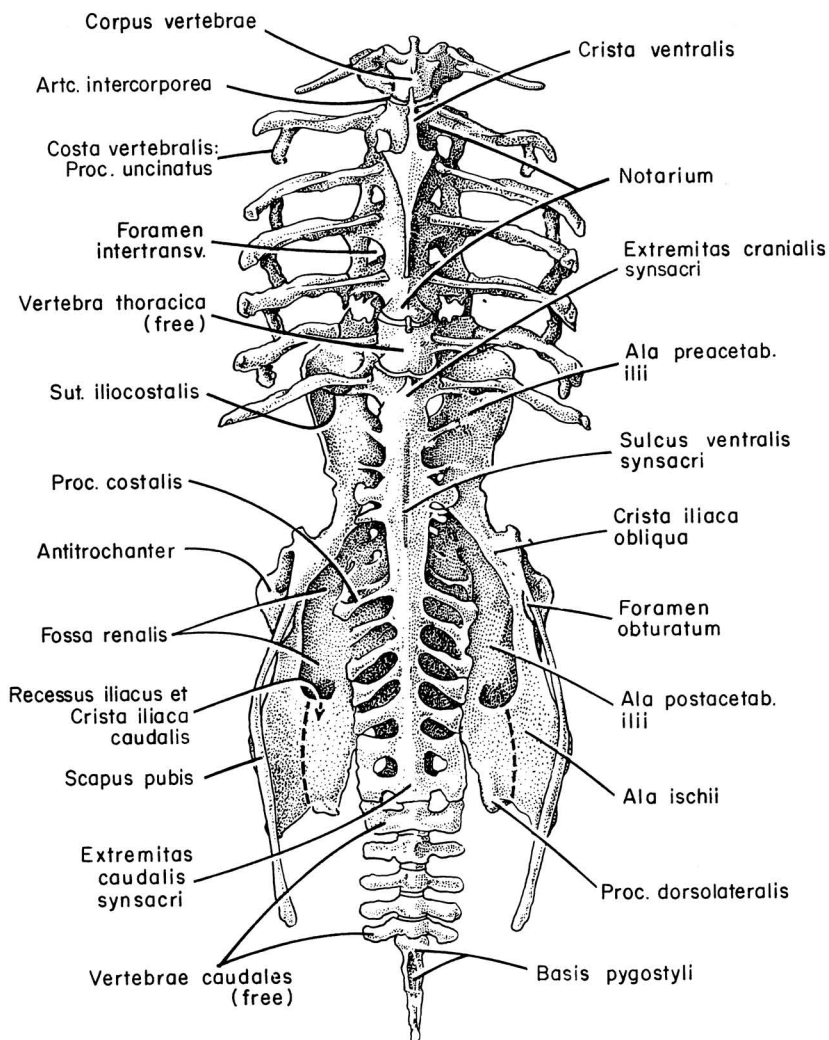


Fig. 5. Notarium, Synsacrum, and Os coxae of the turkey, *Meleagris gallapavo*; ventral view. Redrawn from Harvey, et al. (1968). The dashed lines represent the Sync. ilioischidica (see Fig. 11). On the left side of the drawing the arrow inserted into Recessus iliaceus passes dorsal to a sharp ledge of bone, the Crista iliaca caudalis. Abbreviations: intertransv., intertransversarium; preacetabl., preacetabularis; postacetab., postacetabularis.

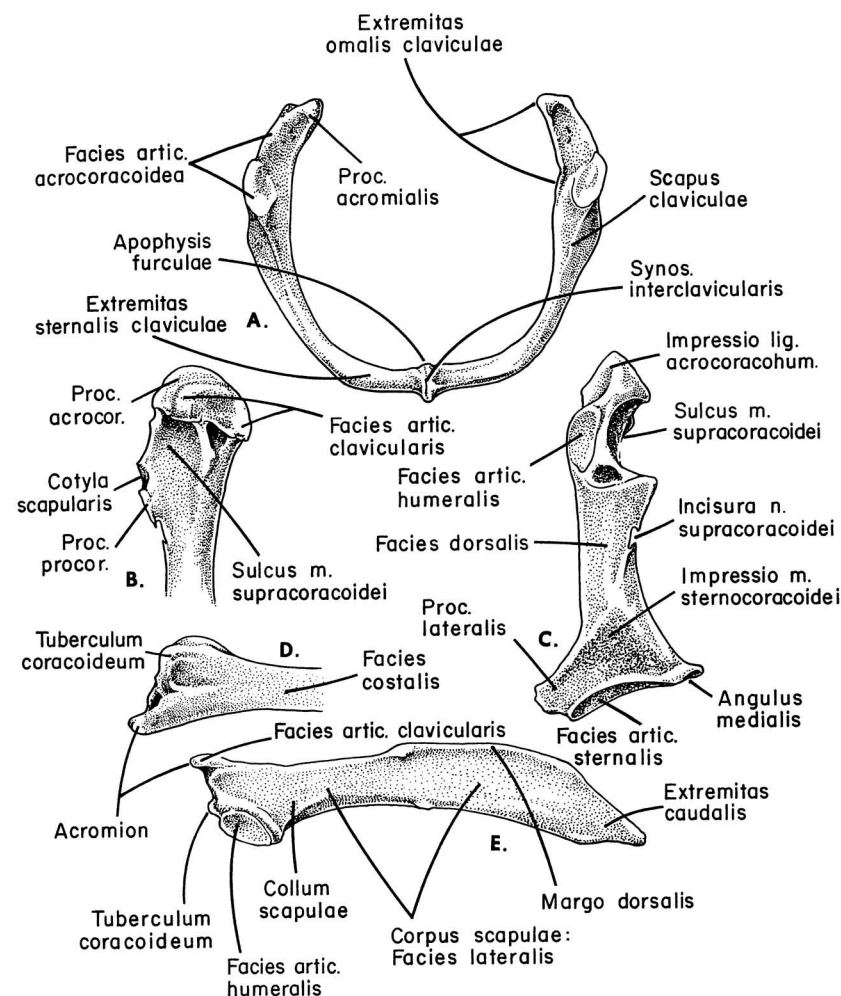


Fig. 6. Bones of the girdle of the thoracic limb of the eagle, *Aquila chrysaetos*. Redrawn from Howard (1929). A. Clavicula, caudal aspect; B. Coracoideum, left shoulder extremity, medial aspect; C. Coracoideum, left, dorsal surface; D. Scapula, left, cranial extremity, costal surfaces; E. Scapula, left, lateral surface. The ankylosed left and right clavicles form the Furcula (see Annot. 162). Abbreviations: acrocor., acrocoracoideus; artic., articularis; procor., procoracoideus; acrocoracohum., acrocoracohumeralis.

