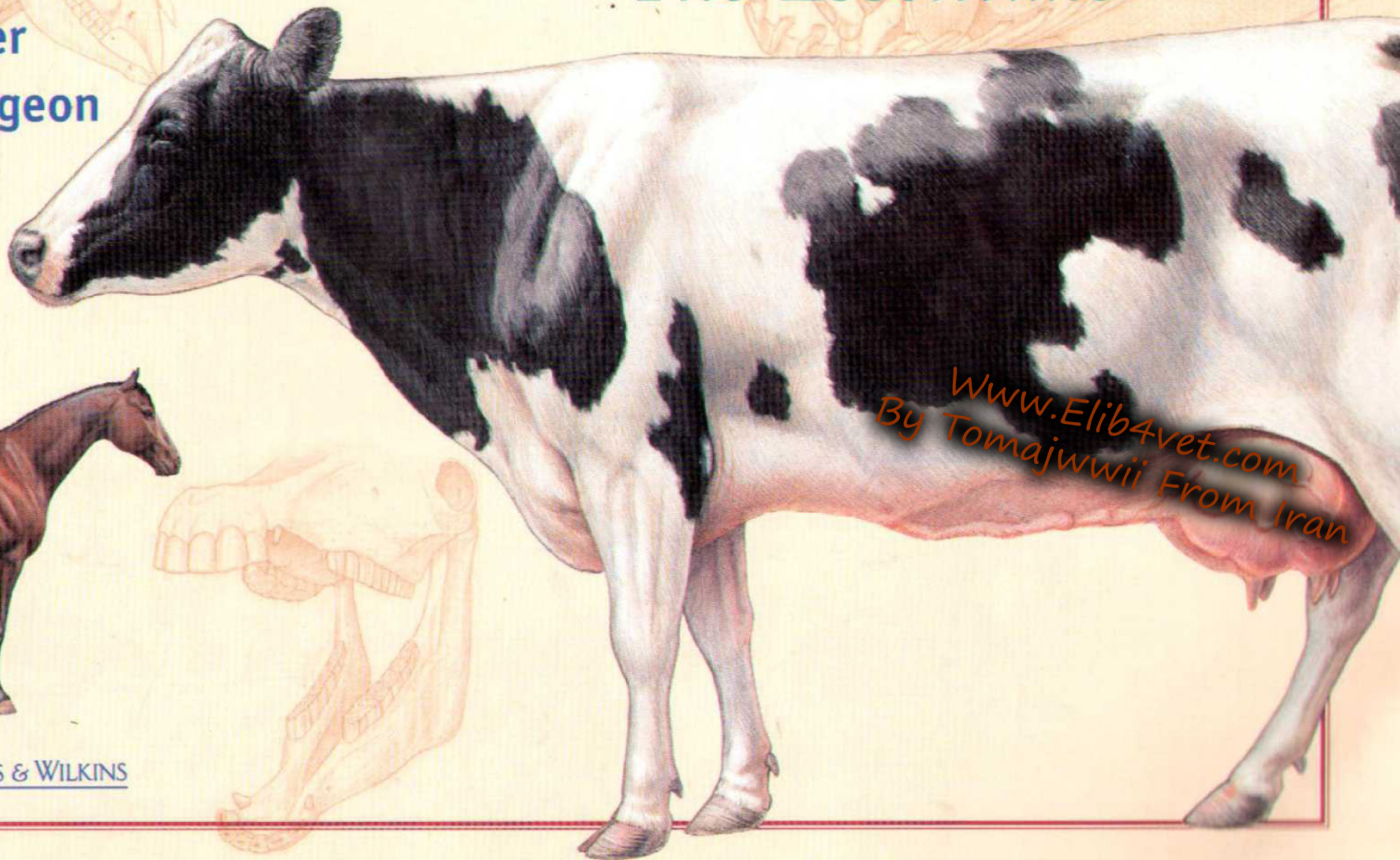


# SPURGEON'S COLOR ATLAS OF Large Animal Anatomy

*The Essentials*

Thomas O. McCracken  
Robert A. Kainer  
Thomas L. Spurgeon



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Spurgeon's Color Atlas of  
Large Animal Anatomy:  
*The Essentials*



# Spurgeon's Color Atlas of Large Animal Anatomy: *The Essentials*

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Thomas Spurgeon

#### TO OUR COLLEAGUE AND FRIEND

*Dr. Thomas L. Spurgeon, exceptionally well-trained anatomist, superb teacher, and educational innovator, devoted his professional life to the advancement of anatomic education through scientific investigation and the dissemination of anatomic knowledge.*

*Following service to his country in the United States Air Force, Thomas L. Spurgeon entered college. Upon completion of his doctorate in anatomy in the School of Veterinary Medicine at the University of California-Davis, Dr. Spurgeon accepted a faculty position in the College of Veterinary Medicine at Washington State University. His record as an excellent anatomist at that institution led to a position in the College of Veterinary Medicine and Biomedical Sciences at Colorado State University.*

*His broad knowledge of both human and veterinary anatomy was utilized fully at Colorado State. Students requiring courses in basic human anatomy as well as those majoring in veterinary medicine and various animal sciences profited from the instruction provided by this well-rounded anatomist who possessed outstanding pedagogic skill. His expertise was equally appreciated by the graduate students he mentored, particularly those in the biomedical illustration program.*

*Dr. Spurgeon, a pioneer in the computer-assisted instruction of anatomy, was continually seeking new methods of presentation. He and his colleague and close friend, Thomas O. McCracken, conceived the unique anatomic presentation used in this atlas.*

*Tragically, Dr. Spurgeon's untimely death in an automobile accident in 1997 brought a halt to his brilliant career. Dr. Spurgeon's devoted sons, Aaron and Kyle, are indeed proud of their father's accomplishments. Countless students mourn the passing of a man who, as teacher and friend, contributed so much to their lives.*



# ACKNOWLEDGMENTS

**M**any talented individuals contributed to the production of *Spurgeon's Color Atlas of Large Animal Anatomy: The Essentials*. Foremost among them were the artists, Conery Calhoon, Molly Babich, Gale Mueller, and Sandra Mullins, who colored Thomas McCracken's original drawings of anatomic specimens. They employed manual and digital techniques to reproduce the subtle colors of tissues and organs.

Consultants, who authored plates drawn by Thomas McCracken, selected clinical conditions and husbandry applications based on their anatomic significance. The consultants were Dr. Gayle Trotter for the horse; Dr. Frank Garry for the ox; Dr. Joan Bowen for the sheep and goat; Dr. LaRue Johnson for the llama and alpaca and the swine; and Dr. John Avens for the chicken. These specialists reviewed the plates on the various species, enhancing the accuracy of the presentations. Their contributions are gratefully acknowledged.

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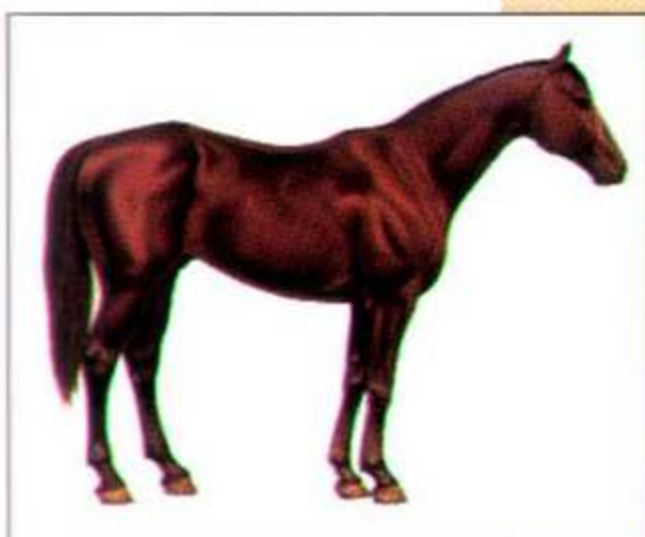




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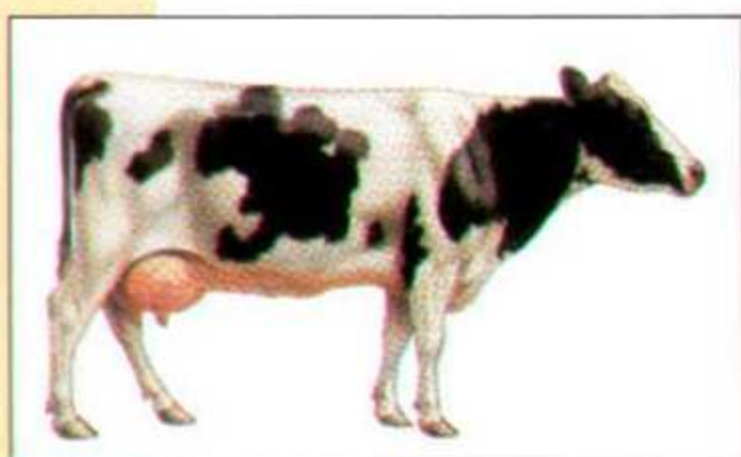




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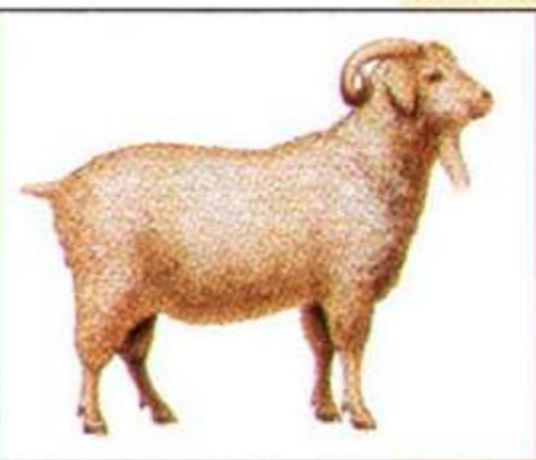
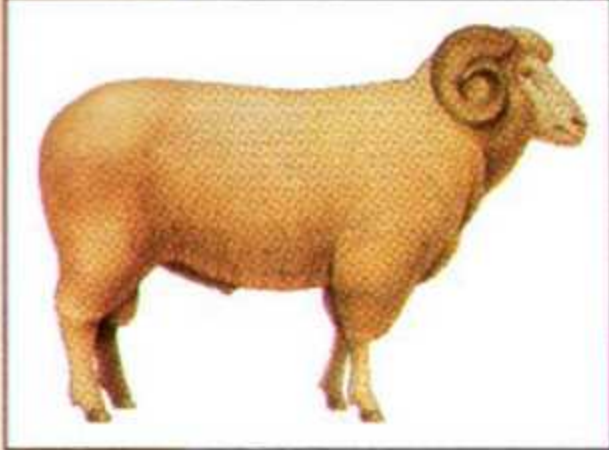






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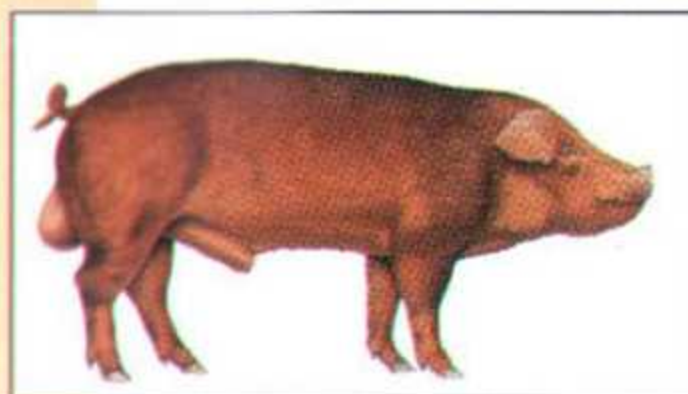


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# INTRODUCTION

**S**urgeon's *Color Atlas of Large Animal Anatomy: The Essentials* is not a complete, detailed anatomic atlas. Instead, it presents topographic relationships of the major organs of the horse, ox, sheep, goat, llama, alpaca (a smaller species with long, lustrous hair), swine, and chicken in a simple yet technically accurate format. As an important food animal, the chicken is included with the large domestic animals in this atlas. Throughout the *Atlas*, most male and female of a given species are on facing pages. The majority of the plates contain information on the entire body. Some plates are confined to a region; a few contain organs isolated from the rest of the body. Whereas most systems (e.g., digestive and reproductive) are presented for each animal, other systems are included only for some species to illustrate general anatomic patterns. Structures common to the various animals are labeled several times; other structures are labeled on only one or two species, usually emphasizing specific anatomy (the anatomy peculiar to a certain species). Animal specialists authored plates illustrating selected clinical or husbandry applications that reflect the anatomy of the organs involved.

The *Atlas* is intended for use by individuals at different stages of their education, serving as a survey of the specific anatomy of the different animals. Advanced 4-H club members, high school vocational agriculture students, and college students studying veterinary medical technology, veterinary medicine, animal science, and wildlife biology can use this *Atlas* as an introduction to the anatomy of common farm animals. The *Atlas* can also serve as a reference for horse breeders and trainers, as well as livestock and poultry producers. It will provide a quick review for persons with previous training in anatomy and will be an invaluable aid for the professional—e.g., a veterinarian or animal scientist—in explaining to a client some aspect of anatomy that pertains to an animal's condition and needs.

The following introductory pages provide the reader with a background in nomenclature and anatomic orientation.



# NOMENCLATURE AND ANATOMIC ORIENTATION

## ANIMAL CLASSIFICATION

The horse (*Equus caballus*) is classified as an odd-toed ungulate (hoofed mammal) in the order Perissodactyla, suborder Hippomorpha, and family Equidae. Members of this family are termed equids. "Equine" is an adjective. Equine characteristics include the grouping of limb muscles close to the trunk with tendons extending over long third metacarpal and metatarsal bones to the digits, providing leverage for sustained, rapid locomotion. Because this leverage arrangement does not develop great force, the heavy draft horse must rely on body weight to perform pulling tasks. Another equine characteristic is the horse's extensive large intestine, the site of final microbial digestion and absorption of nutrients.

Cloven-hoofed ungulates that walk on their third and fourth digits are in the order Artiodactyla. Domestic ungulates in the suborder Ruminantia include those in the family Bovidae, subfamily Bovinae—the ox (*Bos taurus*) and zebu (*Bos indicus*)—and subfamily caprinae, the sheep (*Ovis aries*) and goat (*Capra hircus*). The noun "bovids" (after Bovidae) is usually reserved for cattle, bison, yak, and water buffalo; sheep are ovids and goats are caprids, named according to each genus. Adjectives end in -ine: bovine, ovine, and caprine, respectively.

The llama (*Lama glama*) and alpaca (*Lama pacos*) are cud-chewing artiodactyls from South America called camelids, named after the family Camelidae in the suborder Tylopoda. South American camelids are also called lamoids. Both ruminants and camelids have large, compartmented stomachs essential for the microbial digestion of cellulose. Feed is more finely divided by rumination, a physiologic sequence of regurgitation of stomach contents, remastication (chewing), and redeglutition (swallowing).

Swine (pigs are young; hogs are mature) are artiodactyls in the suborder Suiformes, family Suidae. Domestic swine (*Sus scrofa domesticus*) are descended from the European wild boar with some input from the smaller *Sus indica* from China. The adjective "porcine" is derived from the Latin *porcinus*, from *porcus*, a hog. Reflecting its omnivorous diet, the swine's digestive tract is somewhat simpler than those of ruminating animals.

The chicken or domestic fowl (*Gallus gallus domesticus*) is classified with other comb-bearing gallinaceous birds in the order Galliformes. Descended from the Red Junglefowl of southeast Asia, the chicken is in the family Phasianidae.



## GENERAL TERMINOLOGY

With some exceptions, particularly for most muscles wherein traditional Latin names are used, the terminology in this *Atlas* conforms to English translations of Latin terms in the *Nomina Anatomica Veterinaria* (N.A.V.), 3rd ed., 1983. There are some departures from N.A.V., however. For example, according to N.A.V., the hoof includes the underlying corium (dermis) with the horny epidermis, whereas in common usage hoof refers only to the horny epidermal structure. In compliance with the intent of N.A.V., nomenclature will be consistent for all species. Common terms and meat-packing terms are used on some plates. Abbreviations for organs in this *Atlas* include: a, artery; b, bone; j, joint; lig., ligament; ln, lymph node; m, muscle; n, nerve; v, vein. Double letters indicate the plural form of these words (e.g., aa, arteries). Positional and directional terms, body planes, and the extent of body cavities are used to indicate the location of parts of the body and functional changes in position. The extent of diseased regions is defined using this anatomic terminology.

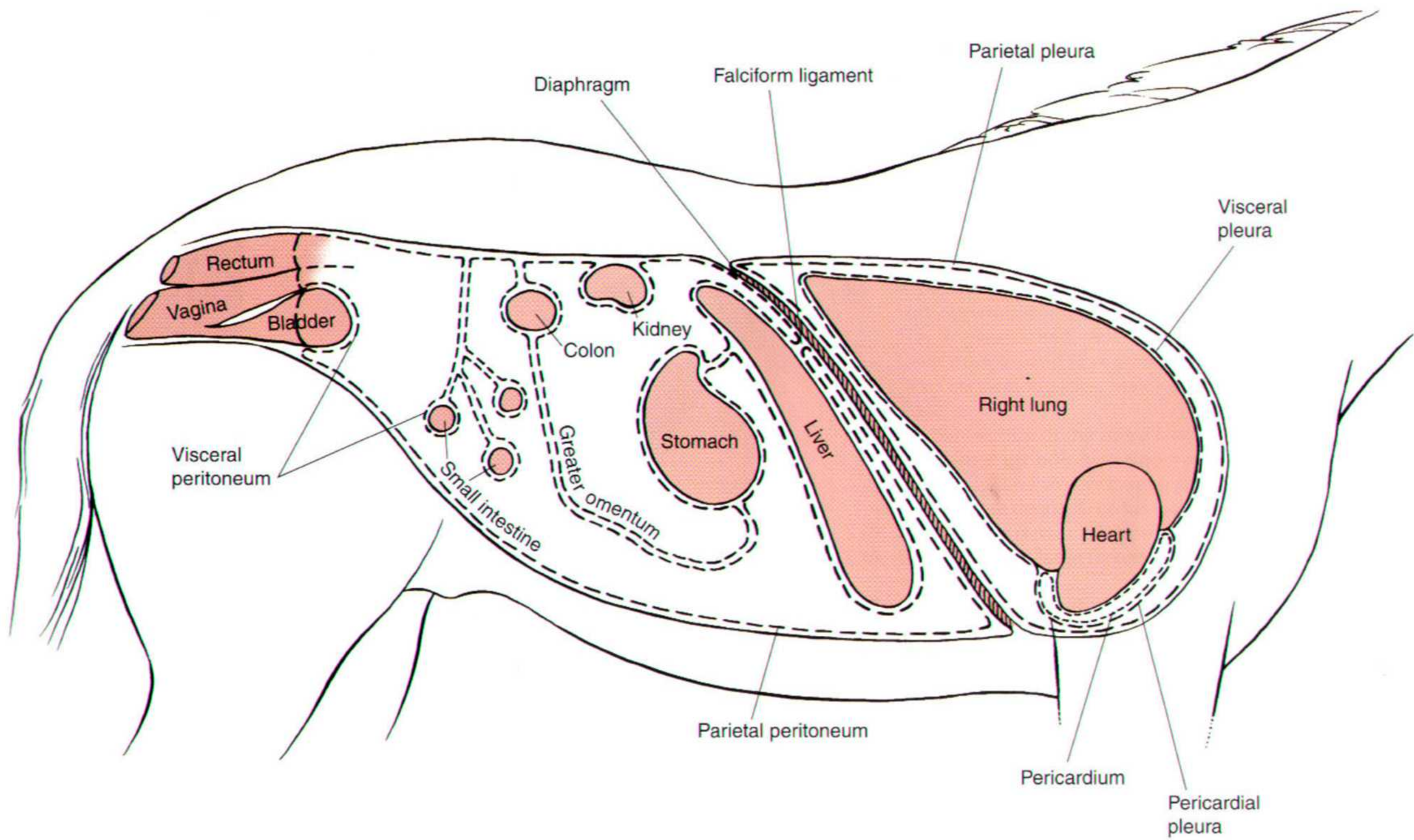
## POSITIONAL AND DIRECTIONAL TERMS

The following terms are illustrated on the accompanying drawing of a horse. **Dorsal** and **ventral** are opposite terms indicating relative locations toward the back (L., dorsum) or belly (L., venter). Above the knee (carpus) and hock (tarsus) and from the belly to the back, a structure located closer to the cranium (skull case) is **cranial** to another structure, and a structure located toward the tail (L., cauda) is **caudal** to another. On the head, the term **rostral** indicates a structure closer to the nose (L., rostrum).