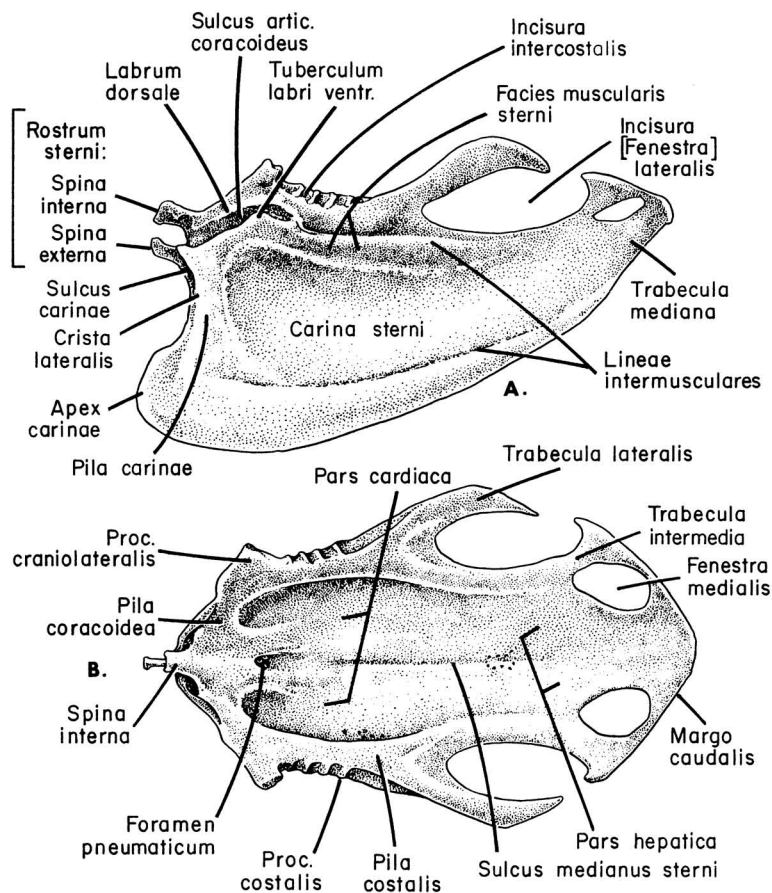


Fig. 7 Sternum of the pigeon, *Columba livia*. Adapted from original drawing of J. J. Baumel. A, left lateral aspect; B, visceral (dorsal) aspect. Abbreviation: artic., articularis.

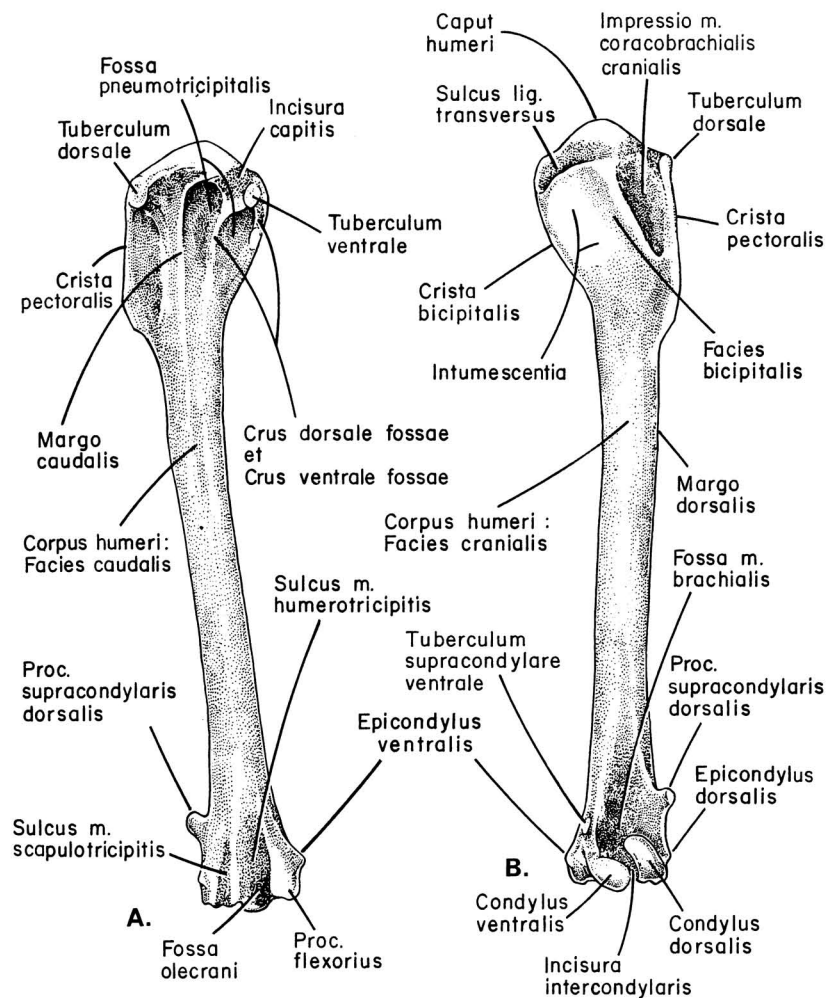


Fig. 8. Humerus of the gull, *Larus argentatus*; left side. Original drawing of Wm. P. Hamilton. A, caudal surface; B, cranial surface. In this species the pneumotricipital fossa is the dual type, not pneumatized (see Annot. 188, 189), and the impression for *M. coracobrachialis cranialis* is very strongly developed.

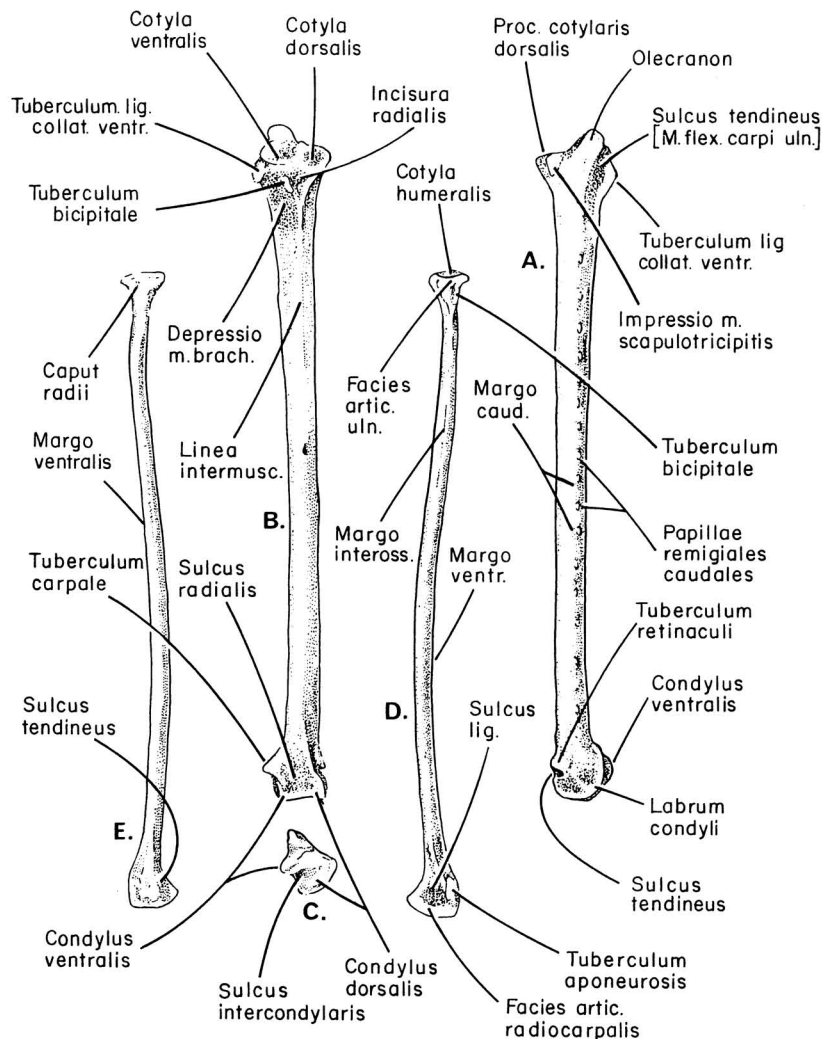


Fig. 9. Radius and Ulna of the gull, *Larus argentatus*; from the left wing. Original drawing, Wm. P. Hamilton. A, Ulna, caudal aspect; B, Ulna, cranial aspect; C, Ulna, distal end; D, Radius, caudal (interosseous) aspect; E, Radius, cranial (proptagial) aspect. Note that the terminology of these bones is based on the wing in the anatomical position (see Annot. 178 and General Intro.). In Fig. C, the Trochlea carpalis and its parts are identified; the pointed Tuberculum carpalis is not labeled. Abbreviations: artic., articularis; collat., collateralis; flex., flexor; intermusc., intermuscularis; inteross., interosseus; uln., ulnaris.