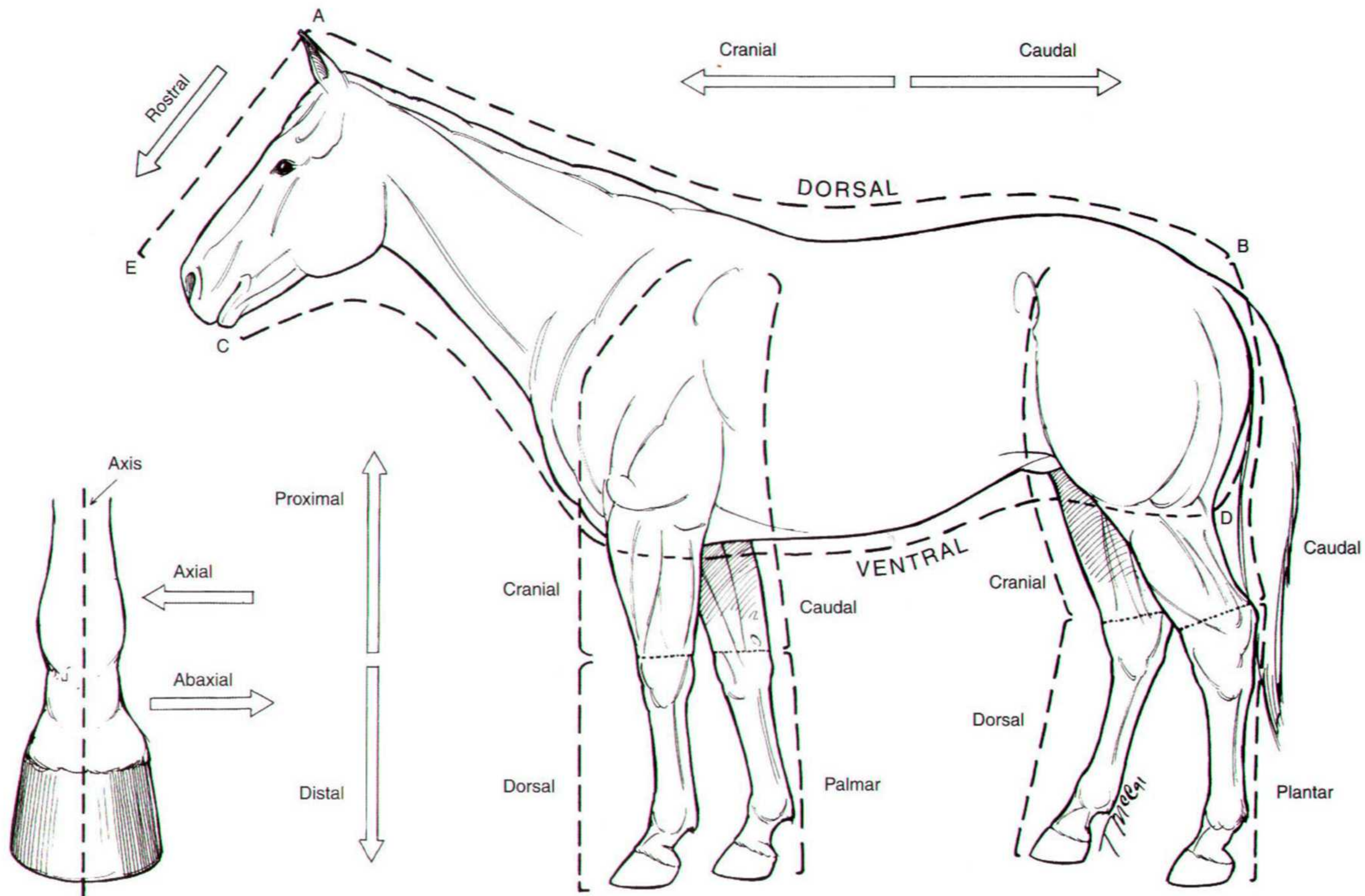
**Proximal** indicates a location toward the attached end of a limb; **distal** indicates a location toward the free end of a limb, that is, further from the trunk. Distal to and including the carpus, **dorsal** replaces cranial; **palmar** replaces caudal. Distal to and including the hock, dorsal replaces cranial, but **plantar** replaces caudal.

On a frontal view of the distal end of a limb, notice that an **axial** structure is located toward the **axis**. An **abaxial** structure is located away from it.











## BODY PLANES

Drawings of a horse are used to illustrate body planes. The **median plane** (L., medius, middle) divides the animal body into right and left halves. A **sagittal plane** (L., sagitta, arrow) is any plane parallel to the median plane. **Medial** and **lateral** (L., latus, side) are directional terms relative to the median plane. Medial structures are located closer to the median plane. Lateral structures lie away from the median plane, that is, toward the side. A **transverse plane** passes through the head, trunk, or limb perpendicular to the part's long axis. A **dorsal plane** (also called a **frontal plane**) is a longitudinal plane that passes through the body parallel to its dorsal surface at right angles to the median plane.



Figure 1

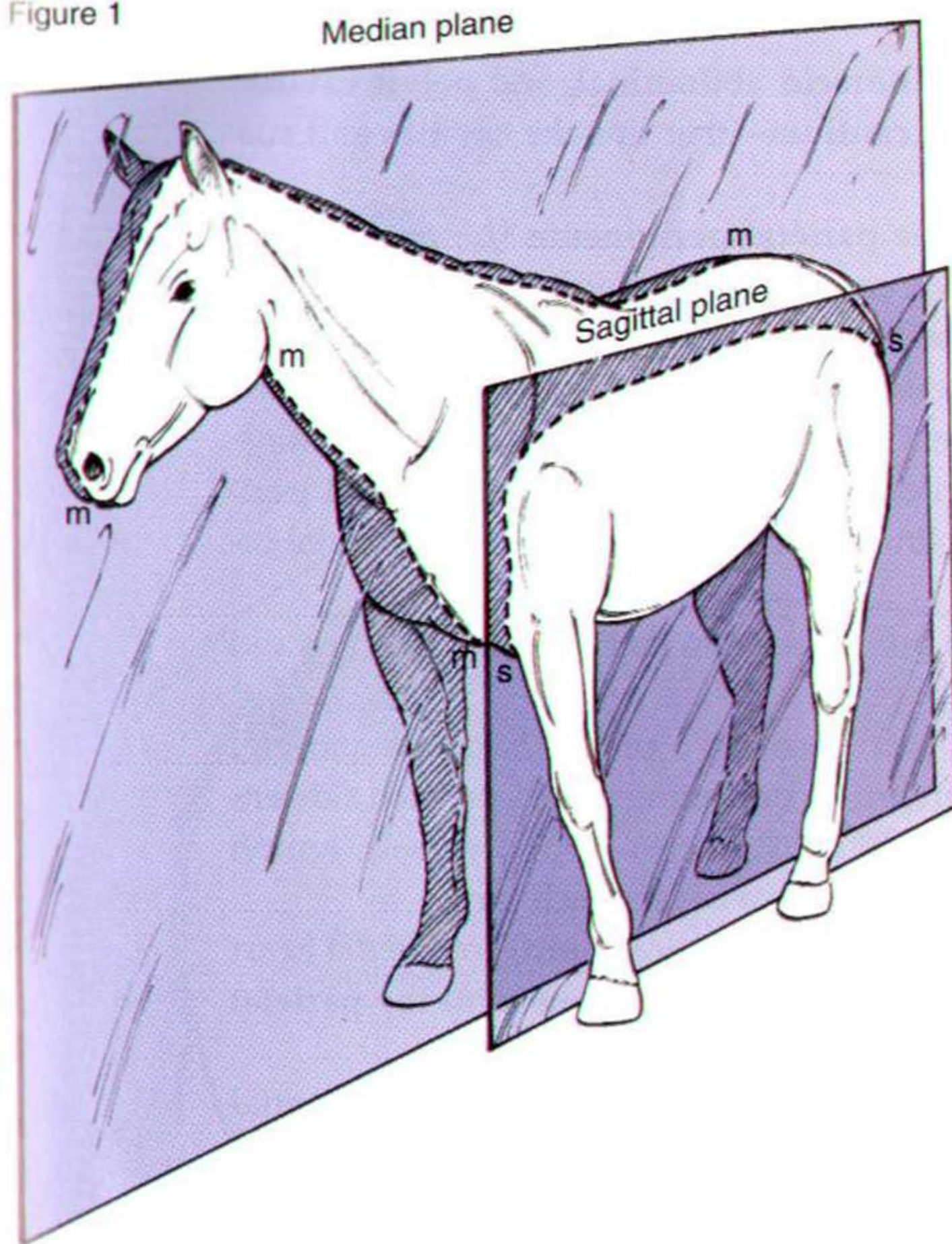


Figure 3

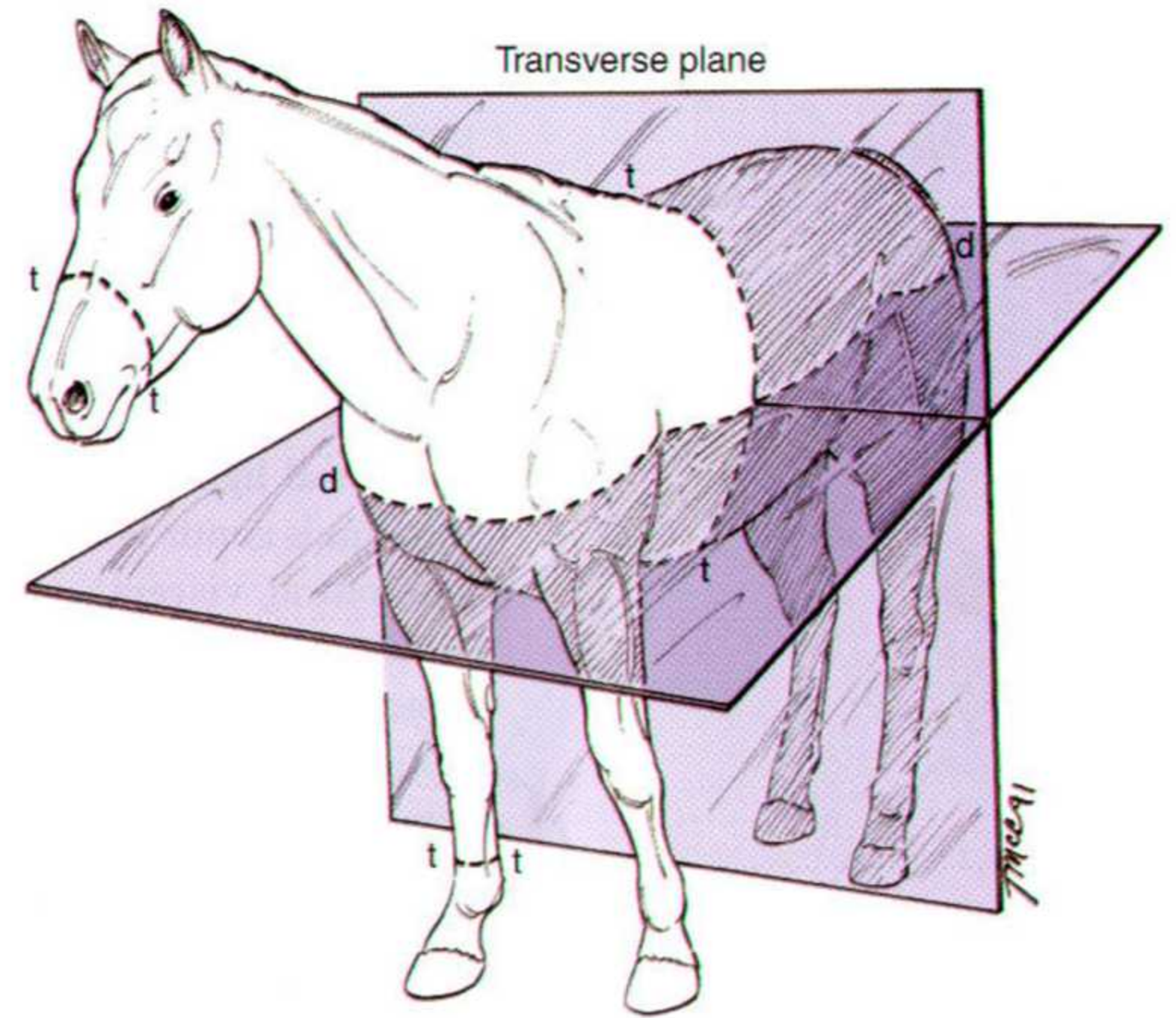
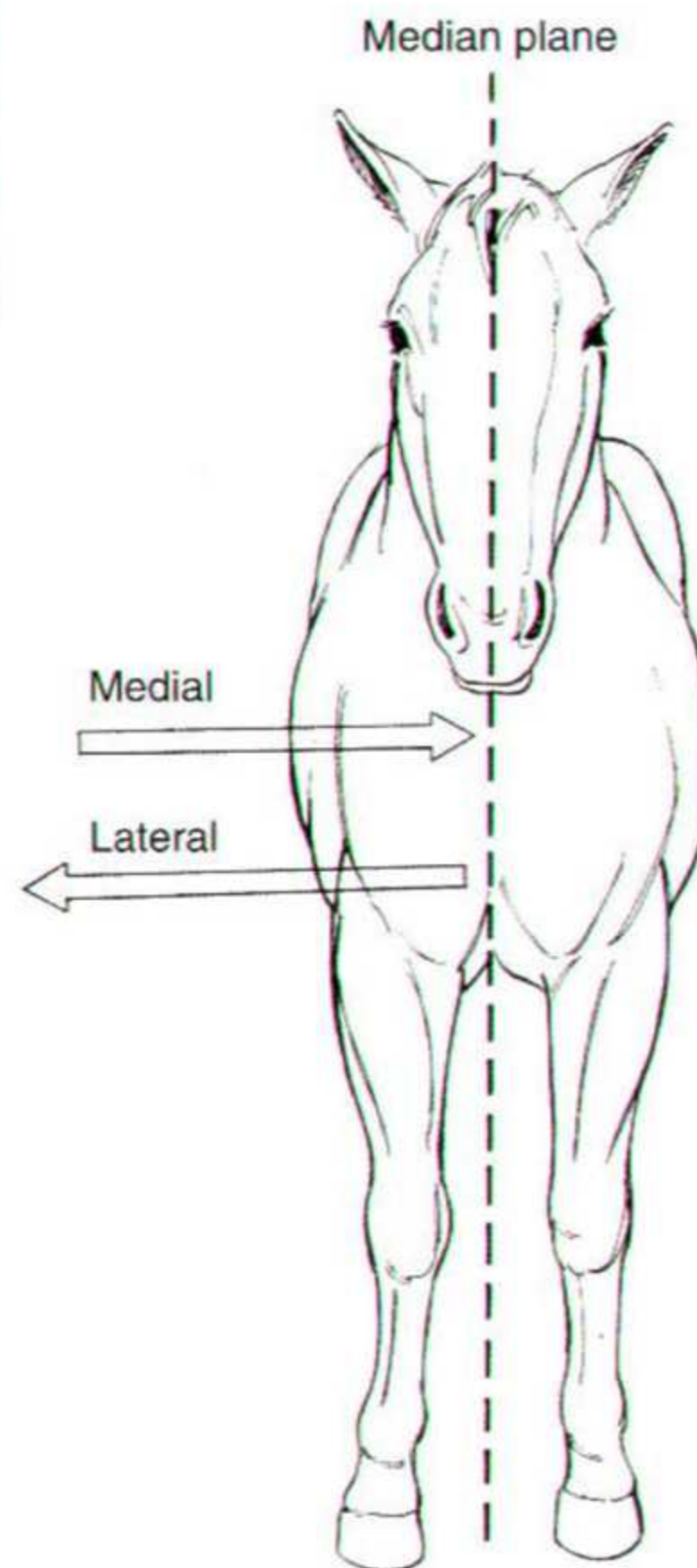


Figure 2





## BODY CAVITIES AND MEMBRANES

A diagrammatic drawing of a mare's trunk illustrates the **thoracic, abdominal, and pelvic cavities** and the serous membranes—**peritoneum, pleura, and pericardium**—that line the cavities and suspend organs.

The peritoneum consists of three continuous parts. The **parietal peritoneum** (L., *paries*, wall) lines the abdominal cavity and the cranial part of the pelvic cavity. **Connecting peritoneum** reflects from the parietal peritoneum and suspends organs in a double fold containing vessels and nerves as it extends to an organ. The connecting peritoneum is indicated by *mes-* (G., *mesos*, middle) plus the Latin or Greek name of the organ. An example is mesentery: *mes-* plus G., *enteron*, small intestine. Peritoneal ligaments suspend and support—e.g., the falciform ligament of the liver. **Visceral peritoneum** is continuous with connecting peritoneum, encircling a viscus (Latin for a large, internal organ; plural, **viscera**).

The musculomembranous **diaphragm** is covered with peritoneum on its abdominal surface and pleura on its thoracic surface.

The **pleurae** are two continuous serous membranes, each forming a pleural sac. The **parietal pleura** lines each half of the thoracic cavity. **Mediastinal pleura** is connecting pleura on each side enclosing the **mediastinum**, a space containing the heart, esophagus, trachea, blood vessels, lymph nodes and ducts, thymus, nerves, and adipose tissue. **Visceral pleura** covers each lung.

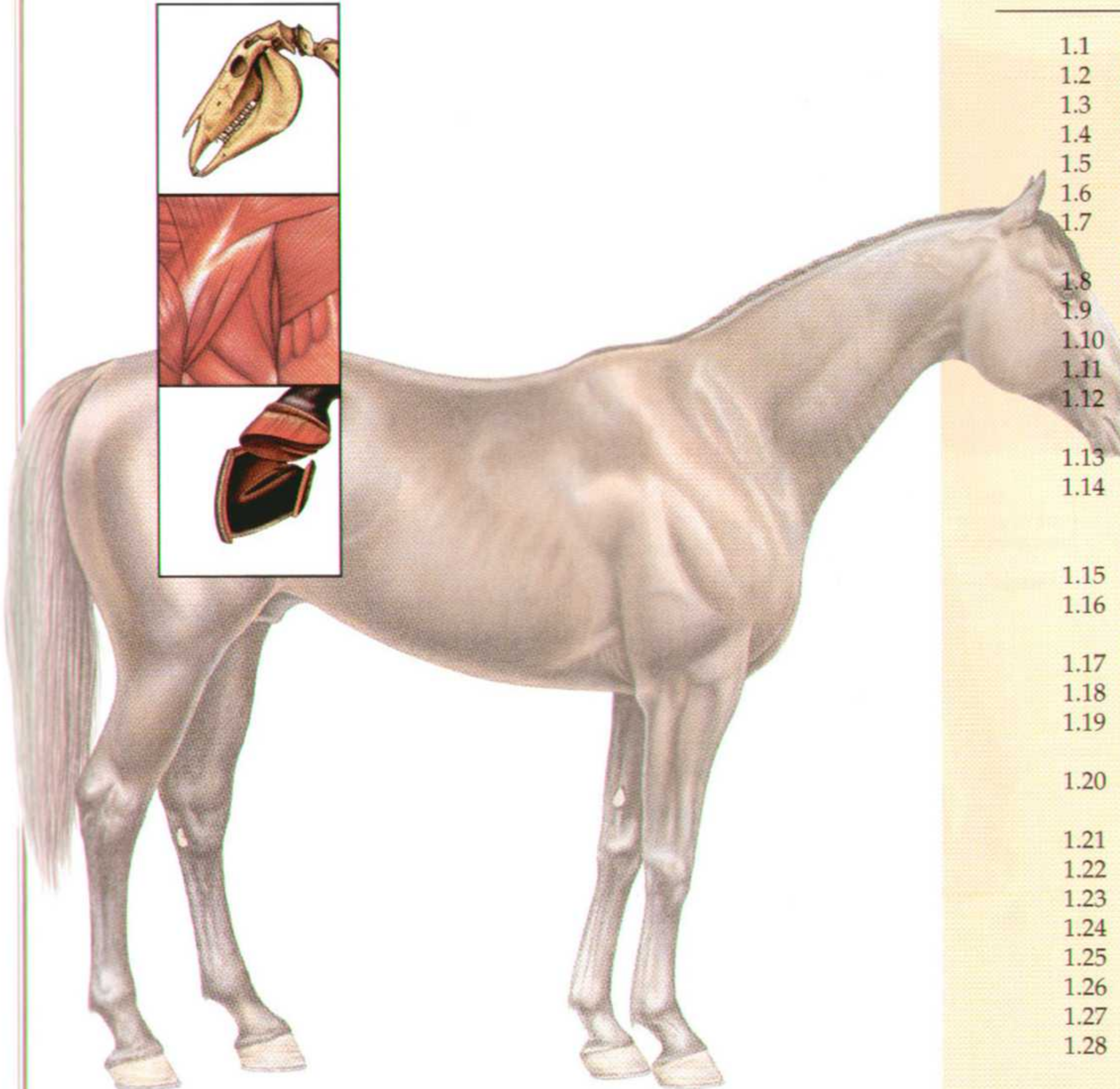
The **pericardium** is the heart sac. **Visceral pericardium** (also called epicardium) covers the heart and reflects around the base of the heart and great vessels to become continuous with the **parietal pericardium**.

The serous cavities—**peritoneal cavity, pleural cavity, and pericardial cavity**—are potential spaces between parietal and visceral membranes containing lubricating serous fluids named for each cavity.



# SECTION 1 THE HORSE (*Equus caballus*)

## PLATES



- 1.1 Right lateral view of a stallion.
- 1.2 Left lateral view of a mare.
- 1.3 Body regions of the horse.
- 1.4 Skeleton of the horse.
- 1.5 Cutaneous muscles and major fasciae of the stallion.
- 1.6 Superficial muscles and veins of the mare.
- 1.7 A. Parasagittal section of the equine digit.  
B. Palmar (plantar) view of major structures of the digit.
- 1.8 Relations of the hoof.
- 1.9 Stay apparatus of the equine forelimb.
- 1.10 Stay apparatus and reciprocal apparatus of the hindlimb.
- 1.11 Deep muscles and *in situ* viscera of the stallion.
- 1.12 Deep cervical muscles, major joints, and *in situ* viscera of the mare.
- 1.13 Median section of the horse's head.
- 1.14 A. Occlusal (grinding) surfaces of an equine lower first incisor tooth related to continuous eruption and wear.  
B. Complete dentition of the male horse circa 5 years of age.
- 1.15 Isolated stomach and intestines of the horse.
- 1.16 Equine cecum, large (ascending) colon, and transverse colon *in situ*.
- 1.17 Clinical condition: Right dorsal displacement of the large colon.
- 1.18 Clinical condition: Left dorsal displacement of the large colon.
- 1.19 Reproductive organs, urinary organs, liver, heart, and adjacent major vessels related to the skeleton of the stallion.
- 1.20 Heart and some adjacent major vessels, abdominal and pelvic viscera, and udder (mammary glands) of the mare.
- 1.21 Relations of the reproductive organs of the stallion.
- 1.22 Relations of the reproductive organs of the mare.
- 1.23 Neonatal organs of the foal.
- 1.24 Major arteries of the mare.
- 1.25 Major veins of the stallion. Portal system excluded.
- 1.26 Lymph nodes and vessels of the horse.
- 1.27 Central and somatic nervous system of the stallion.
- 1.28 Autonomic nervous system of the mare.



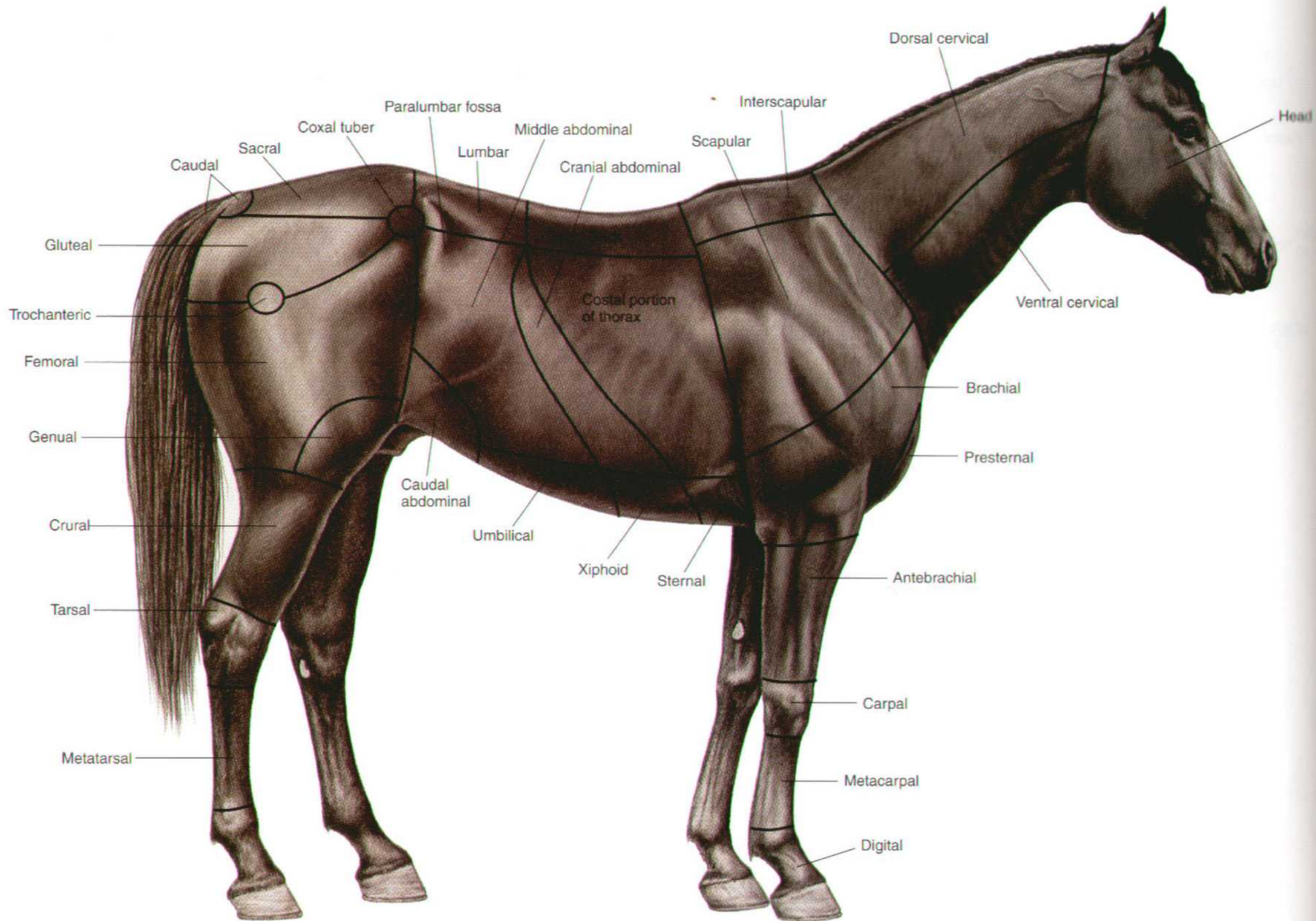
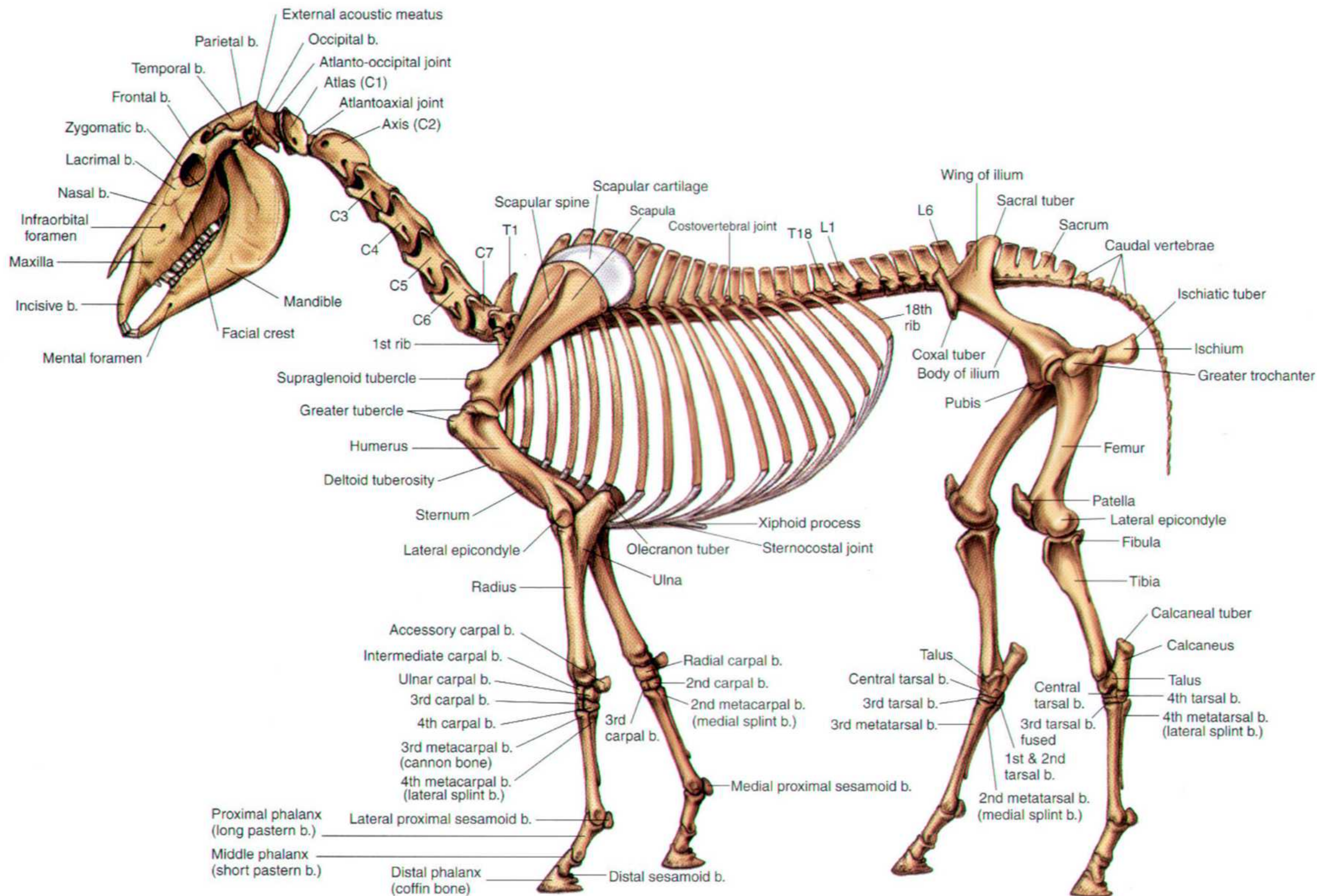


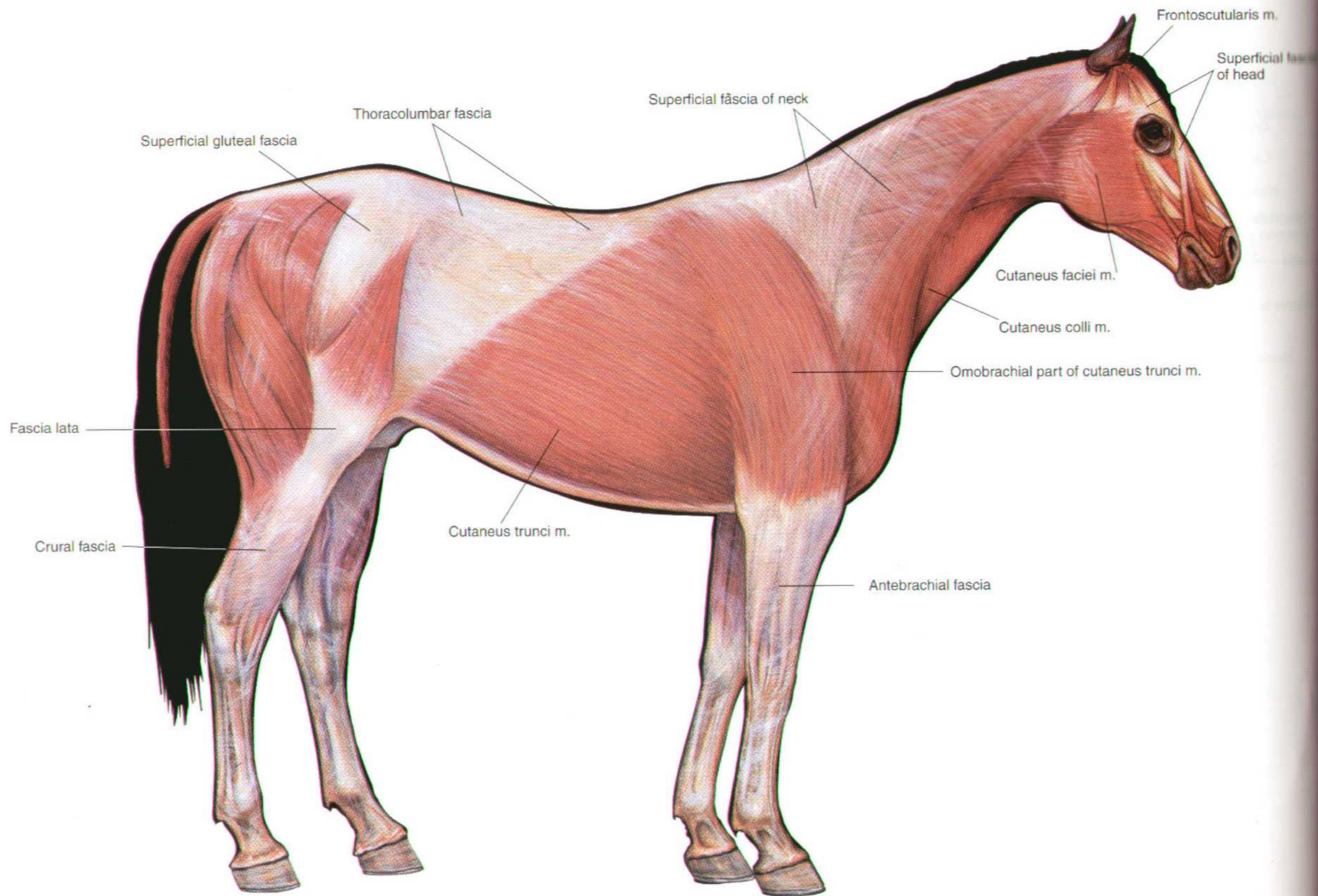
PLATE 1.3 Body regions of the horse. Right lateral view.





**PLATE 1.4** Skeleton of the horse. Left lateral view. C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra, b = bone







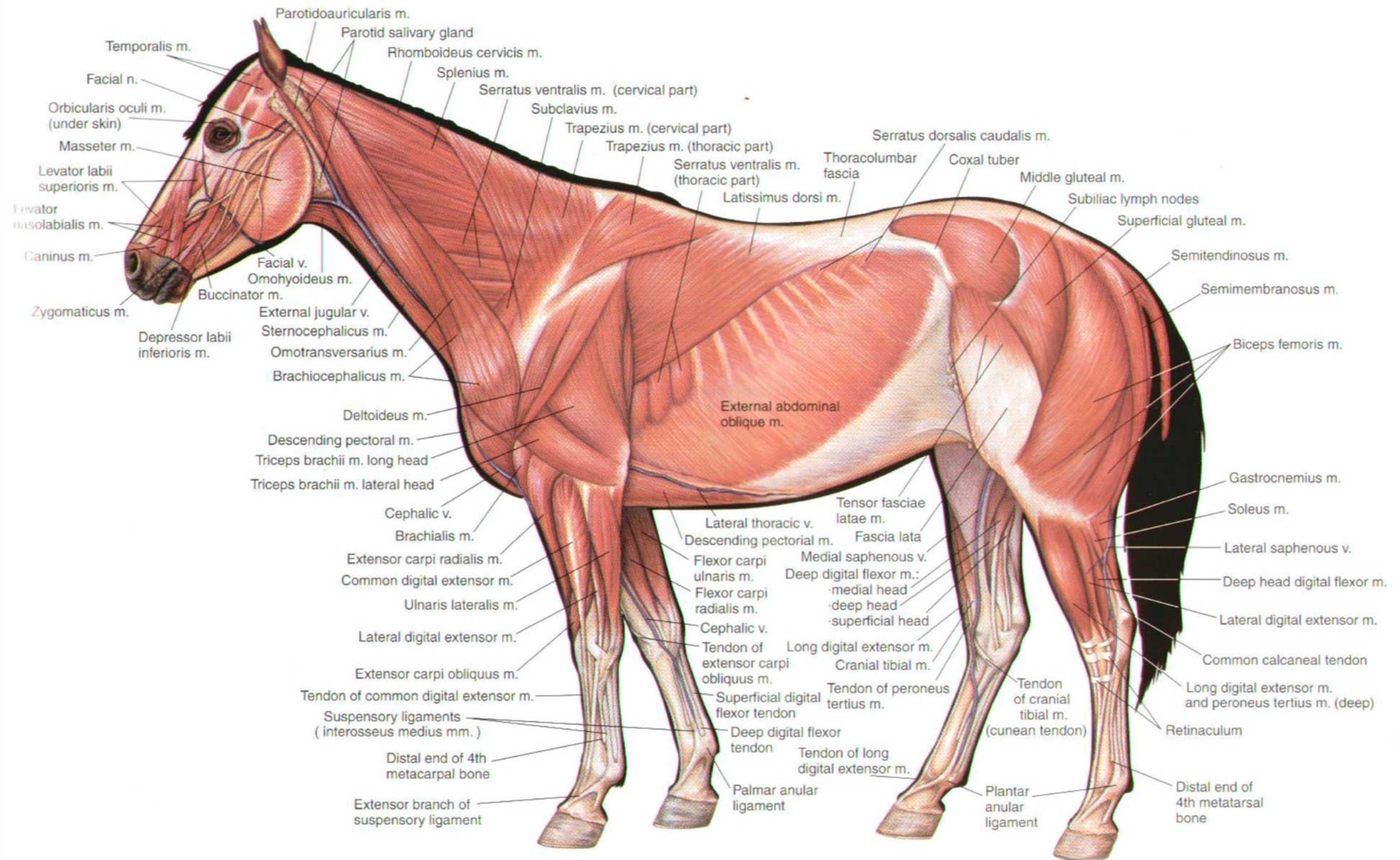
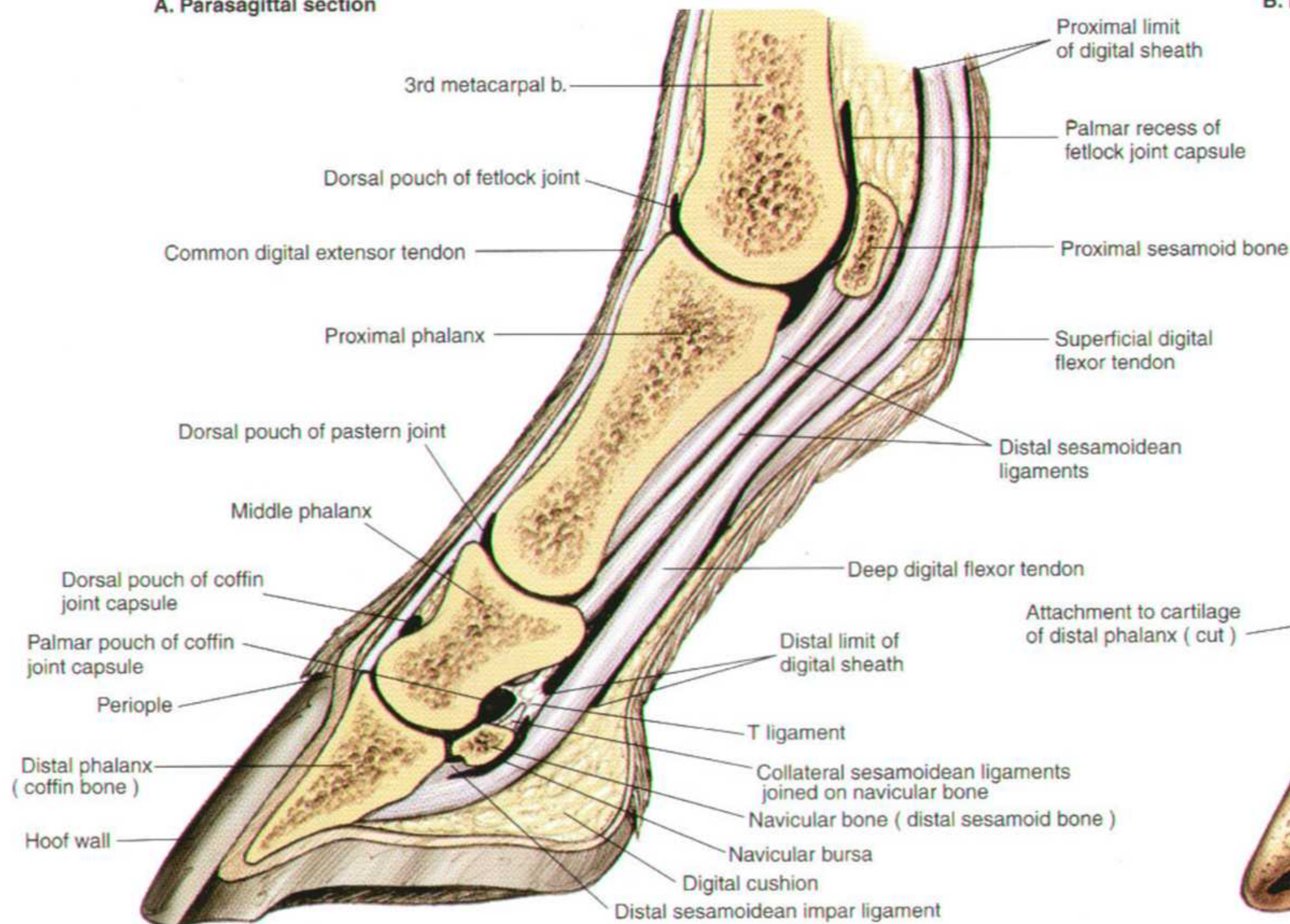


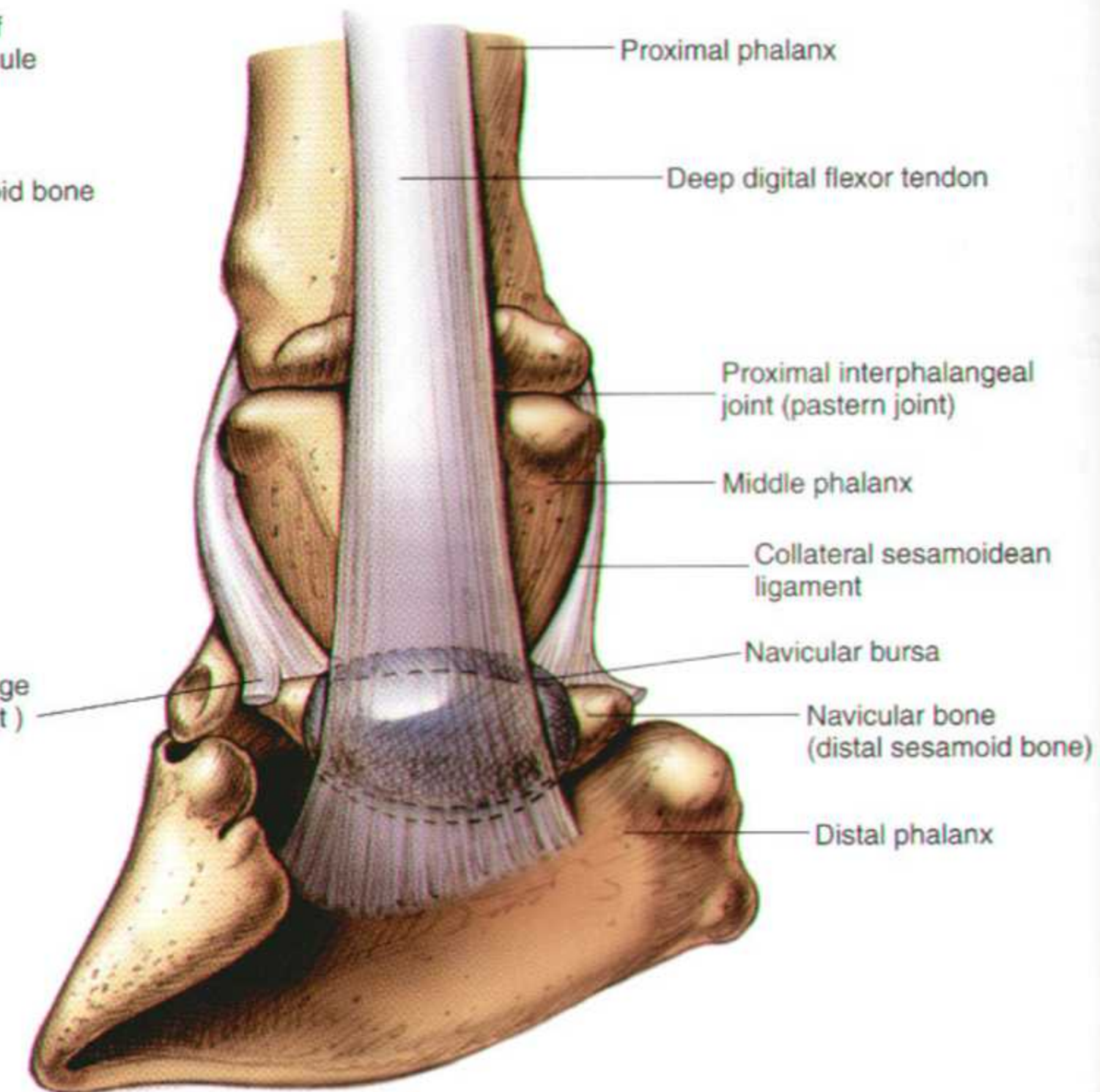
PLATE 1.6 Superficial muscles and veins of the mare. Left lateral view.  
m = muscle, n = nerve, v = vein