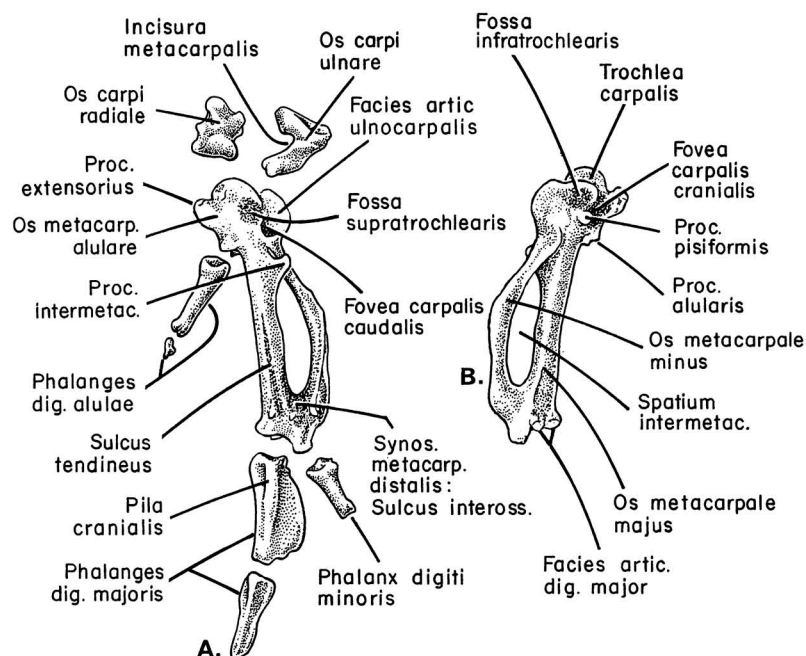


Fig. 10. Carpal and metacarpal bones, phalanges of the turkey, *Meleagris gallapavo*; bones from left wing. Redrawn from Ghetie et al. (1976). A, dorsal aspect; B, ventral aspect. Note that the alular digit of the turkey has two phalanges (see Annot. 224 and **Integ.** Annot. 70).

Abbreviations: artic., articularis; dig., digitalis or digiti; intermetac., intermetacarpale or intermetacarpalis; inteross., interosseus; metacarp., metacarpalis.

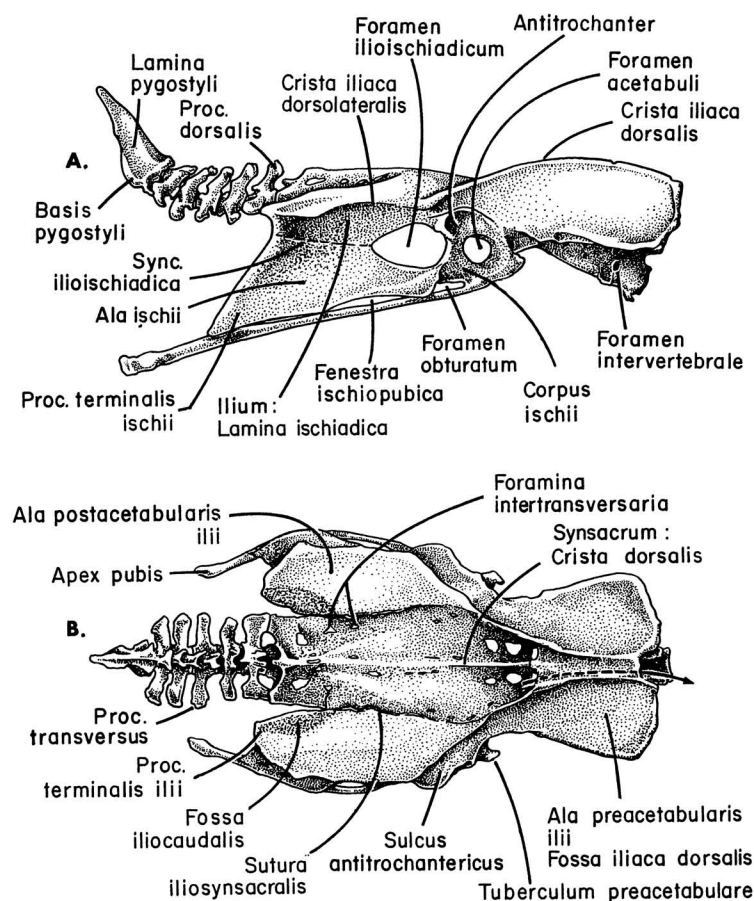


Fig. 11. Pelvis (Os coxae; Synsacrum) and tail skeleton of the turkey, *Meleagris gallapavo*. Redrawn from Harvey, et al. (1968). A, lateral aspect, right side; B, dorsal aspect. In B the arrow traverses Canalis iliosynsacralis. In A notice the dual intervertebral foramina in the synsacral part of the vertebral column (see Annot. 144).

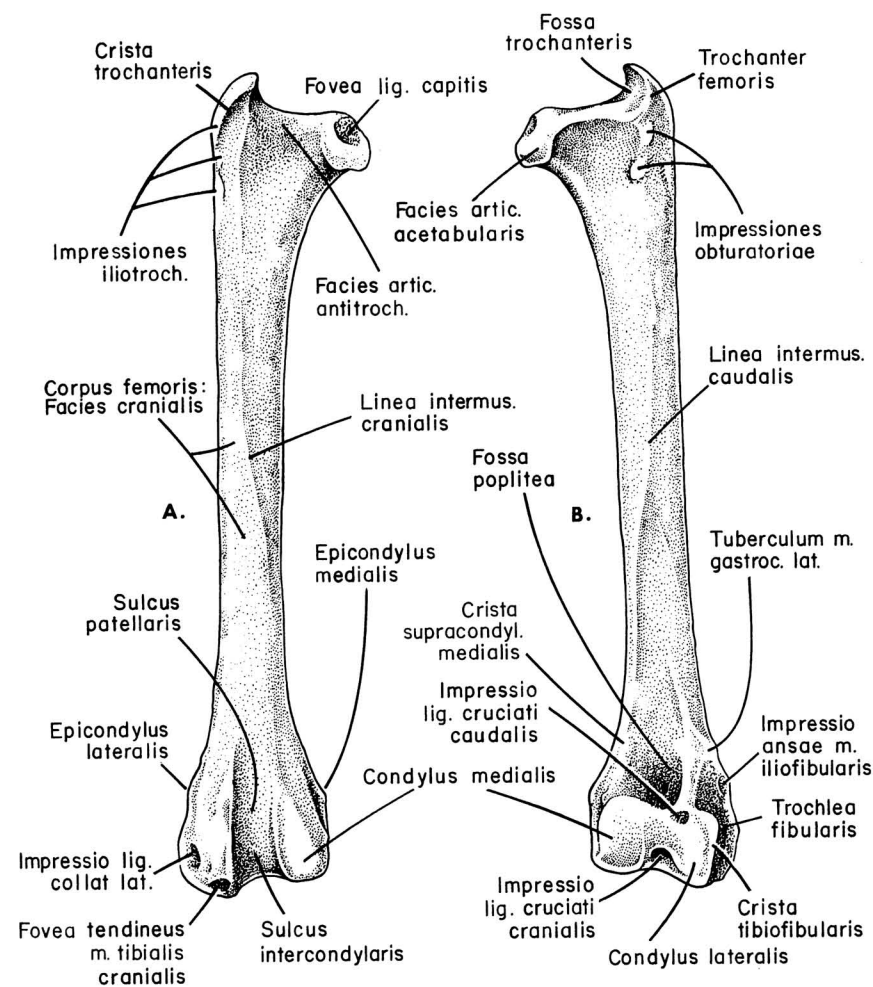


Fig. 12 Femur of the gull, *Larus argentatus*; right side. Original drawing Wm. P. Hamilton. A, cranial aspect; B, caudal aspect. Abbreviations: antitroch., antitrochanterica; artic. articularis; gastroc., gastrocnemialis; iliotroch, iliotrochantericae; intermus., intermuscularis; supracondyl., supracondylaris.