### A. Parasagittal section

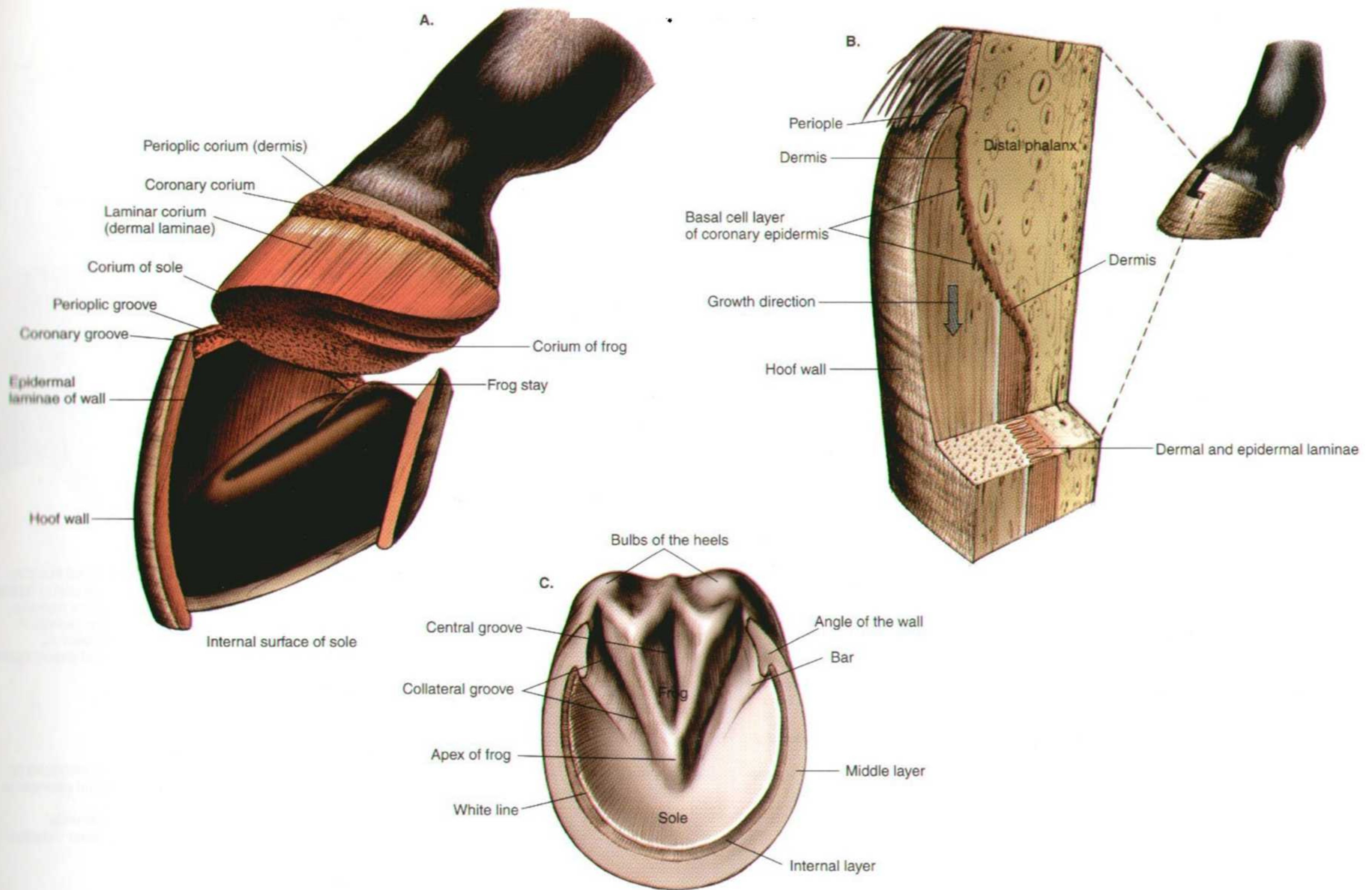


### B. Palmar view



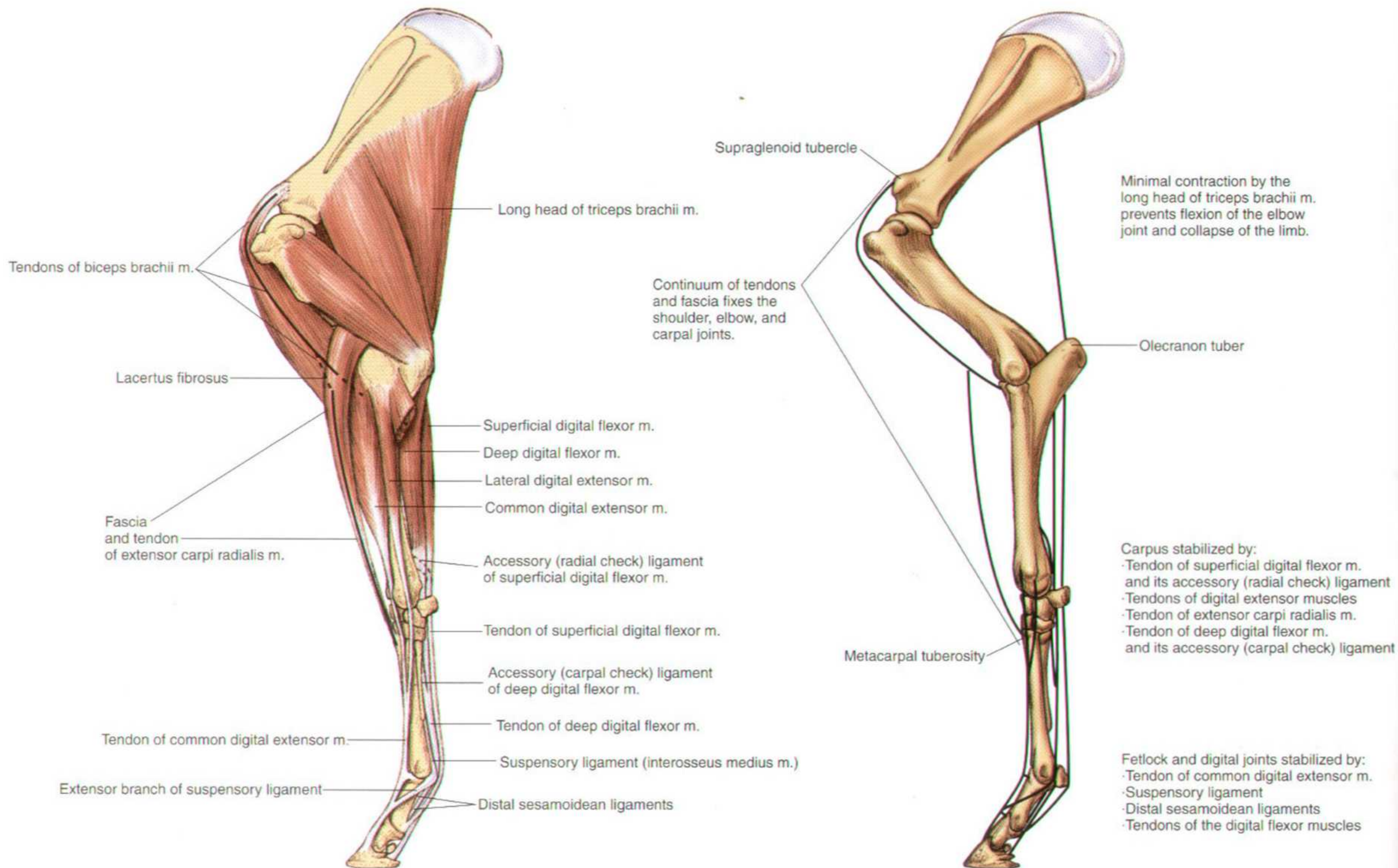
**PLATE 1.7** A. Parasagittal section of the equine digit. B. Palmar (plantar) view of major structures of the equine digit. Navicular bursa obscures joining of collateral sesamoidean ligaments on the navicular bone. b = bone



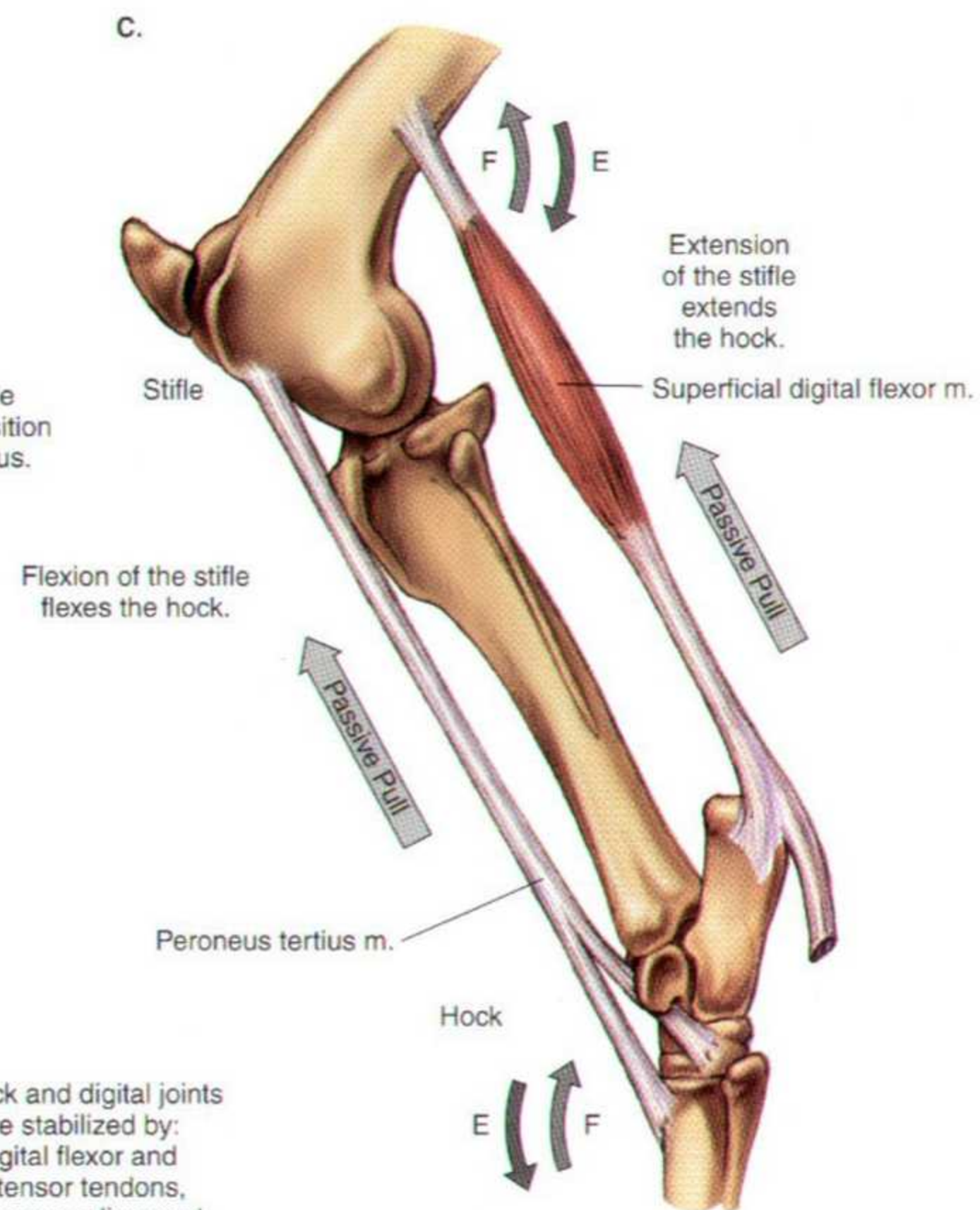
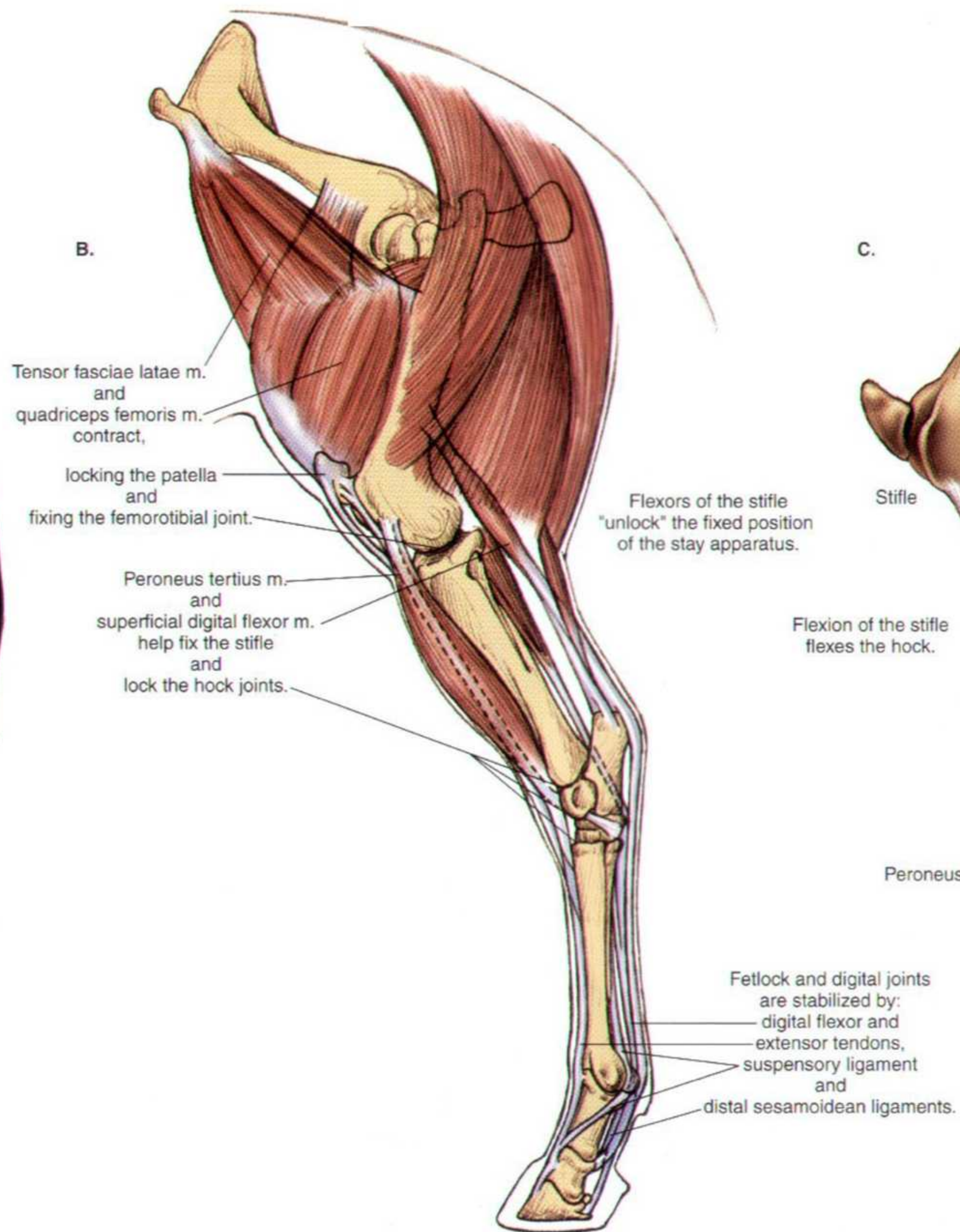


**PLATE 1.8** Relations of the hoof. **A.** Separation of the hoof to show its relations to regions of the corium. **B.** Three-dimensional dissection to show relations of the hoof wall, coronary and laminar corium, and distal phalanx. **C.** Solar surface of the hoof.









**PLATE 1.10** Stay apparatus and reciprocal apparatus of the hindlimb. **A.** One hindlimb partly flexed with its toe on the ground, and the foot of the opposite limb fixed with minimal muscular activity by the stay apparatus. **B.** Stay apparatus of the hindlimb. **C.** The reciprocal apparatus. m = muscle



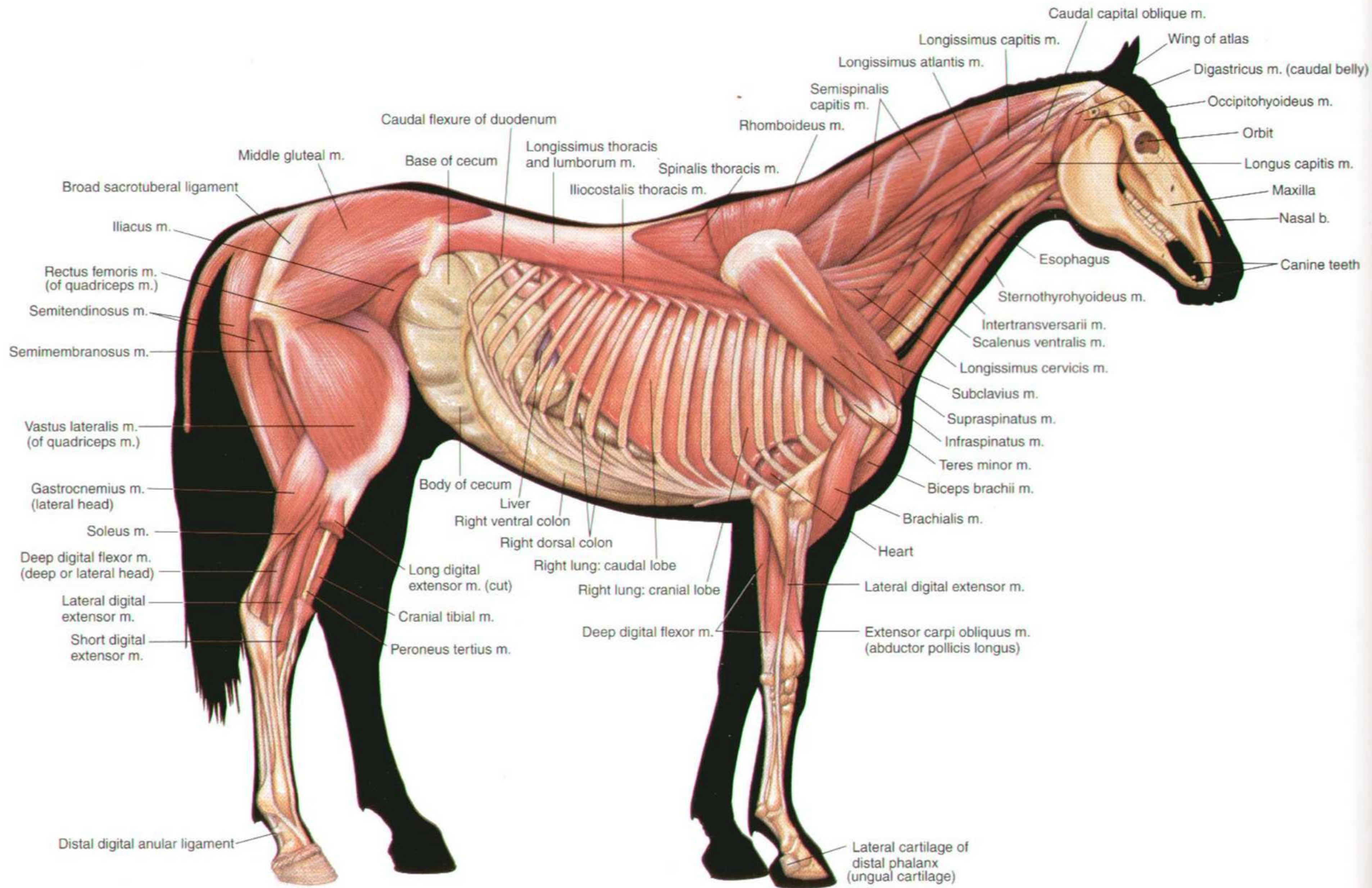
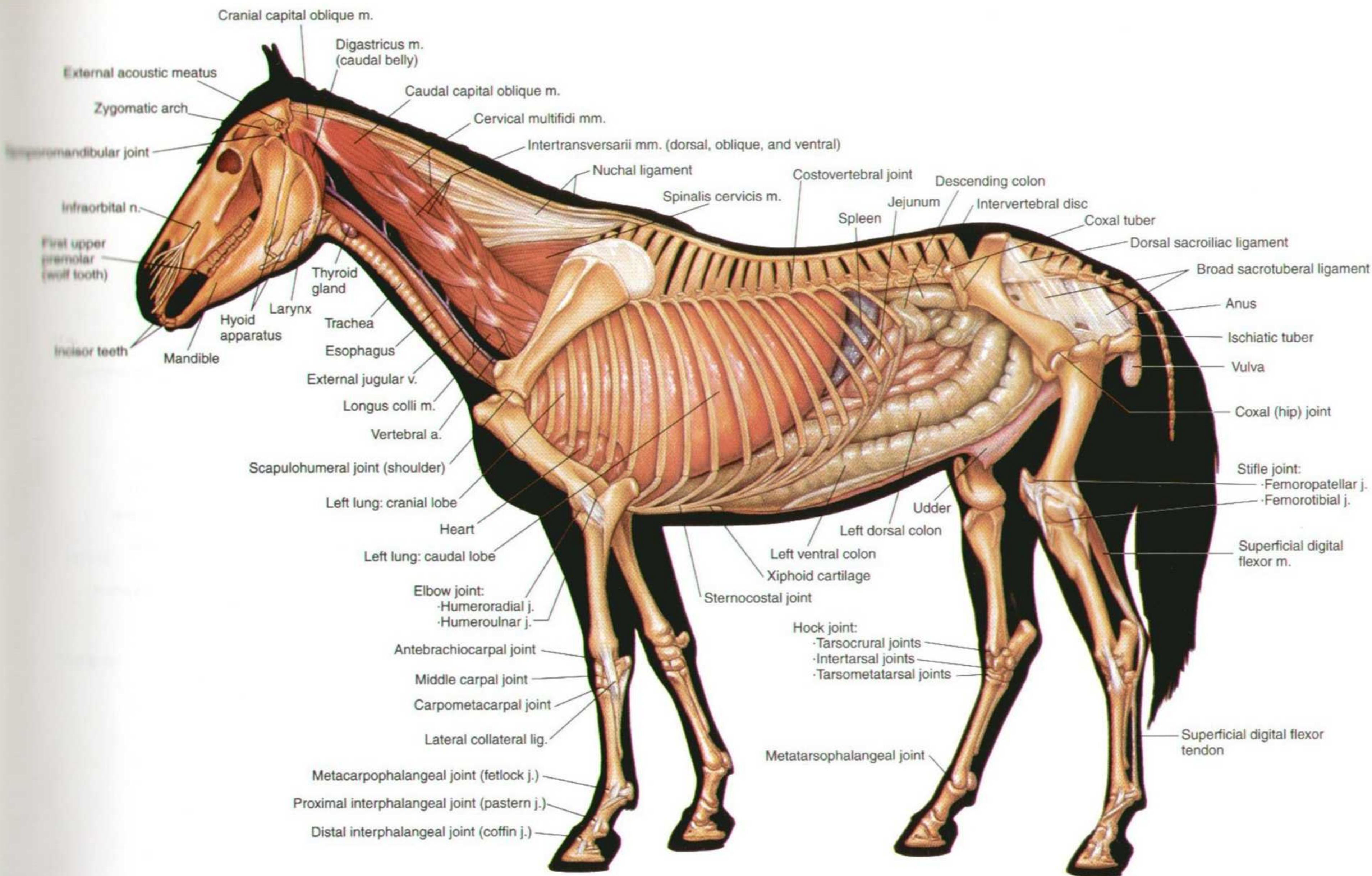


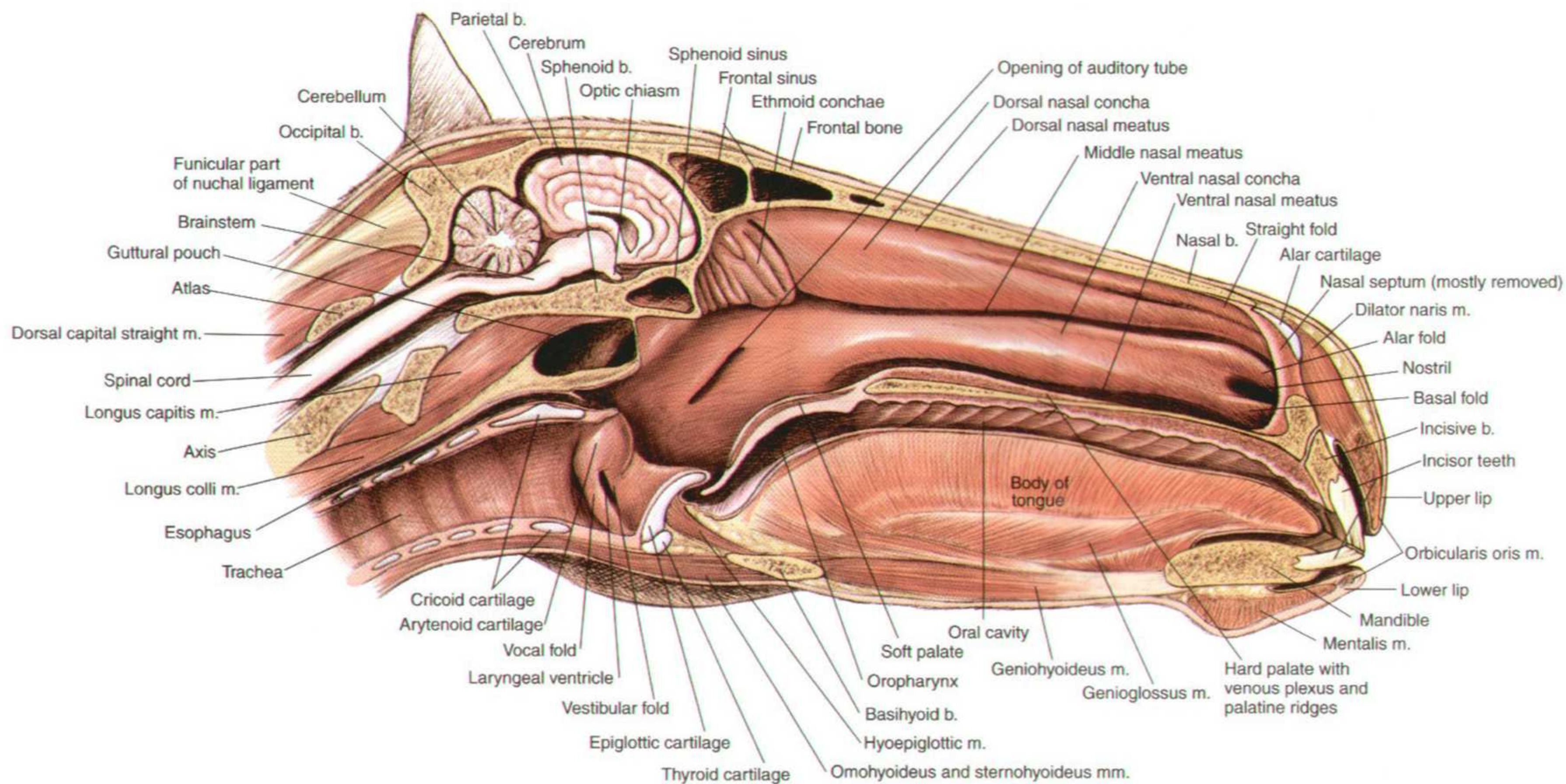
PLATE 1.11 Deep muscles and *in situ* viscera of the stallion.  
Right lateral view. m = muscle, b = bone





**PLATE 1.12** Deep cervical muscles, major joints, and *in situ* viscera of the mare. Left lateral view.  
 n = nerve, v = vein, m = muscle, a = artery, j = joint, lig = ligament

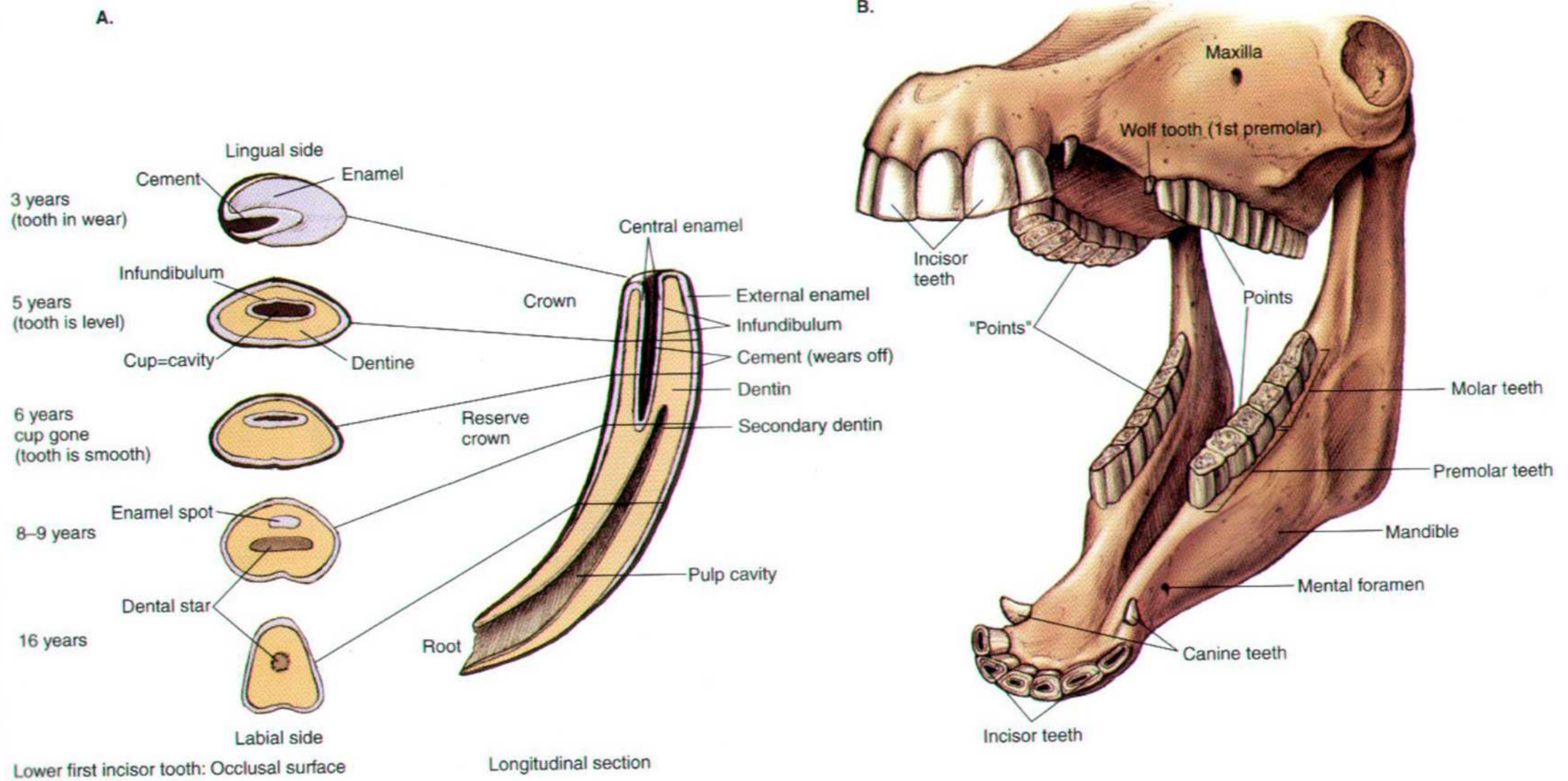




**PLATE 1.13** Median section of the horse's head. Nasal septum mostly removed.  
b = bone, m = muscle

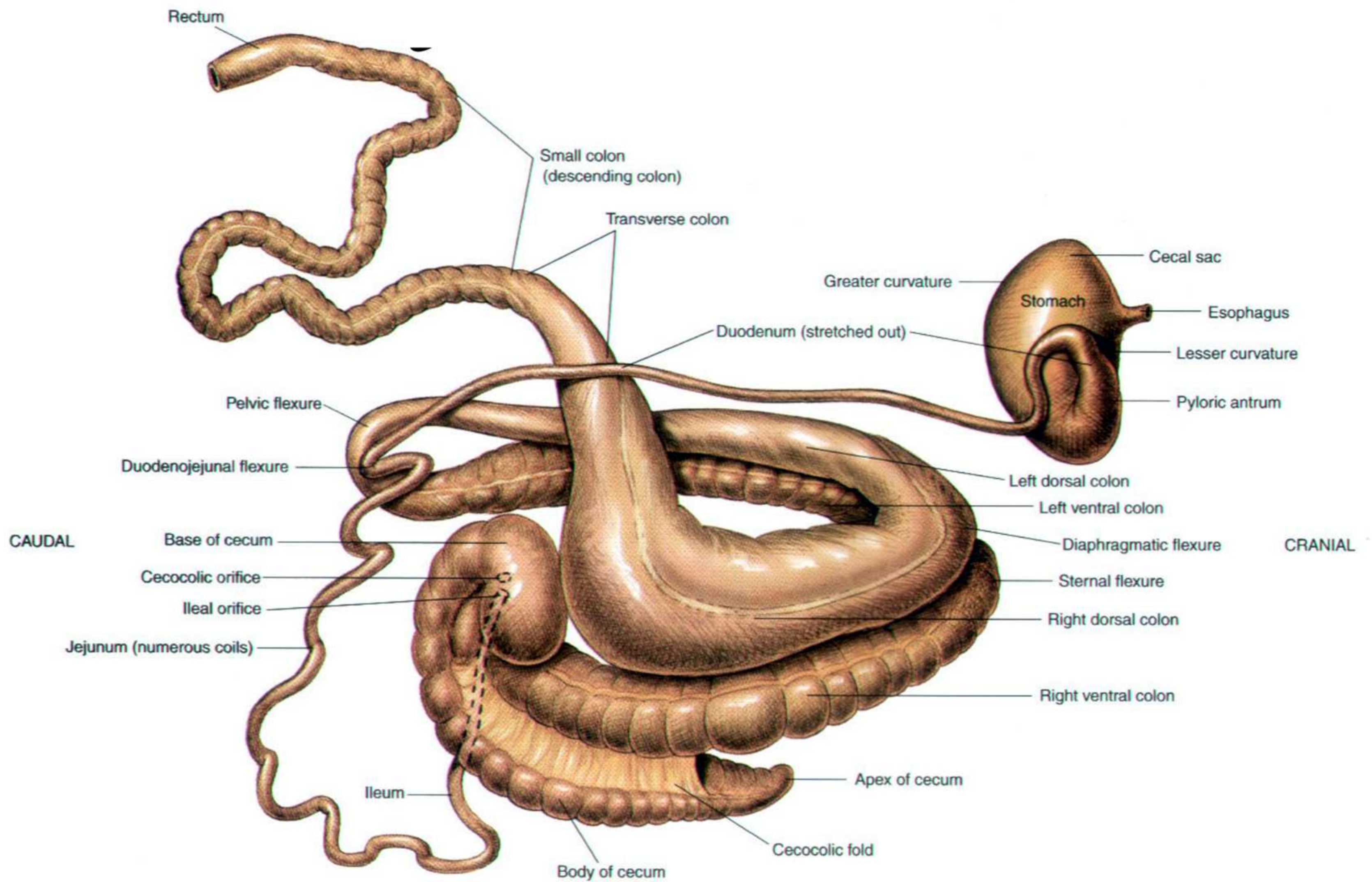


Oval  
Round  
Triangular



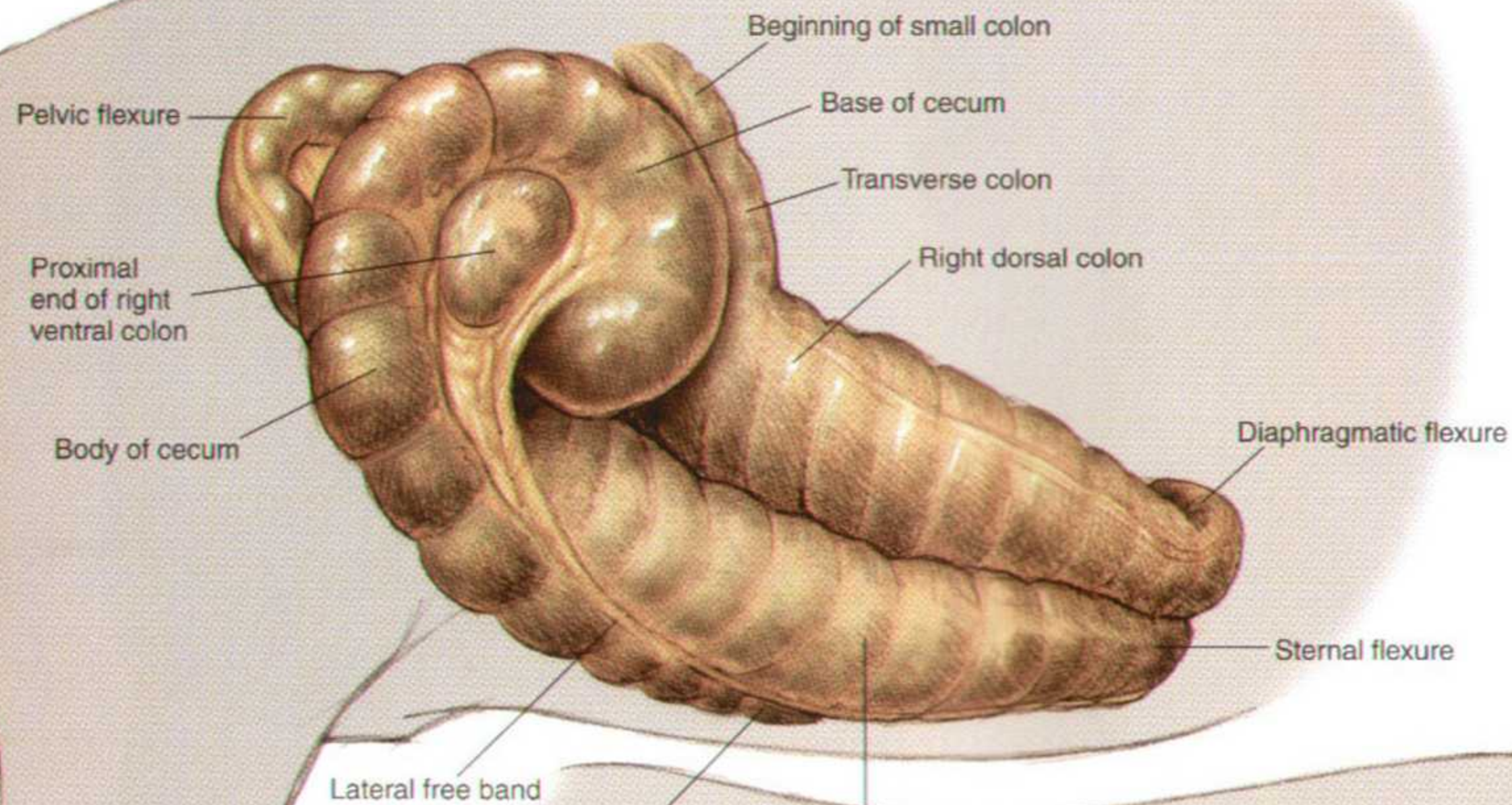
**PLATE 1.14** A. Occlusal (grinding) surfaces of an equine lower first incisor tooth related to continuous eruption and wear. Approximate levels at advancing ages indicated on a longitudinal section. B. Complete dentition of the male horse circa 5 years of age.







A.



B.