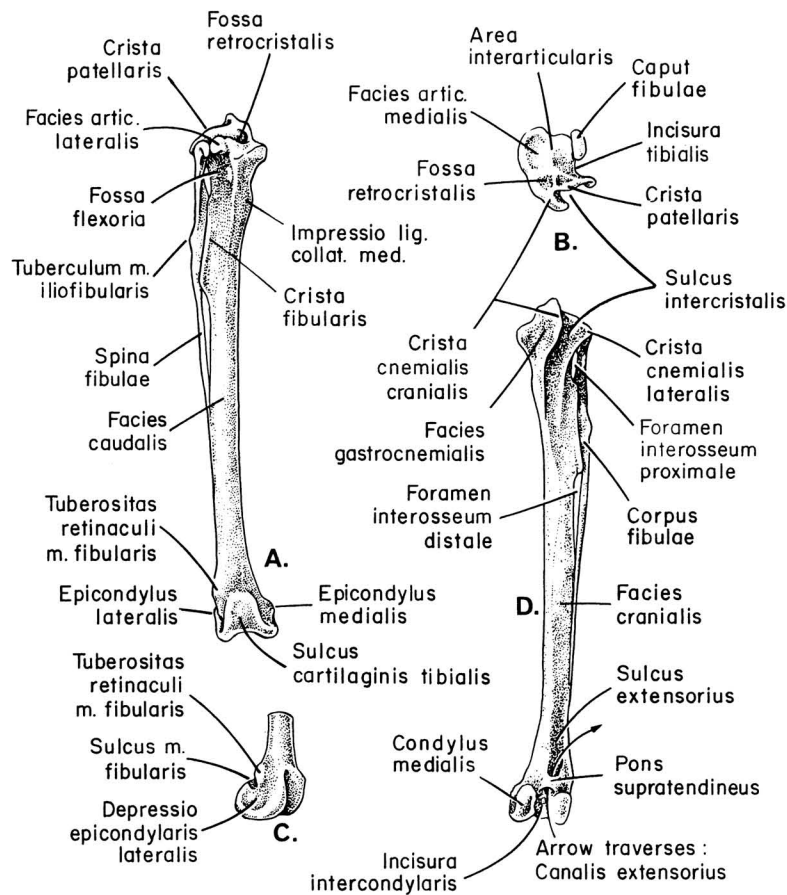


Fig. 13. Tibiotarsus and Fibula of the goose, *Branta canadensis*; left side. Original drawing Wm. P. Hamilton. A, caudal view; B, proximal articular surfaces of both bones; C, distal extremity of Tibiotarsus, lateral aspect; D, cranial view. In A Tuberositas poplitea (not labeled) is located just medial to the tip of leader on the Fossa flexoria. Abbreviations: artic., articularis; collat., collateralis.

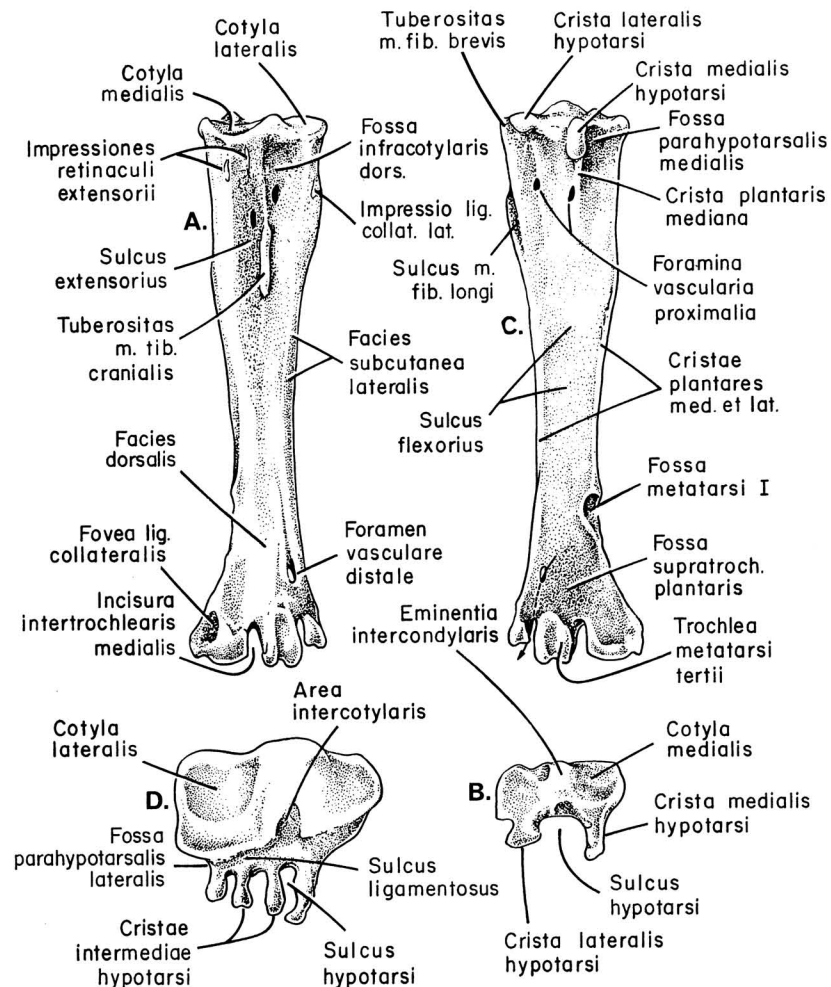


Fig. 14. Tarsometatarsus of the eagle, *Aquila chrysaetos* (A-C) and the goose, *Anser caerulescens* (*Chen hyperborea*); all bones from the left limb. Redrawn from Howard (1929). A, dorsal aspect; B, proximal end; C, plantar aspect; D, proximal end. In C the arrow traverses Canalis interosseus tendineus which conducts the tendon of M. extensor digiti IV. The Eminentia intercondylaris is a process of the proximal end of the bone that, in the articulated joint, projects between the tibiotarsal condyles and receives the distal attachment of Lig. intercondylare tibiotarsale (see Arthr. Annot. 171). Abbreviations: fib., fibularis; supratroch., supratrochlearis; tib., tibialis.

M. tensor propatagialis, Pars brevis blends with the proximal end of the dorsal aponeurosis to a variable degree in different birds. Digitations pass from the caudal margin of Aponeurosis antebrachialis dorsalis to the follicles of the secondary remiges.

(195) **Septum humerocarpale.** Well defined intermuscular fascial sheet that passes dorsally from the humerocarpal ligament to the ventral aspects of the secondary remiges. The septum is described in detail by Alix (1884) and Pelissier (1923). See Annot. 143, Lig. humerocarpale and Figs. 5, 11.

(196) **Digitationes remigiales.** Synonymy: Ligg. sous-remigien (Pelissier, 1923). These ligamentous slips from Septum humerocarpale and from the elastic ligament of M. flexor carpi ulnaris are attached to the follicles of the secondary remiges. See Annot. 197 and Fig. 11.

(197) **Lig. elasticum m. flexoris carpi ulnaris.** Continuous elastic ligament stretching the length of the antebrachium; receives the insertion of Pars caudalis of M. flexor carpi ulnaris. Alix (1874) noted the elastic structure of this ligament, and referred to the part of the muscle inserting on it as "rotateur des remiges" inasmuch as it sends digitations to each secondary feather. Pelissier (1923) called it the "lig. du cubital antérieur"; he noted that in the coraciiform bird, *Lophoceros*, the ligament is not continuous but consists of a series of individual digitations to the secondary remiges.

(198) **Lig. elasticum intertetricale.** Synonymy: intercovertal lig. (Stettenheim, 1959). Connects adjacent major ventral tectrices (covert feathers) of the antebrachium, carpus, and manus. Lig. elasticum intertetricale is strongest and best-developed in the carpal region (*Lig. elasticum intertetricale carpale*) (e.g. *Columba*, charadriiforms, Stettenheim, 1959) and tapers proximally and distally in the wing.