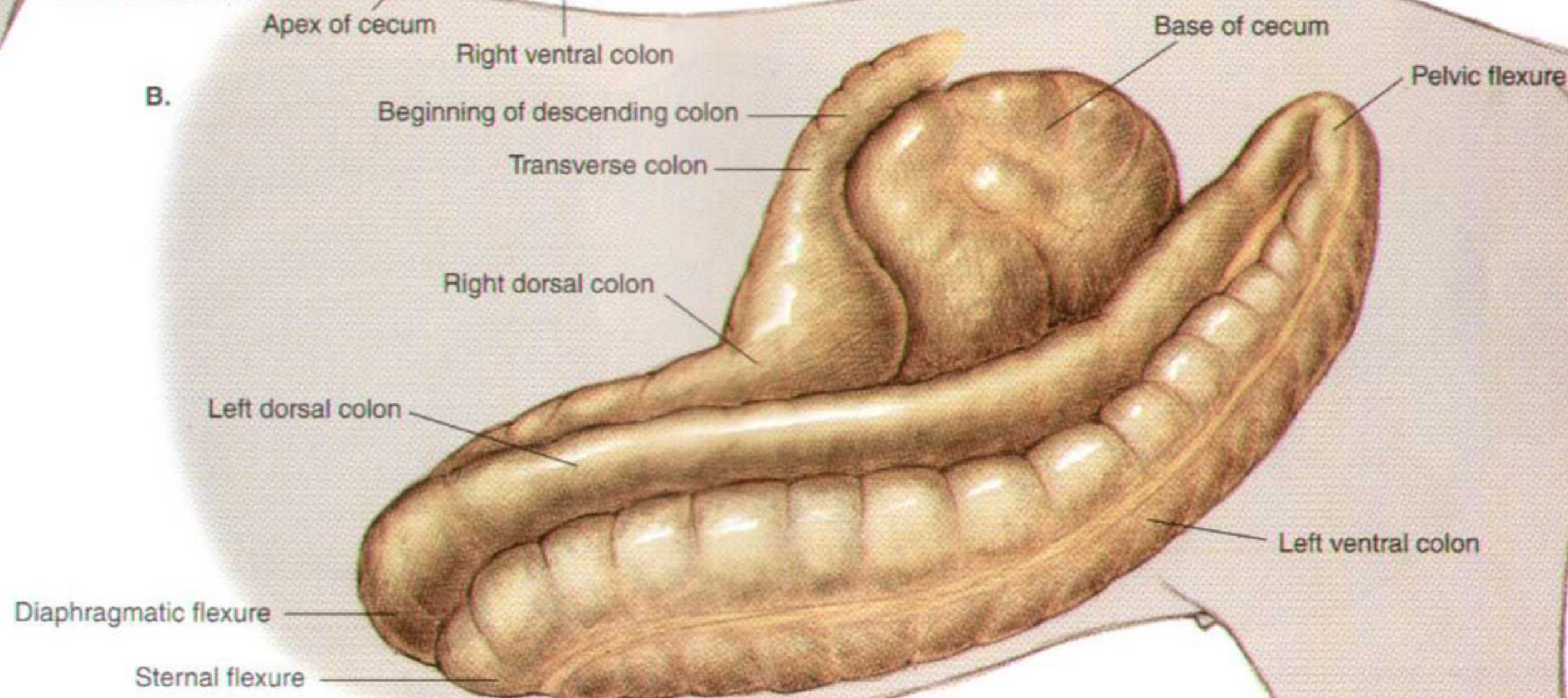
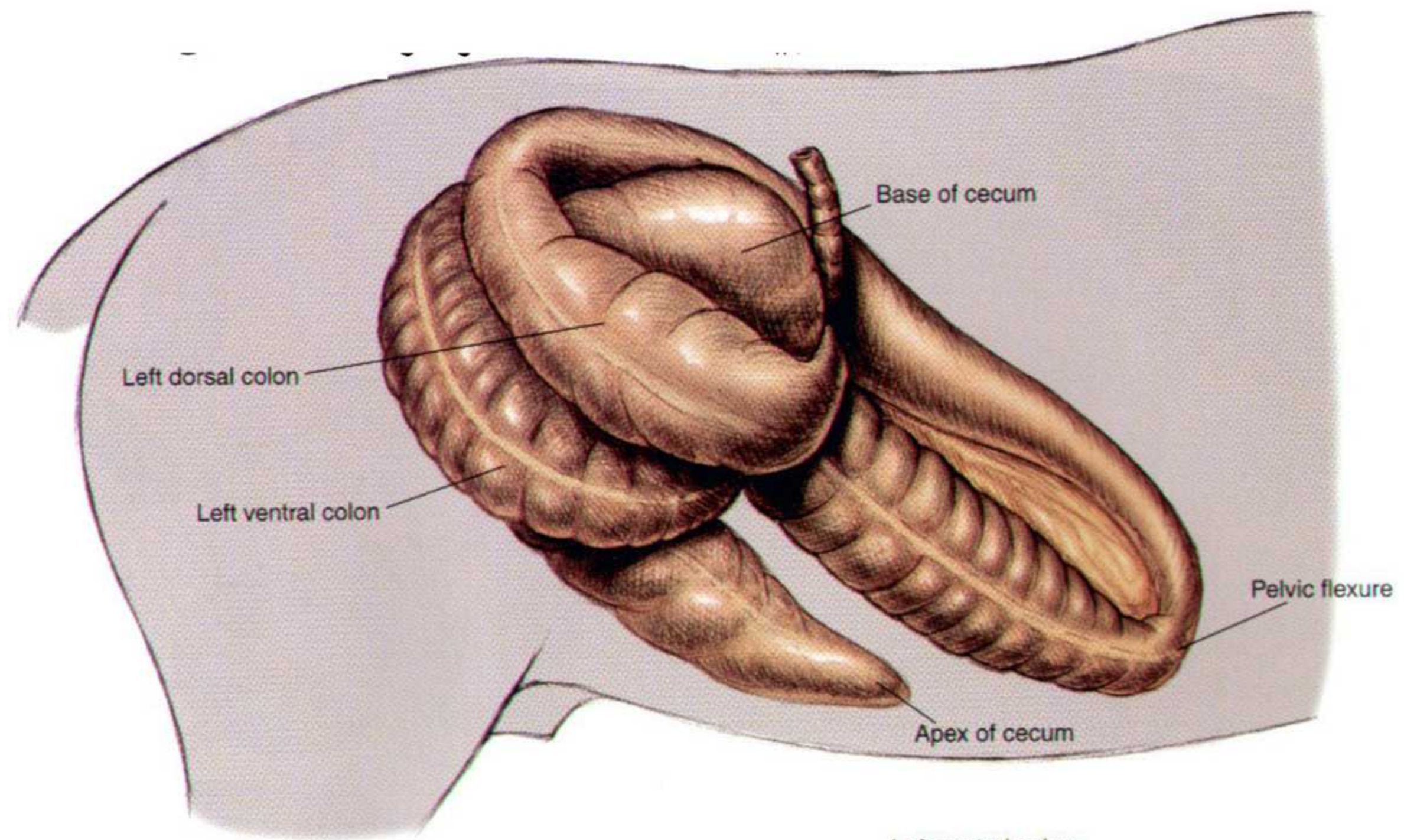


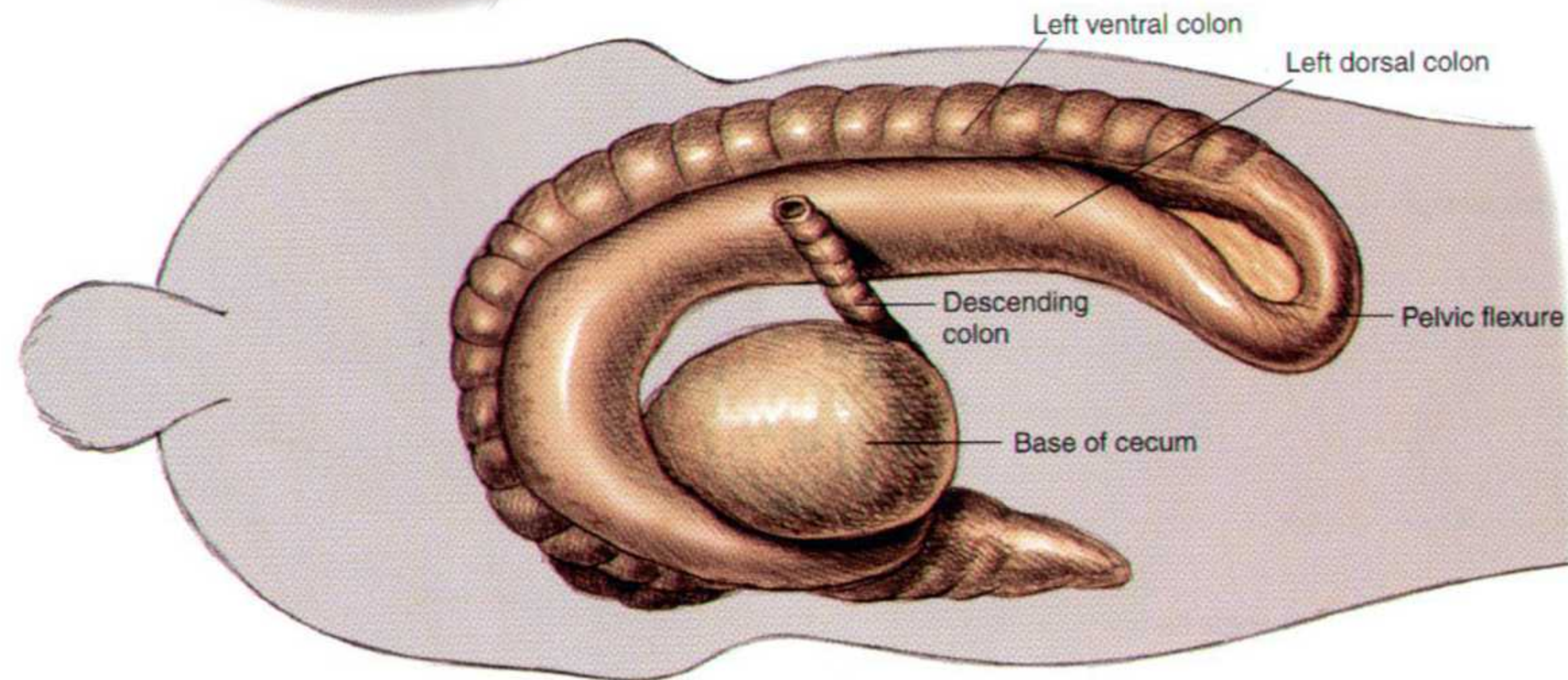
PLATE 1.16 Equine cecum, large (ascending) colon, and transverse colon *in situ*.  
A. Right lateral view. B. Left lateral view.



A.



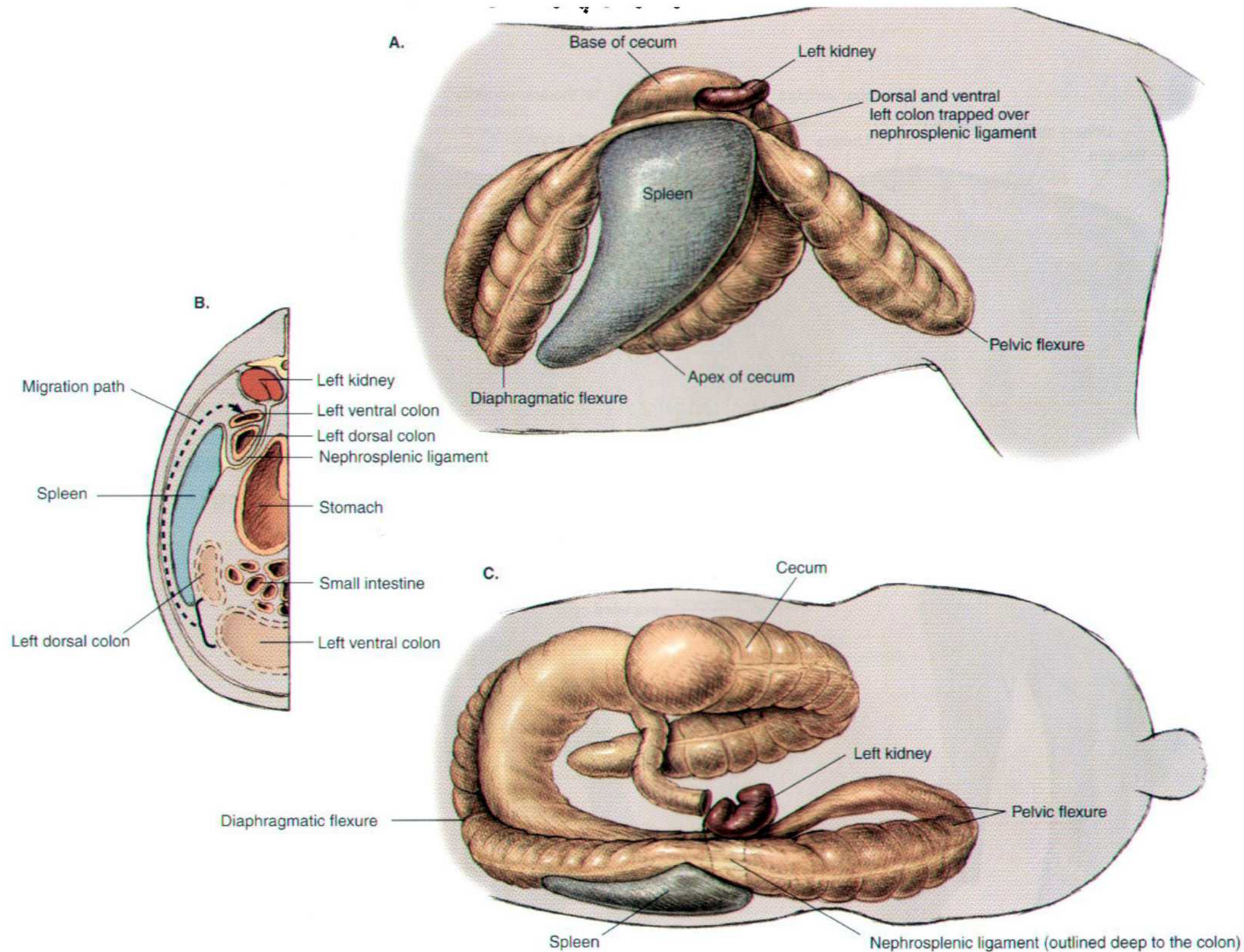
B.



**PLATE 1.17** Clinical condition: Right dorsal displacement of the large colon. **A.** Right lateral view. **B.** Dorsal view. This displacement is a common cause of colic in adult horses. Most commonly, the large colon moves from the left side of the abdomen, courses caudad between the right body wall and the cecum, and comes to lie again in the left portion of the abdomen with the pelvic flexure facing toward the diaphragm. In many cases, the pelvic flexure will not migrate that far craniad and will instead be located in the caudal aspect of the abdomen on either side of the body or the median plane.







**PLATE 1.18** Clinical condition: Left dorsal displacement of the large colon. **A.** Left lateral view. **B.** Cross-section of the left side of the abdomen. Caudocranial view. **C.** Dorsal view. In this displacement, the left colon moves dorsad and becomes entrapped over the nephrosplenic ligament. The abnormal position of the left colon can often be confirmed by rectal examination, and, many times, left dorsal displacement can be corrected by anesthetizing and rolling the horse to free the entrapment.



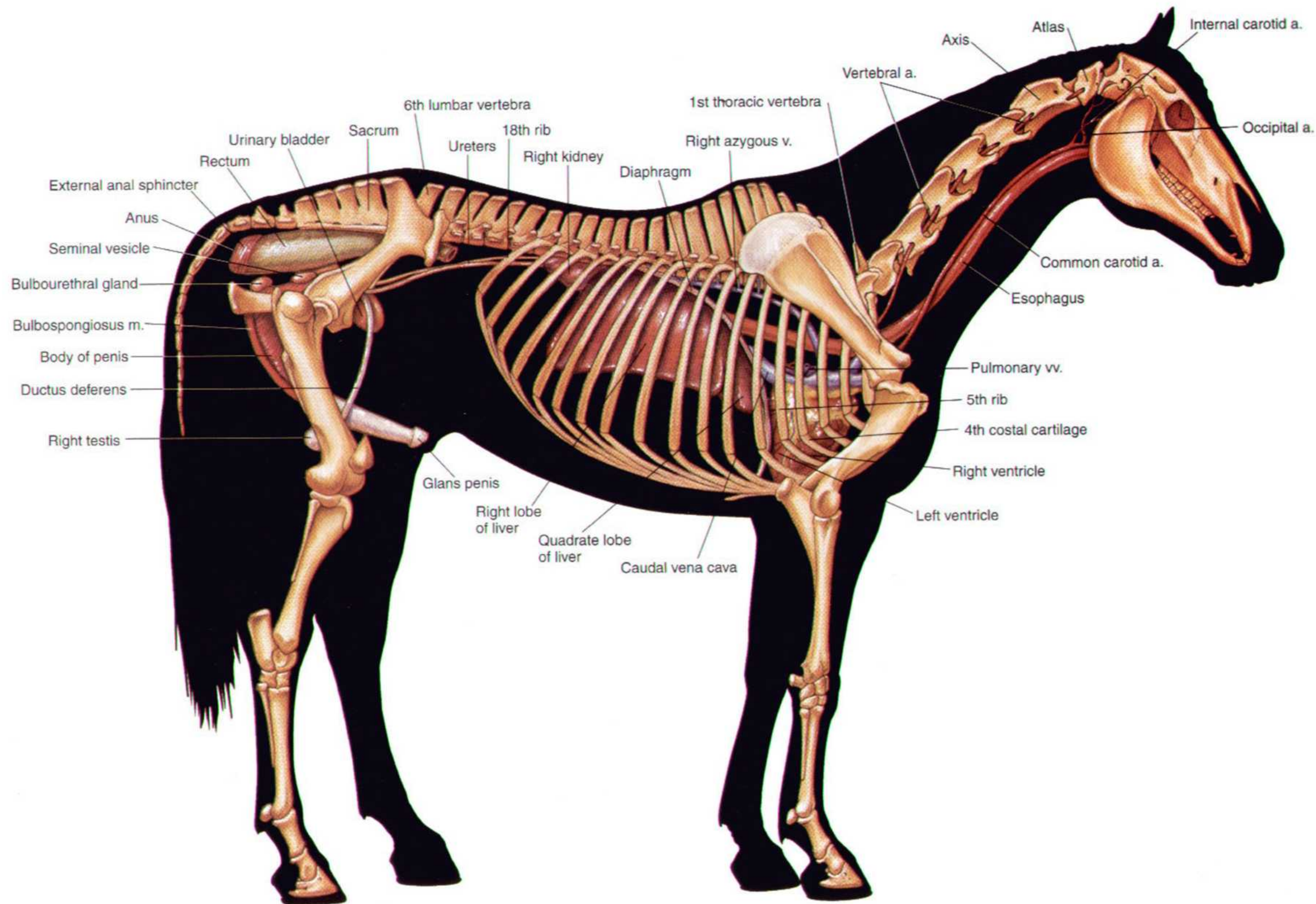
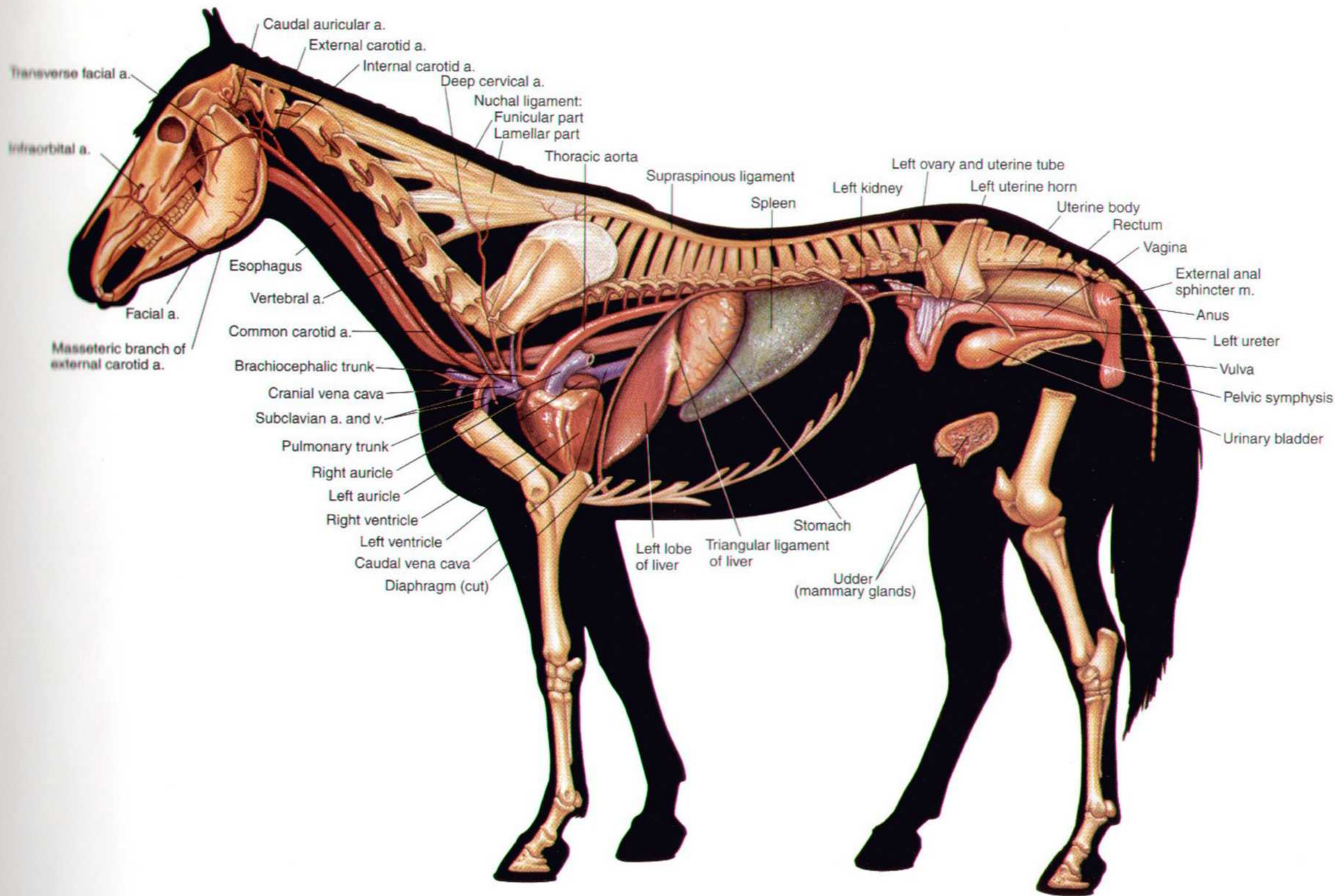