(199) **Ligg. cubiti** (Pelissier, 1923). Short ligaments attached to follicles of the calami of the secondary remiges that insert on the series of Papillae remigiales caudales of the shaft of the ulna; not attached to the apices of the follicles, but slightly distal to the apices.

(200) **Lig. elasticum interrectricale.** Synonymy: "lig. elastique souscaudal ou inferior" (Robin and Chabry, 1884). The form of this ligament varies markedly between different species, e.g.: In *Columba* it consists of a thin, wide transverse band stretching between the follicles of the rectrices on their ventral aspects. In *Gallus* strong, thick parts of Lig. elasticum are found between adjacent rectrices and a thin band ventral to the rectrices. In both species the ligament is placed just deep to the fold of integument that connects rectrices. See Fig. 11.

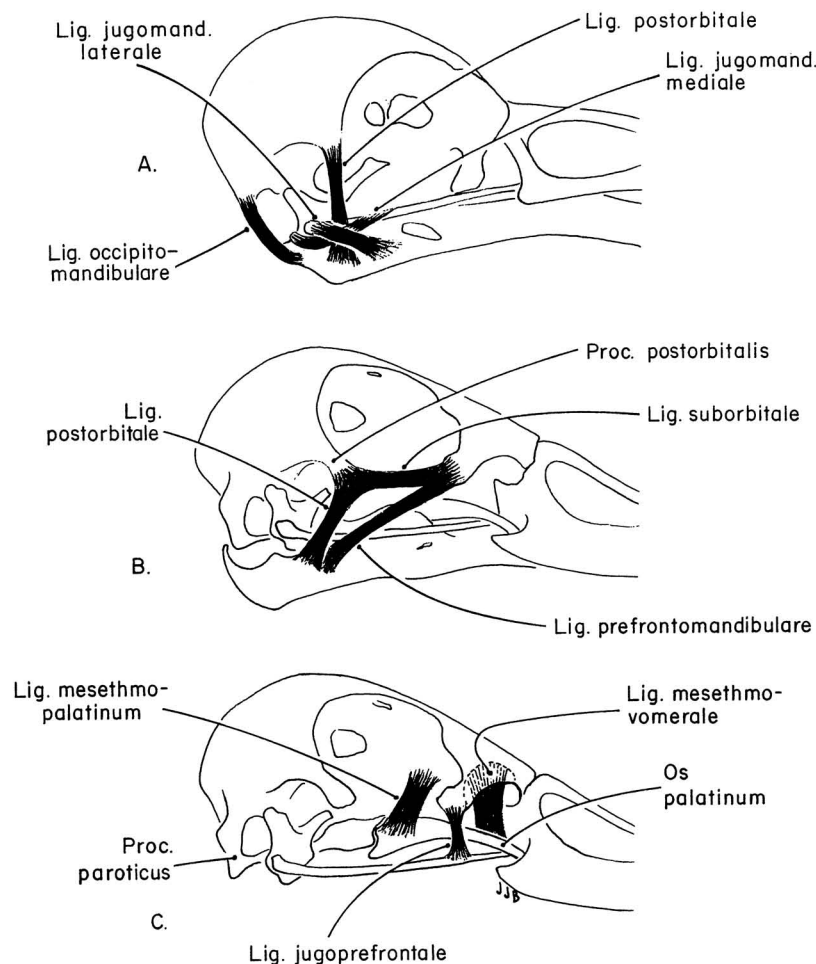


Fig. 1 Ligaments of the face. A, *Corvus*; lateral view, right side of the skull showing the superficial ligaments; B and C, *Anser*, lateral view, right side of the skull. In B the superficial ligaments are shown; the more deeply disposed ligaments are shown in C. Redrawn from Bock (1964).

Abbreviations: Lig. jugomand., Lig. jugomandibulare.

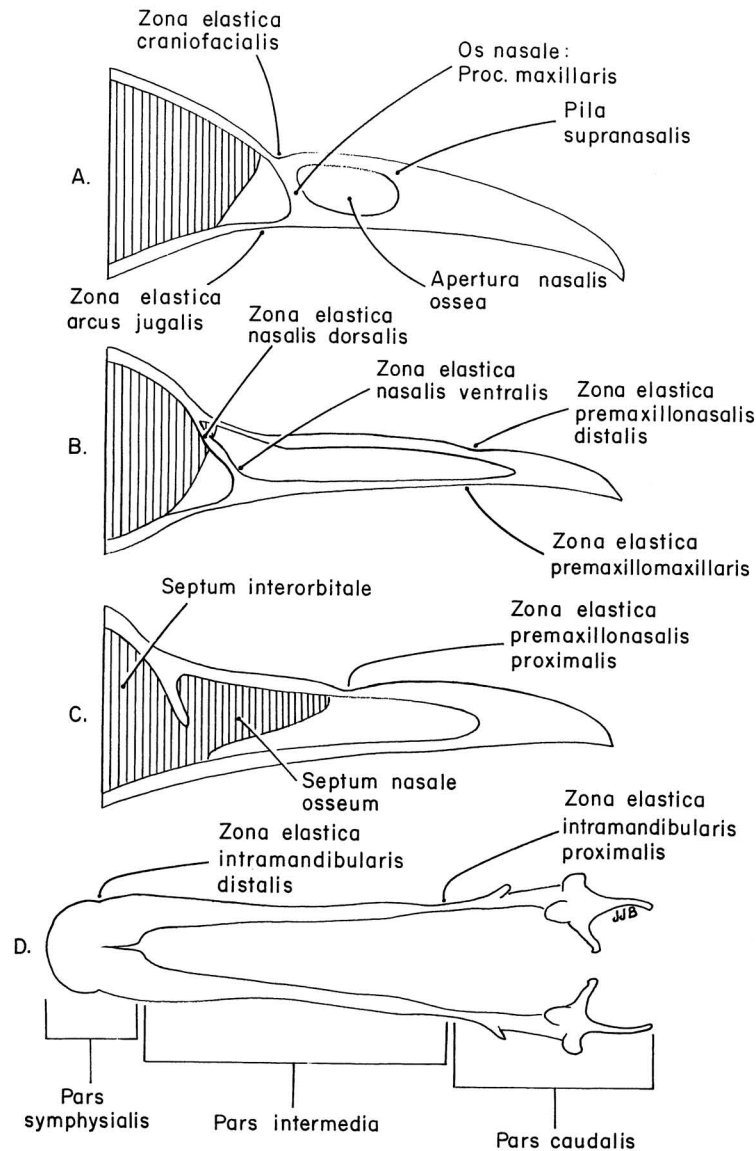


Fig. 2 Elastic zones of the skull. A–C, lateral views of the craniofacial region; redrawn from Bock (1964); vertically-lined areas = Septum interorbitale and Septum nasale. D, dorsal view of the mandible; redrawn from Lebidinsky (1920).

A, Prokinetic skull, holorhinal nostril (*Corvus*).

B, Rhynchokinetic skull, schizorhinal nostril (charadriiform type). Note: not all of the different elastic zones shown would appear in the skull of any one species.

C, Rhynchokinetic type (ratite type).

D, Mandible of the swan (*Cygnus*). See Osteo. Fig. 1 for a lateral view of the mandible of a gull (*Larus*) demonstrating its structure at the level of the proximal intramandibular elastic zone.

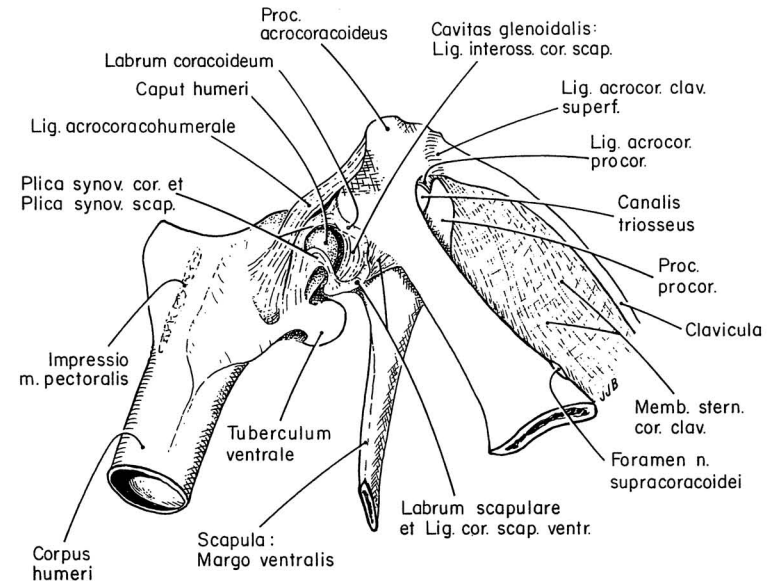


Fig. 3 The shoulder joint (Art. humeralis) of the pigeon, *Columba livia*. Right shoulder ventral aspect; the general articular capsule is not depicted. Original drawing, J. J. Baumel. Abbreviations: Lig. acrocor. clav. superf., Lig. acrocoracoclaviculare superficiale; Lig. acrocor. procor., Lig. acrocoraco-procoracoideum; Lig. cor. scap. ventr., Lig. coraco-scapulare ventrale; Lig. inteross. cor. scap., Lig. interosseum coracoscapulare; Proc. procor., Proc. procoracoideus.

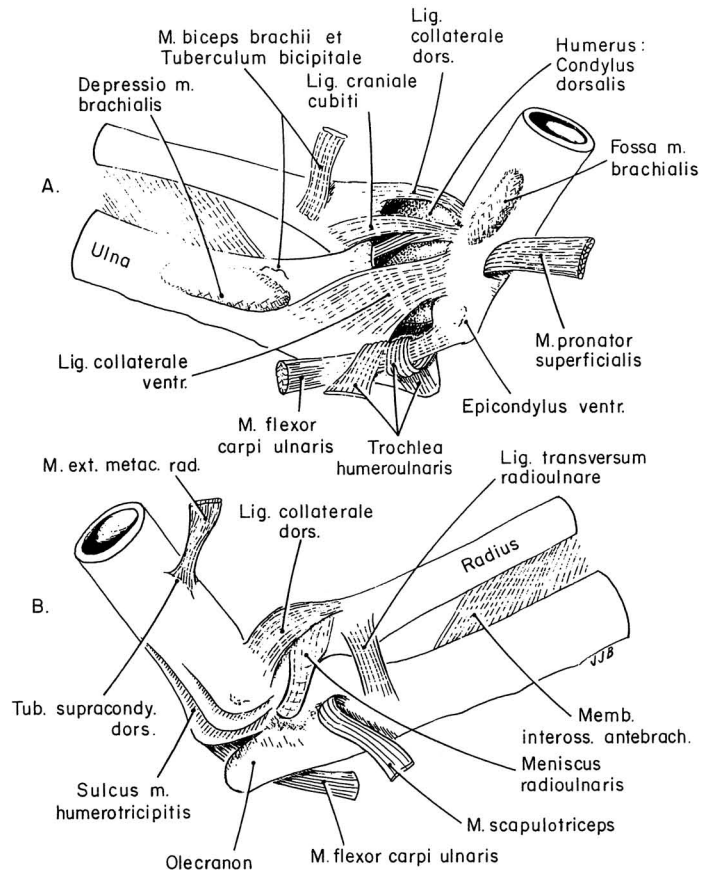


Fig. 4 The elbow joint (Juntura cubiti) of the pigeon, *Columba livia*. Right side. Original drawing, J. J. Baumel.

A, ventral aspect; B, dorsal aspect.

Note: 1) Lig. craniale cubiti splits into two slips, one attached to the Radius, the other attached to the Ulna; the latter intervenes between the two bones; 2) in A the well-developed Capsula articularis has been removed between the three ligaments; 3) in B the articular capsule is quite delicate (not shown); 4) the Meniscus radioulnaris has strong attachments to Radius and Ulna; 5) the dorsal and caudal aspects of the humeroulnar joint are strengthened by the tendons of the triceps muscles and possess no collateral ligaments.

Abbreviations: M. ext. metac. rad., M. extensor metacarpi radialis; Memb. inteross. antebrach., Membrana interossea antebrachialis; Tub. supracondy. dors., Tuberculum supracondylare dorsale.

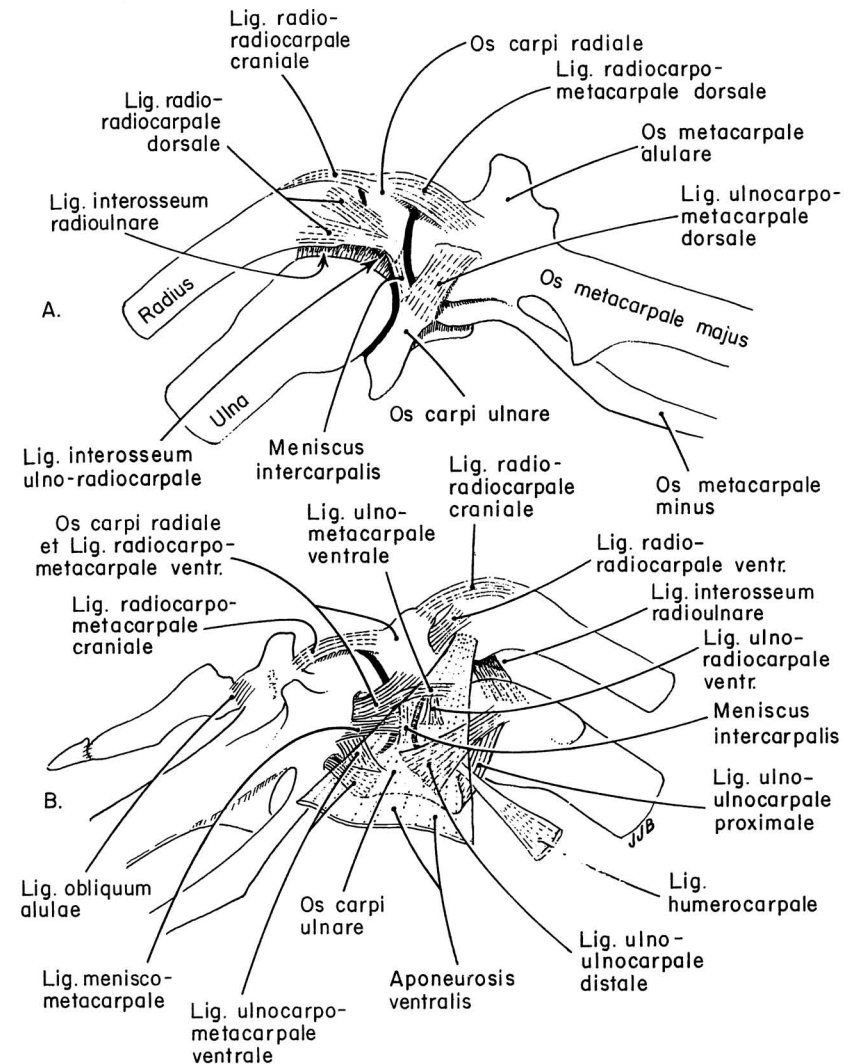


Fig. 5 The wrist joint (Juntura carpi) of the chicken, *Gallus gallus*. Original drawing, J. J. Baumel.

A, dorsal aspect; B, ventral aspect.

Note: 1) The bones are drawn apart slightly to better demonstrate the interosseous ligaments and meniscus; the joint spaces are depicted in solid black; 2) the Lig. interosseum radioulnare and Lig. interosseum ulno-radiocarpale are continuous with one another; 3) the ventral aponeurosis is superficial to many of the ventral ligaments of the joint; the main part only of the aponeurosis is drawn (see Annot. 114, 115, and Fig. 11); 4) the Lig. interosseum radioulnare intervenes between the distal extremities of the Radius and Ulna, so that the two bones articulate directly with one another only slightly, if at all.