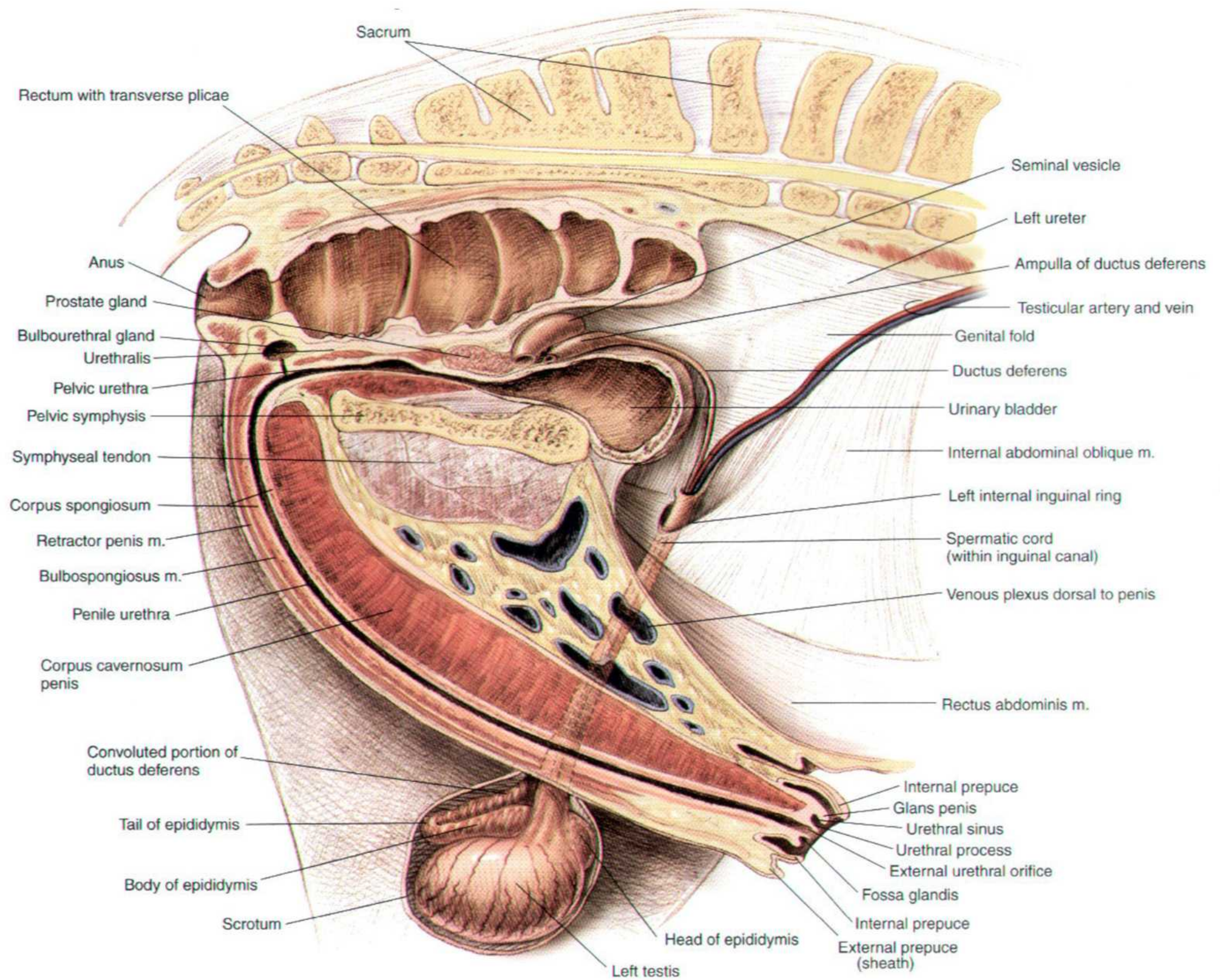
PLATE 1.19 Reproductive organs, urinary organs, liver, heart, and adjacent major vessels related to the skeleton of the stallion. Intestines and lungs are removed.  
Right lateral view. v = vein, a = artery, m = muscle





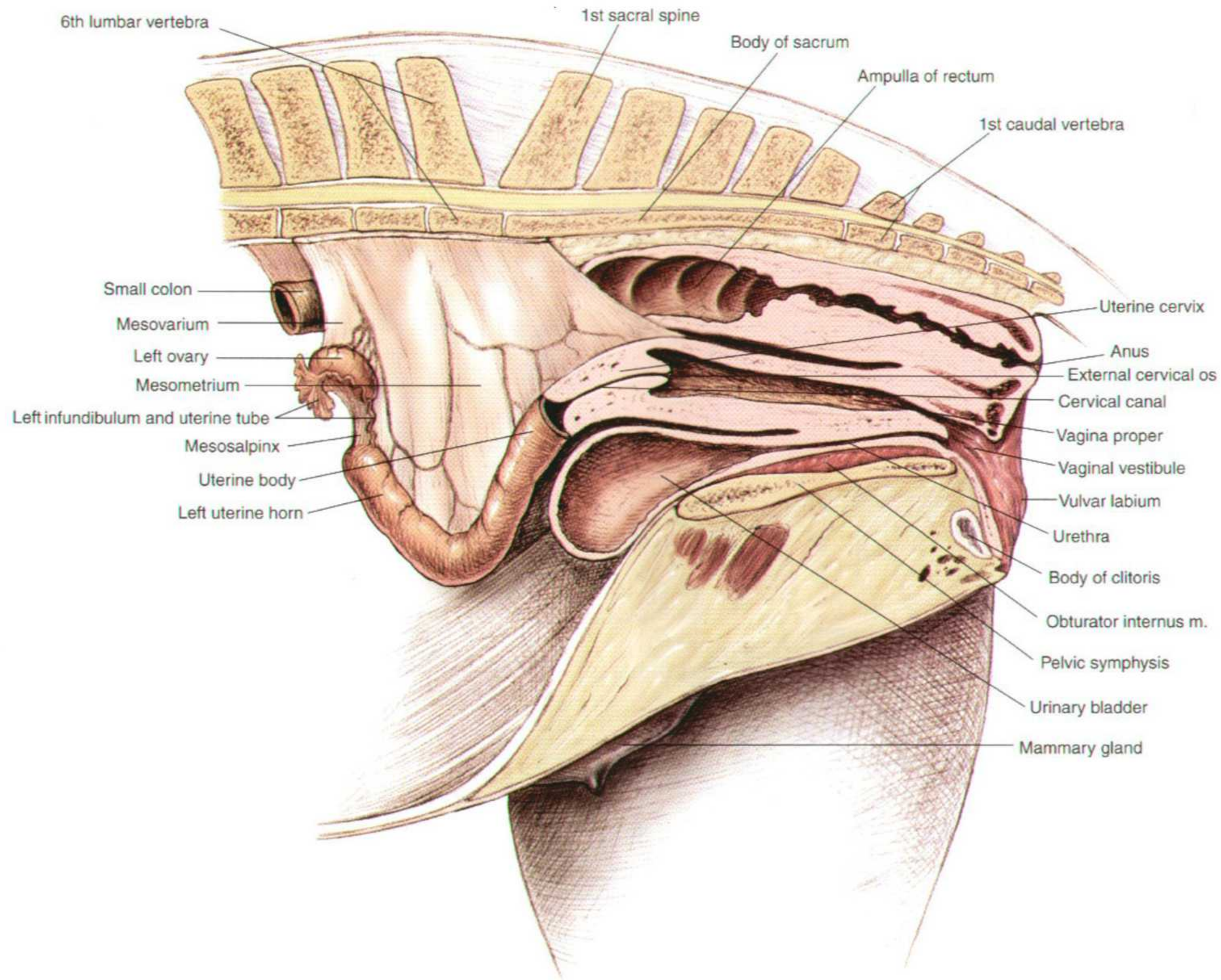
**PLATE 1.20** Heart and some adjacent major vessels, abdominal and pelvic viscera, and udder (mammary glands) of the mare. Intestines and lungs are removed.  
Left lateral view. a = artery, v = vein, m = muscle





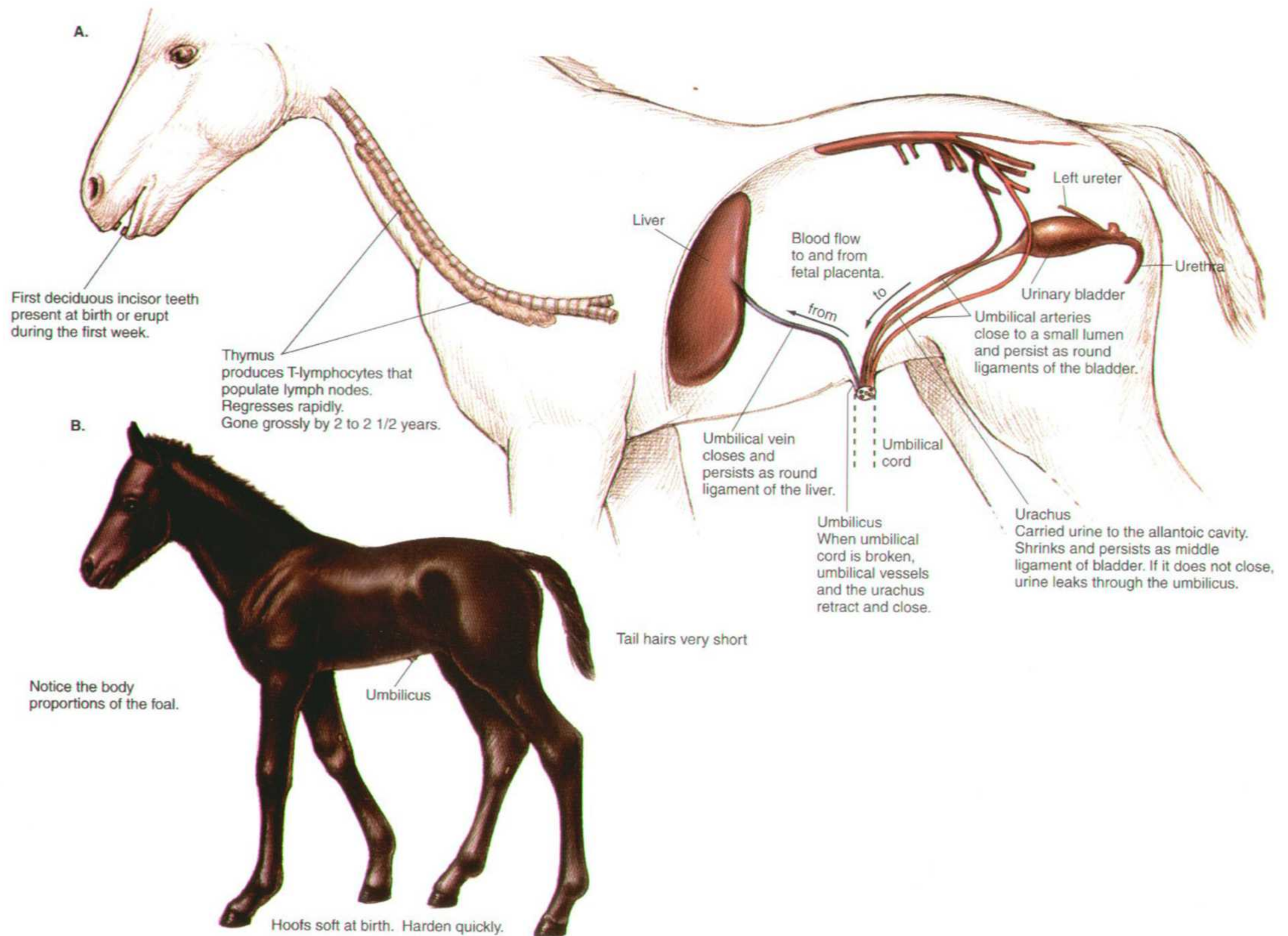
**PLATE 1.21** Relations of the reproductive organs of the stallion.  
Median section, right lateral view. m = muscle





**PLATE 1.22** Relations of the reproductive organs of the mare. Partial median section.  
Left lateral view. m = muscle







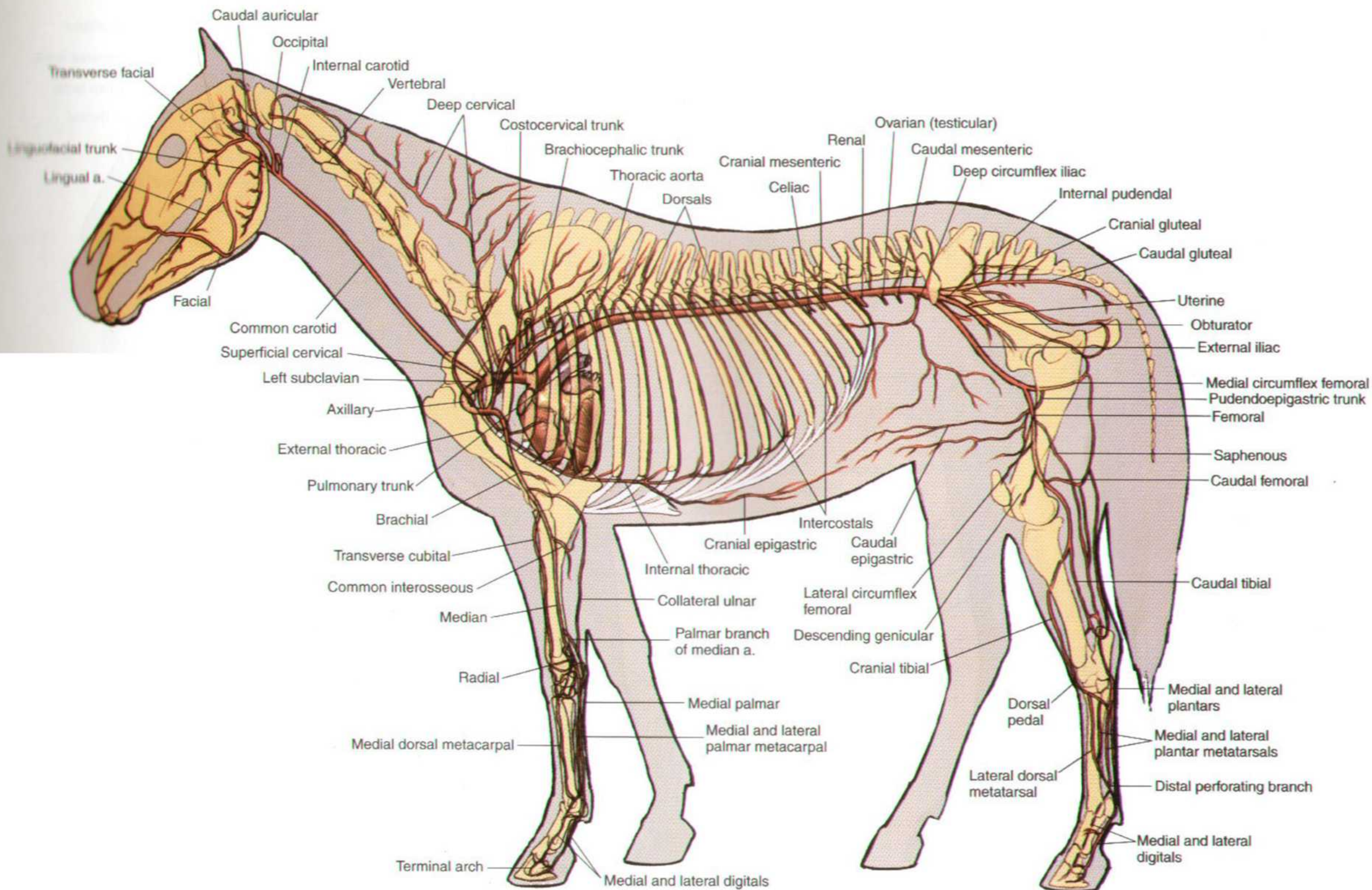


PLATE 1.24 Major arteries of the mare. Left lateral view. a = artery



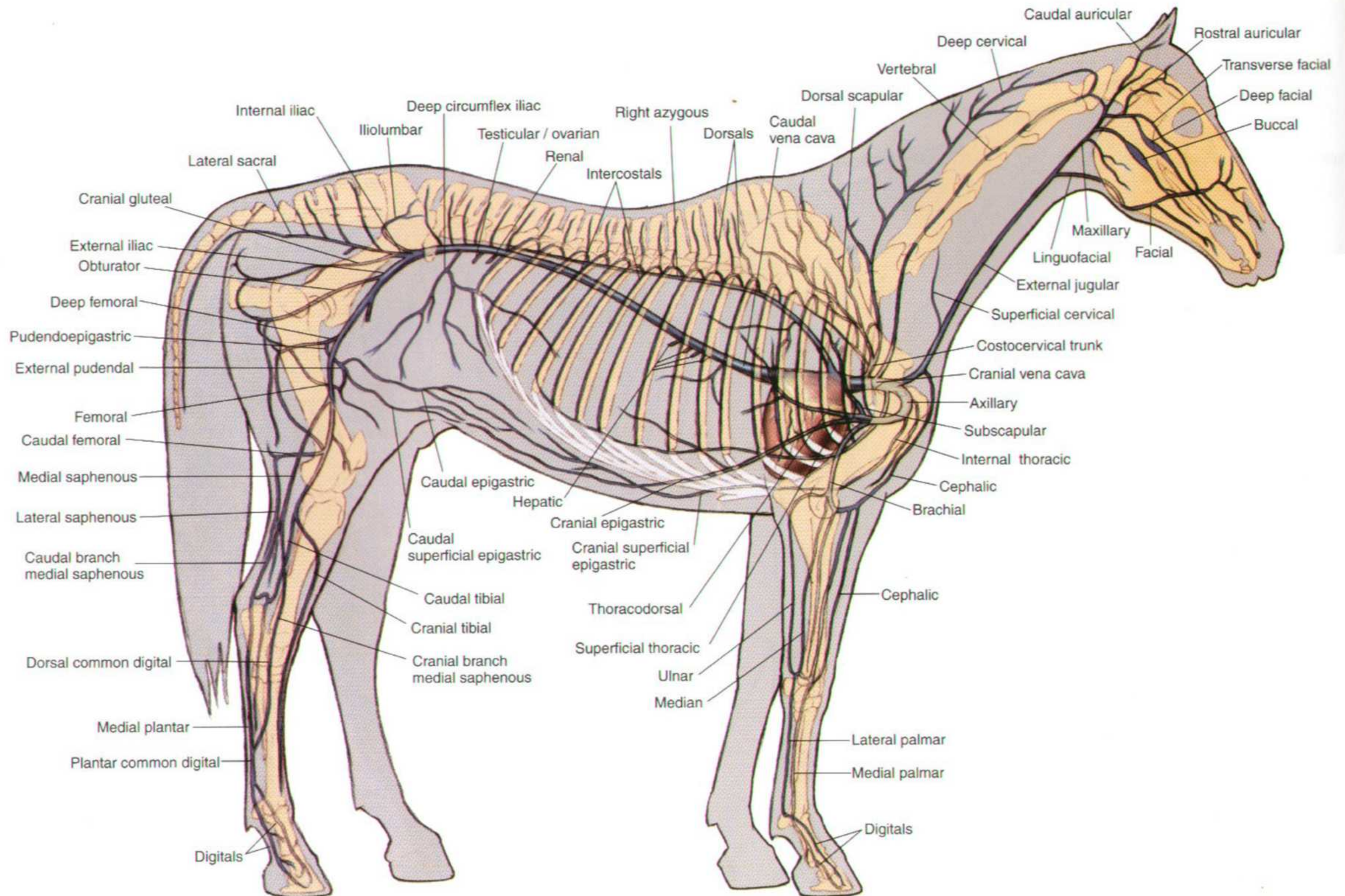
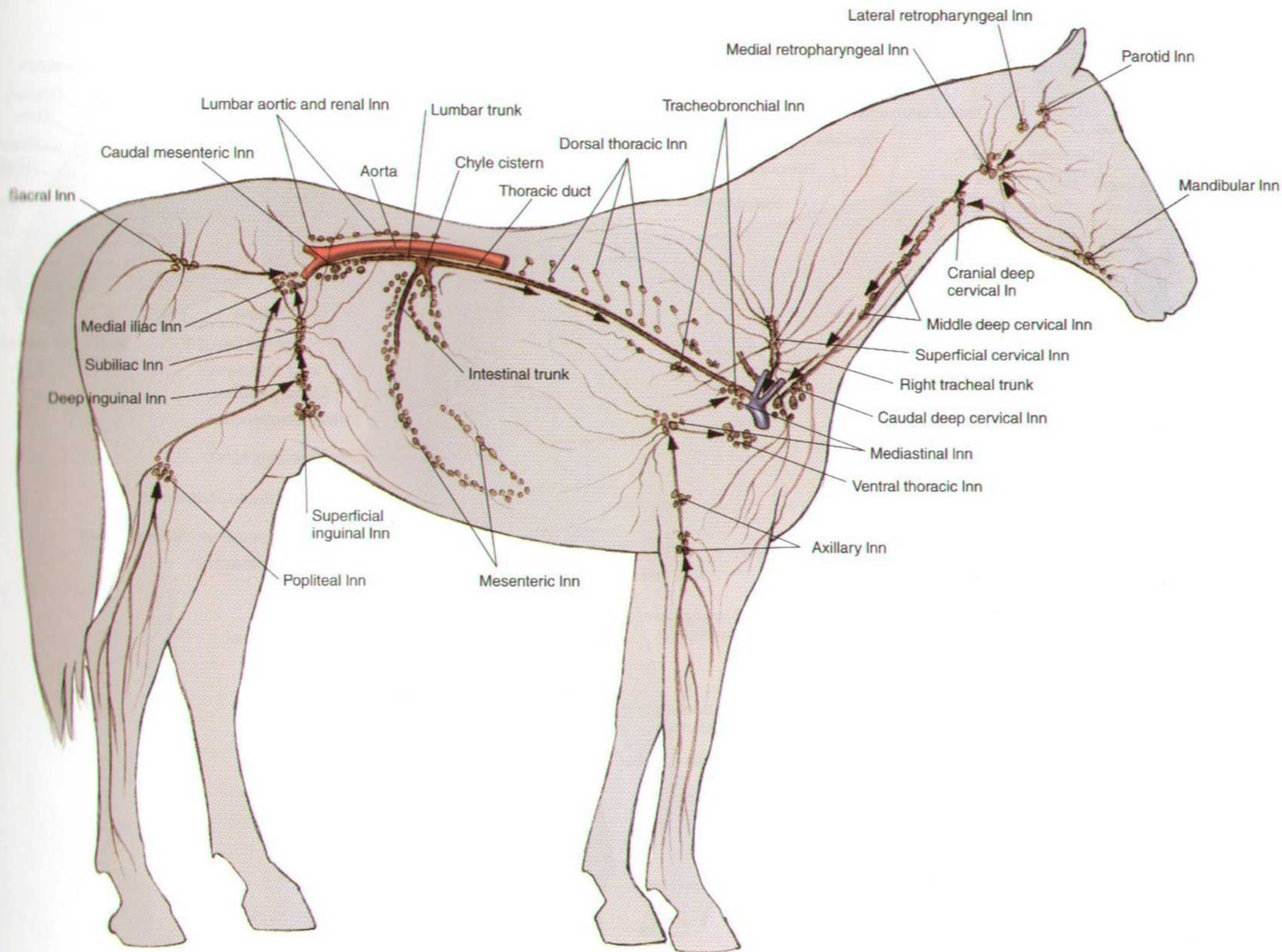


PLATE 1.25 Major veins of the stallion. Portal system excluded. Right lateral view.