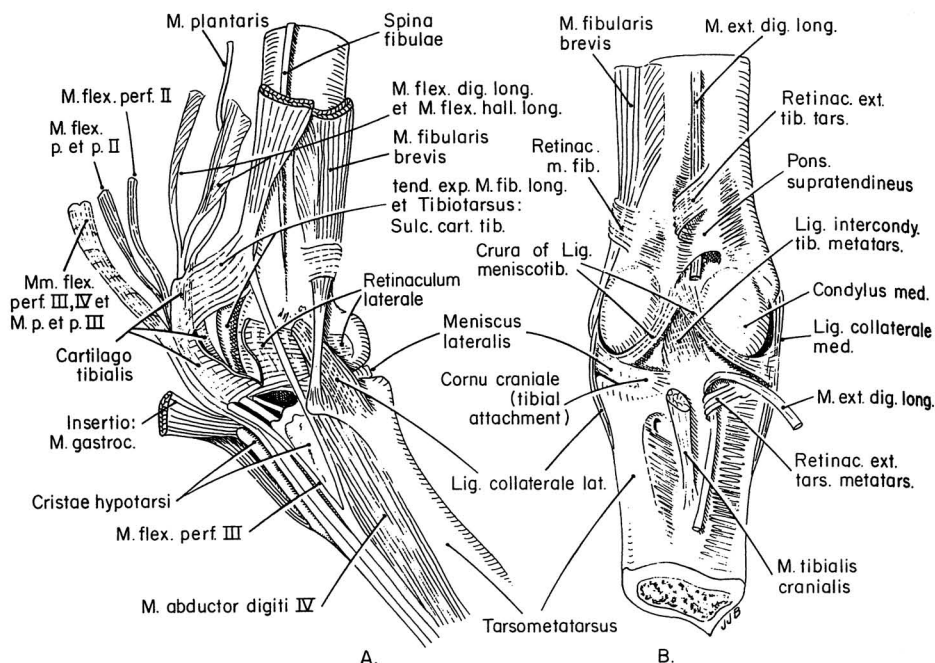


Fig. 8 The ankle joint (Art. intertarsalis) of the pigeon, *Columba livia*. Original drawing, J. J. Baumel.

A, lateral aspect, right limb; B, cranial aspect, right limb.

Note: 1) In A, the attachments of M. plantaris and M. fibularis longus to Cartilago tibialis; 2) in A, the tibial cartilage is drawn caudally out of its articular sulcus on the distal extremity of the Tibiotarsus; 3) the Art. cartilago-tibiotarsalis is in open communication with the Art. intertarsalis; 4) in A, the distal part of the Retinaculum laterale serves as the articular capsule of the intertarsal joint; 5) the tendon of M. tibialis cranialis (cut) traverses the Retinaculum extensorium tibiotarsi; 6) the medial crus of Lig. meniscotibialis is attached to the margin of the medial cotyla of the Tarsometatarsus since no medial meniscus is present in the pigeon and other birds (see Annot. 168).

Abbreviations: Lig. intercondy. tib. metatars., Lig. intercondylare tibiometatarsale; Lig. meniscotib., Lig. meniscotibialis; M. ext. dig. long., M. extensor digitorum longus; M. fib. long., M. fibularis longus; M. flex. dig. long., M. flexor digitorum longus; M. flex. hall. long., M. flexor hallucis longus; M. flex. perf. II, III, IV; M. flexor perforatus digiti II, III, or IV; M. flex. p. et p. dig. II, III, M. flexor perforans et perforatus digiti II or III; Retinac. m. fib., Retinaculum m. fibularis; Retinac. ext. tars. metatars., Retinaculum extensorium tarsometatarsi; Retinac. ext. tib. tars., Retinaculum extensorium tibiotarsi; Sulc. cart. tib., Sulcus cartilaginis tibialis; tend. exp., tendinous expansion.

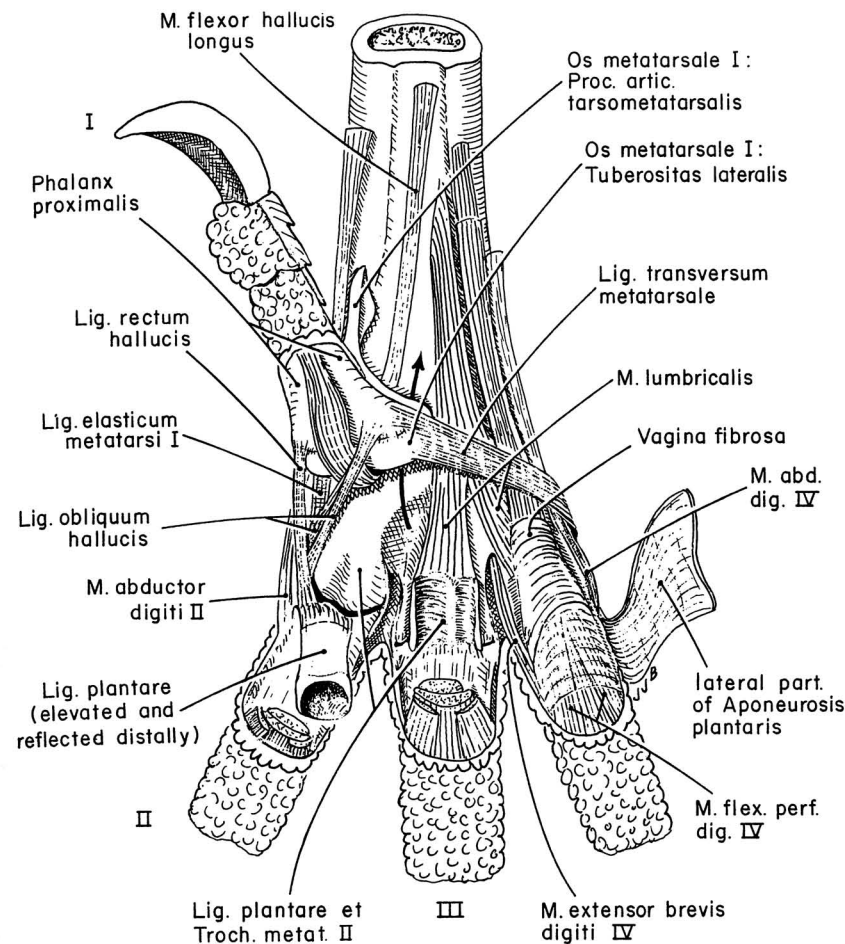


Fig. 9 Joints of the foot (Juncturae pedis) of the pigeon, *Columba livia*. Plantar aspect; right foot; Digitus I [Hallux] hyperextended and drawn medially; the arrow is situated in Canalis flexorius plantaris through which pass the long flexor tendons to the digits.

Note: 1) The deep part of the Lig. obliquum hallucis is attached to the medial aspect of the trochlea of metatarsal II; its superficial part is attached to the proximal phalanx of Digitus II. 2) On the fourth digit the Vagina fibrosa is intact, attached to the margins of the plantar ligament and to the proximal phalanx. On the third digit the flexor sheath and tendons are removed showing the plantar ligament and its attachment to the base of the proximal phalanx. On the second digit the plantar ligament is elevated from its trochlea and reflected distally showing its dorsal surface. 3) A strong part of Aponeurosis plantaris (only a portion depicted) extends transversely across the metatarsophalangeal joints; a thin portion (not shown) extends proximally to become continuous with the transverse metatarsal ligament and the lateral tuberosity of the first metatarsal bone.

Abbreviations: M. abd. dig. IV, M. abductor digiti IV; M. flex. perf. dig. IV, M. flexor perforatus digiti IV; Proc. artic., Proc. articularis.

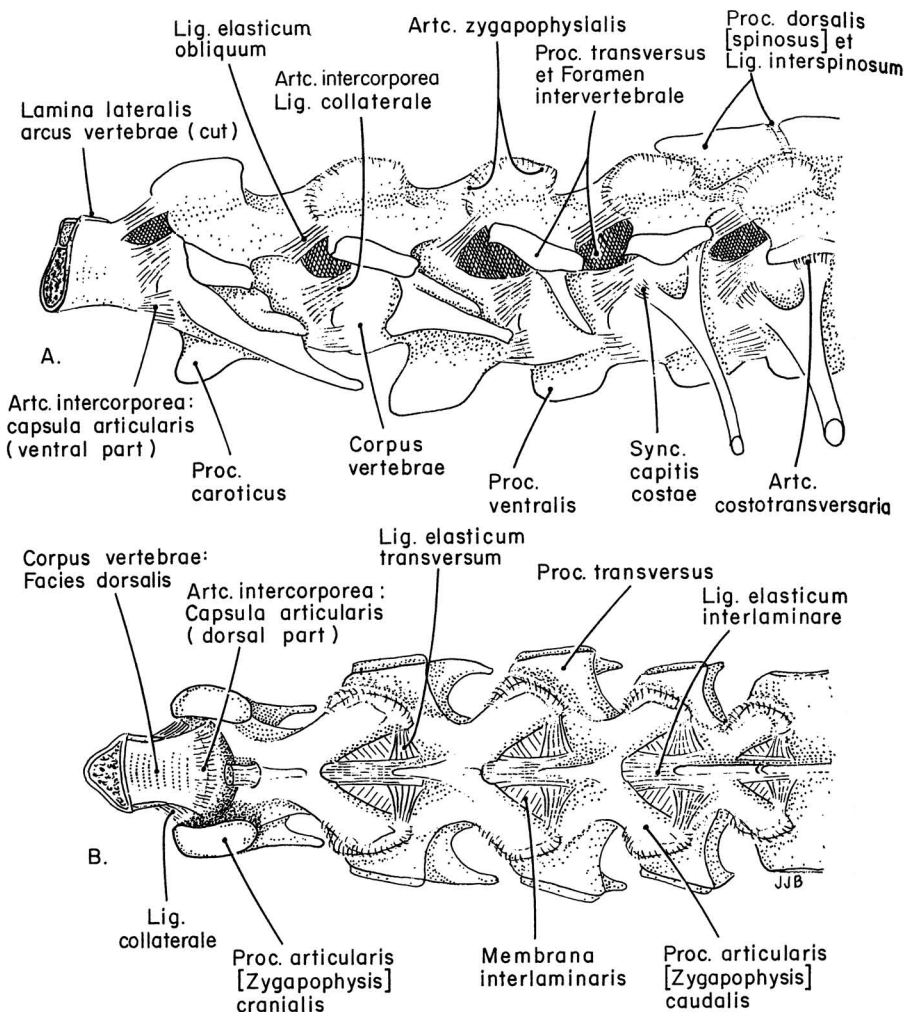


Fig. 10 Ligaments of the joints of the vertebral column (Juncturae columnae vertebralis) of the pigeon, *Columba livia*. Vertebral segment is from the root of the neck. A, lateral view, left side; B, dorsal view. Original drawing, J. J. Baumel.

Note: (1) the arch of the cranialmost vertebra in both A and B is cut away; (2) only the lateral margin of Lig. elasticum obliquum is depicted, the deeper part of the ligament being situated on the ventral surface of Proc. articularis caudalis of the vertebra that forms the cranial attachment of the ligament; (3) Lig. elasticum obliquum assists Lig. elasticum interlaminae in maintaining the dorsal concavity of this part of the neck; (4) both the transverse and the oblique elastic ligaments of one side are tensed when the vertebral column is flexed to the contralateral side; (5) most of the joints between vertebral bodies are synovial joints having a meniscus; (6) the intervertebral foramina of this vertebral segment are extraordinarily large since they transmit the roots of the brachial plexus.

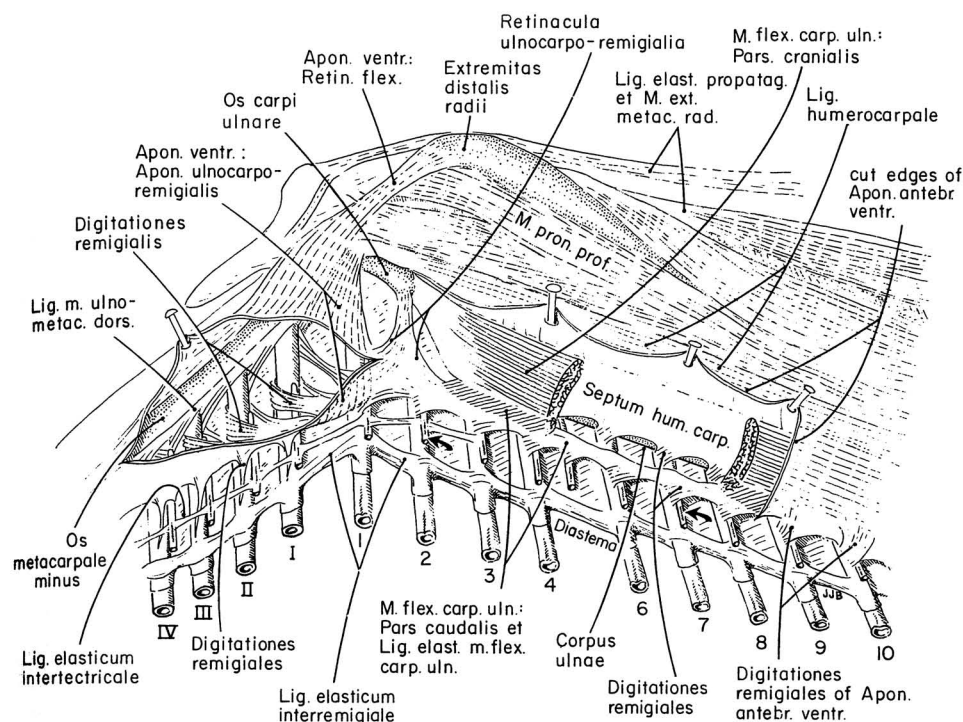


Fig. 11 Ligaments of the feathers (Ligg. pennarum) of the wing of the pigeon, *Columba livia*. Ventral aspect, right wing. Original drawing, J. J. Baumel. Arrows indicate lower major coverts of the secondary remiges (Tectrices secundariae ventrales majores); Roman numerals indicate Remiges primarii, Arabic numerals indicate Remiges secundariae.

Note: 1) the Diastema or hiatus in the series of secondary remiges (see *Integ.* Annot. 53); 2) the digitations to the remiges from the ventral antebrachial aponeurosis, from the elastic ligament of M. flexor carpi ulnaris, and from the humerocarpal septum; 3) the Lig. humerocarpale splits to enclose M. flexor digitorum superficialis, the cranial and caudal laminae blending on the dorsal side of the muscle and becoming continuous with the Septum humerocarpale. (4) the space deep to the reflected parts of Aponeurosis ventralis contains the belly of M. ulnometacarpalis dorsalis which has been removed to display the calami of the primary feathers.

Abbreviations: Apon. antebr. ventr., Aponeurosis antebrachialis ventralis; Apon. ventr., Aponeurosis ventralis; Lig. m. ulnometac. dors., Lig. m. ulnometacarpalis dorsalis; Lig. elast. m. flex. carp. uln., Lig. elasticum m. flexoris carpi ulnaris; Lig. elast. propatag., Lig. elasticum propatagiale; M. ext. metac. rad., M. extensor metacarpi radialis; M. flex. carp. uln., M. flexor carpi ulnaris; M. pron. prof., M. pronator profundus; Retin. flex., Retinaculum flexorum; Septum hum. carp., Septum humerocarpale.