**PLATE 1.26** Lymph nodes and vessels of the horse. Right lateral view. *Arrows* indicate the flow of lymph. Lymph node groups in the horse consist of up to dozens of lymph nodes ranging in size from a few millimeters to 2 centimeters in diameter. In = lymph node



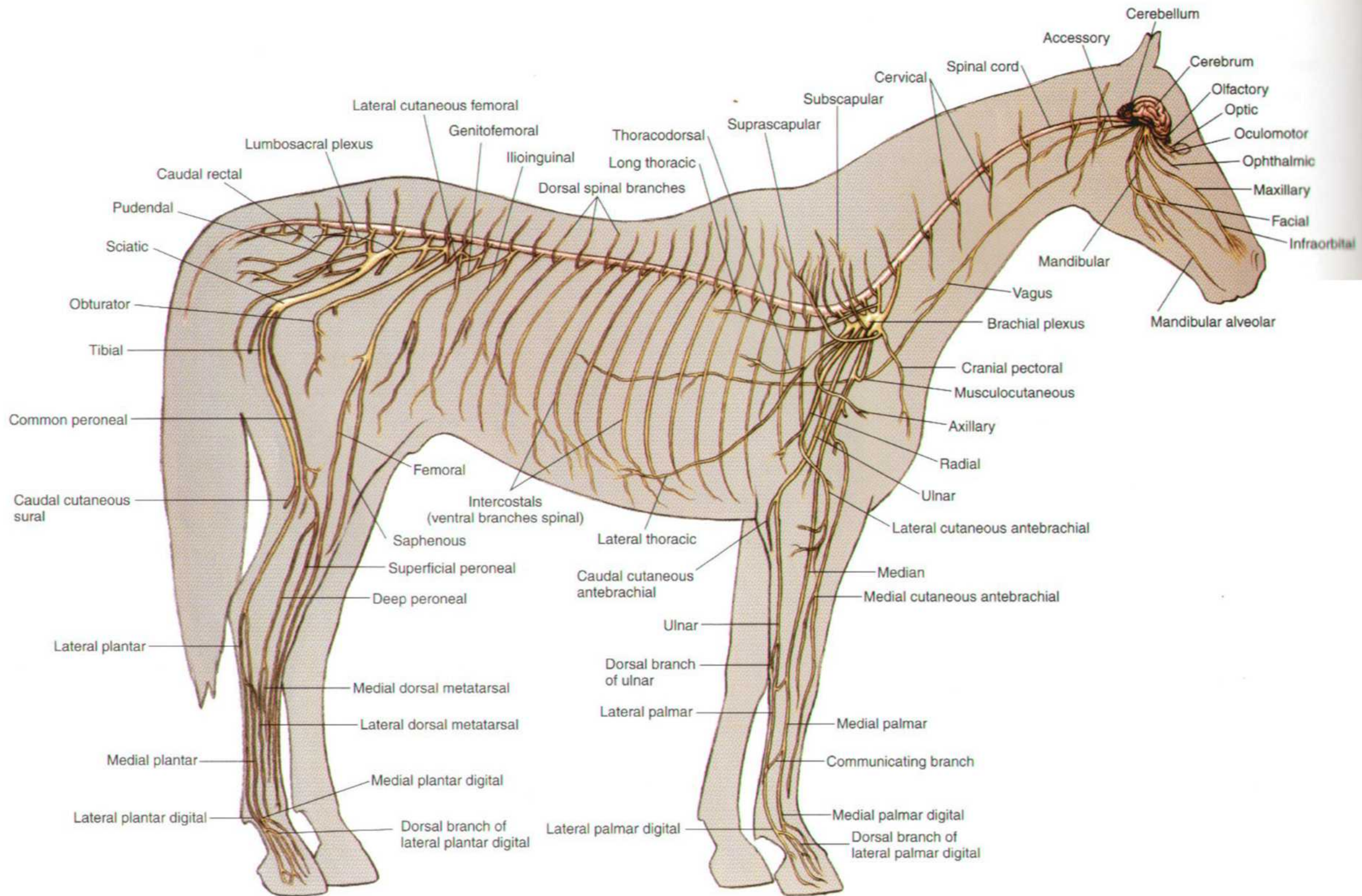


PLATE 1.27 Central and somatic nervous system of the stallion. Right lateral view.



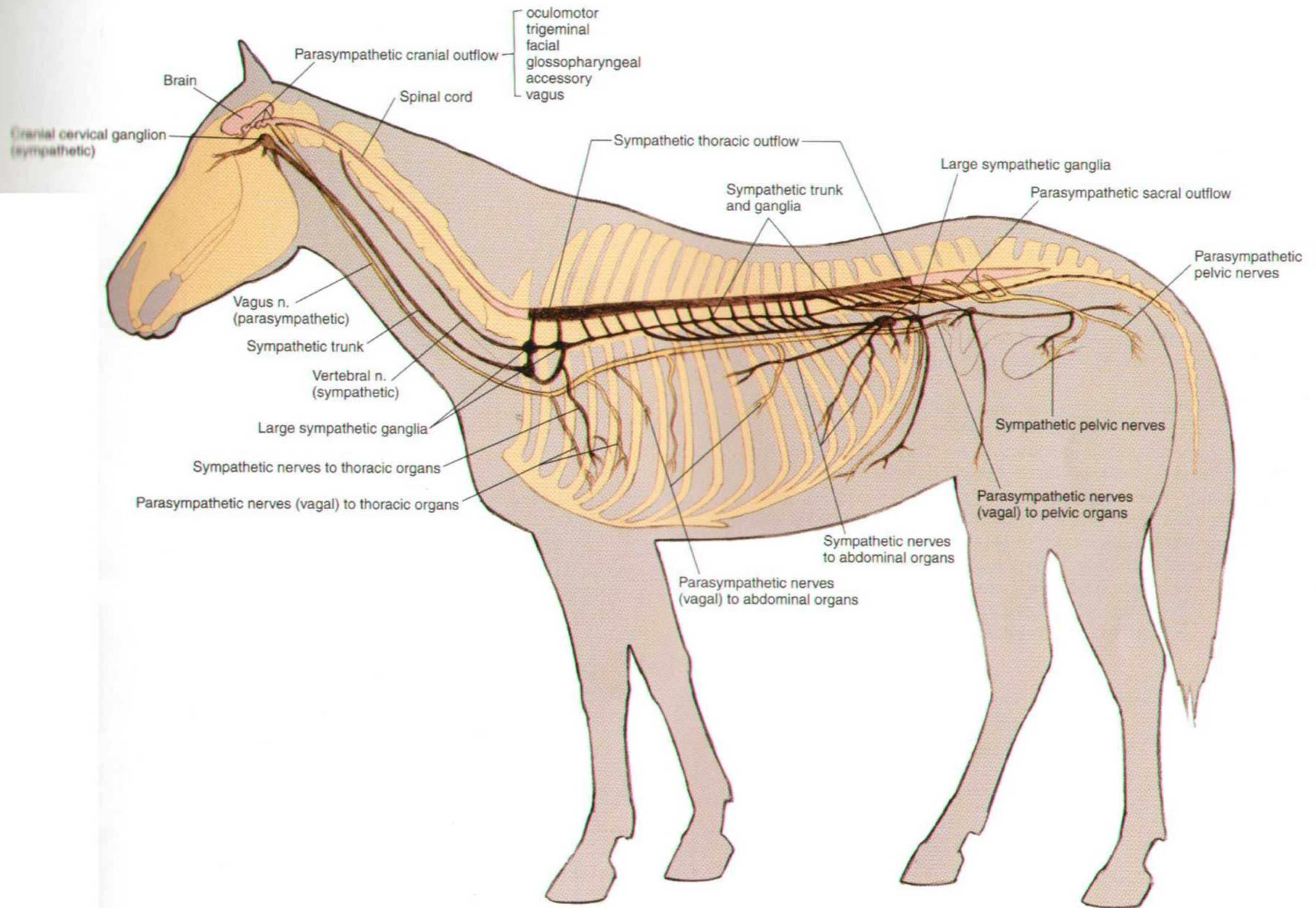


PLATE 1.28 Autonomic nervous system of the mare. Left lateral view. n = nerve



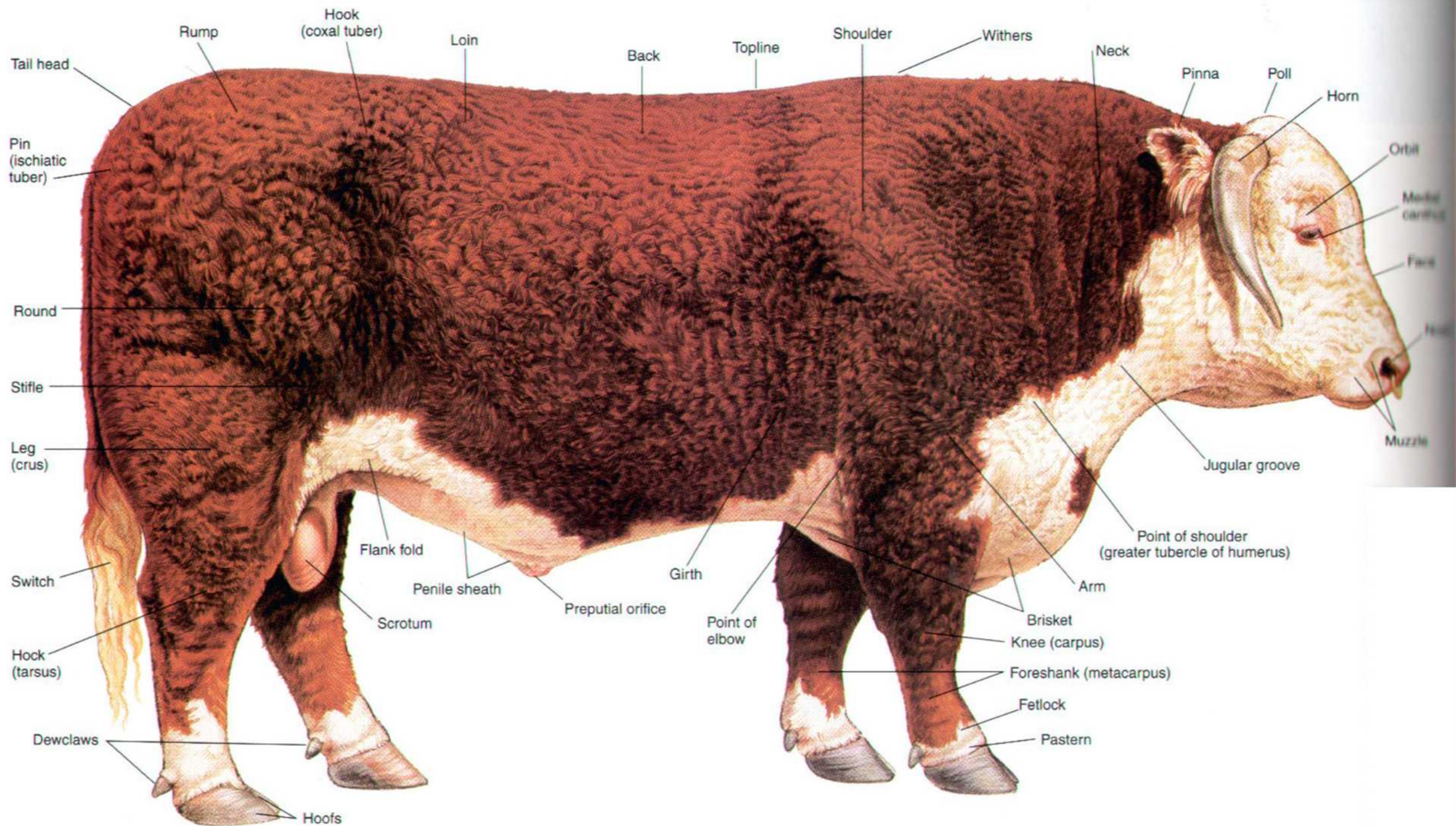
# SECTION 2 THE OX (*Bos taurus*, also *Bos indicus*)

## PLATES

- 2.1 Right lateral view of a beef bull.
- 2.2 Left lateral view of a dairy cow.
- 2.3 Body regions of the ox.
- 2.4 Skeleton of the ox.
- 2.5 Cutaneous muscles and major fasciae of the bull.
- 2.6 Superficial muscles and veins of the cow.
- 2.7 Deep cervical muscles and *in situ* viscera of the bull.
- 2.8 Deep cervical muscles, major joints, *in situ* viscera, and udder of the cow.
- 2.9 Median section of the head and left lateral view of the respiratory system of the ox.
- 2.10 Interior of the rumen and reticulum of the cow.
- 2.11 Clinical condition: Right volvulus of the abomasum in a bull.
- 2.12 Clinical condition: Left displacement of the abomasum in a cow.
- 2.13 Reproductive organs, urinary organs, liver, heart, and adjacent major vessels related to the skeleton of the bull.
- 2.14 Heart and adjacent major vessels, abdominal and pelvic viscera, and udder (mammary glands) of the cow.
- 2.15 Relations of the reproductive organs of the bull.
- 2.16 Relations of the reproductive organs of the cow.
- 2.17 Major veins of the bull.
- 2.18 Major arteries of the cow.
- 2.19 Central nervous system and principal nerves of the peripheral nervous system of the bull.
- 2.20 Significant lymphatic organs of the cow.









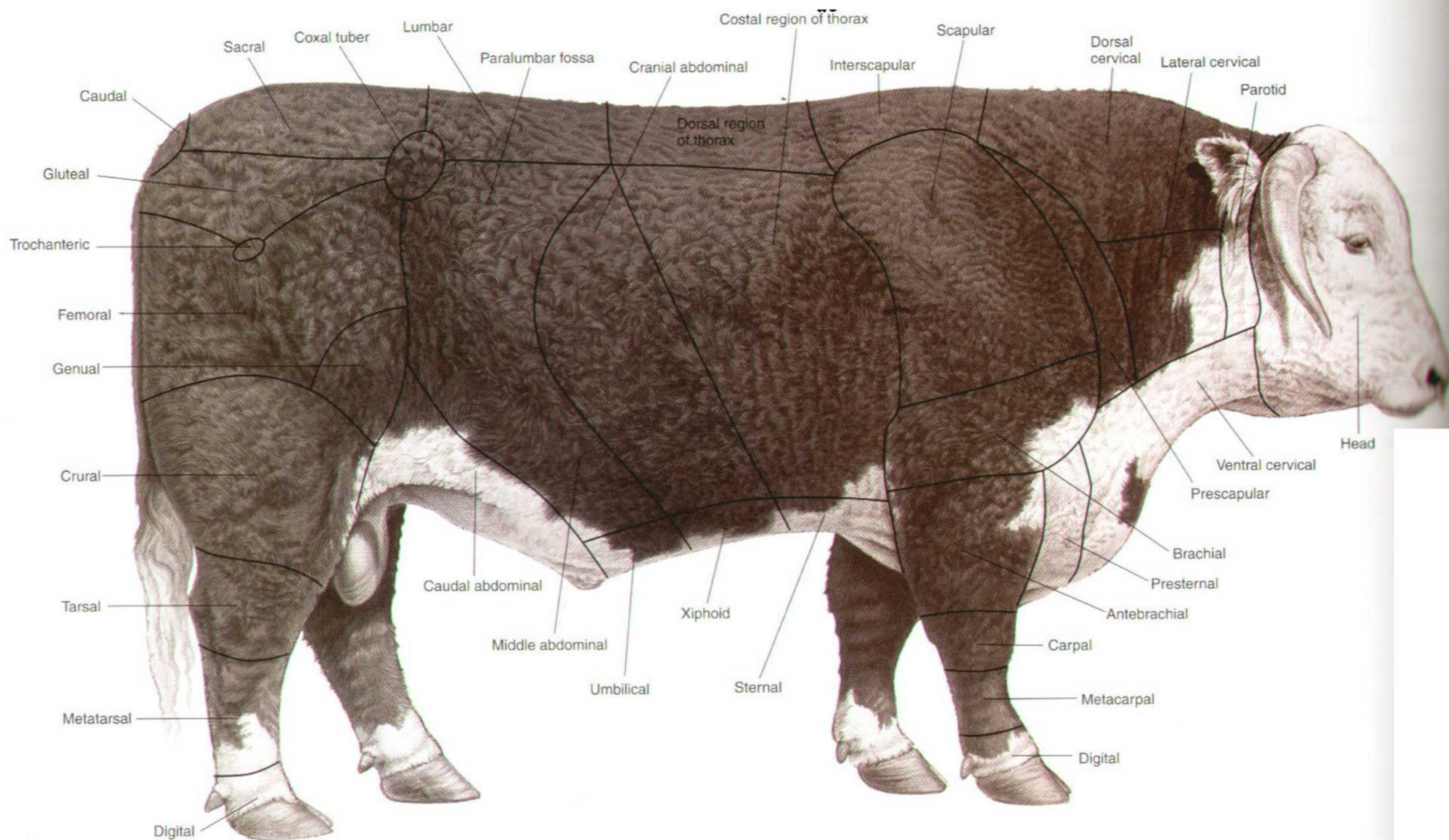
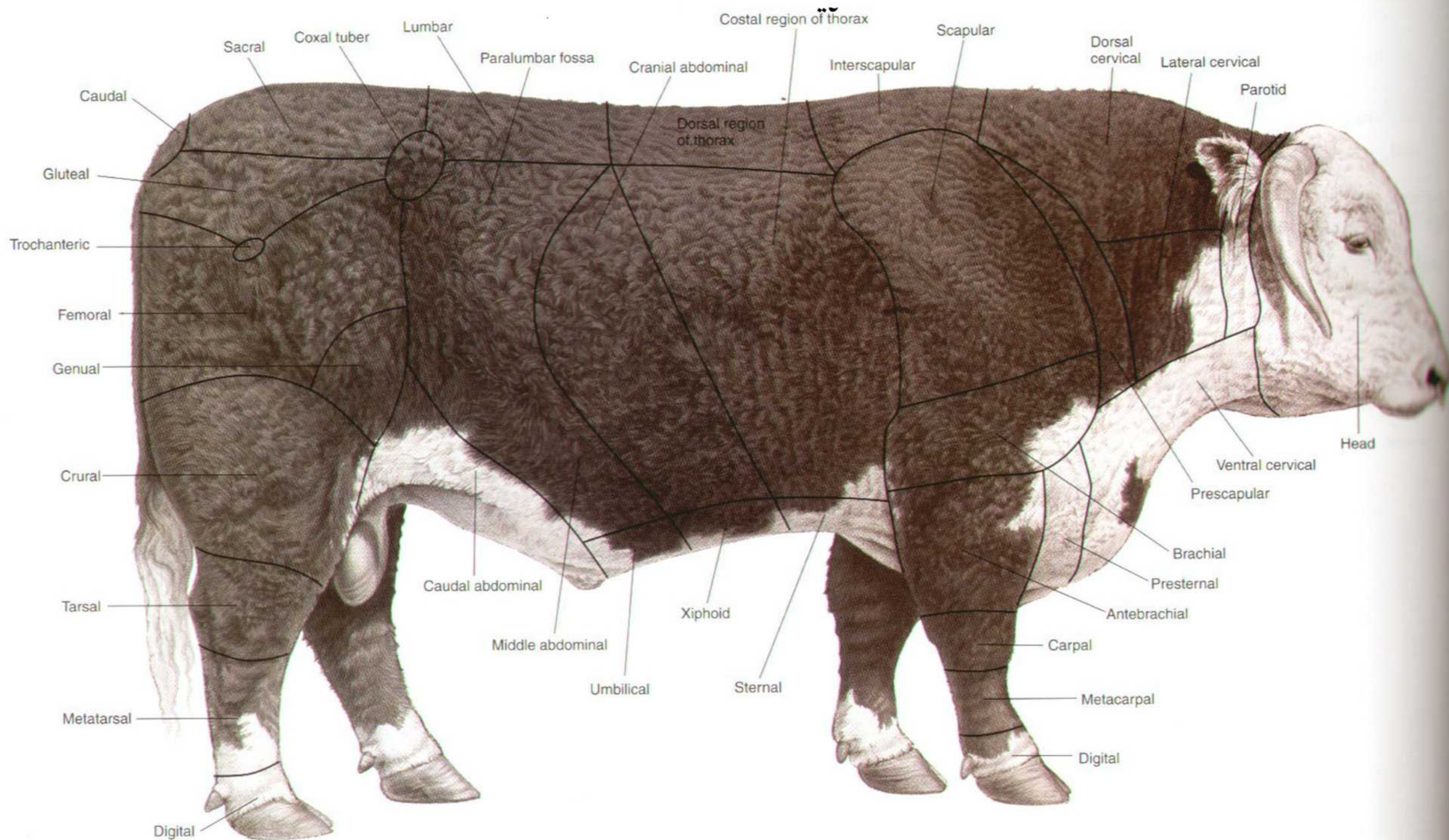
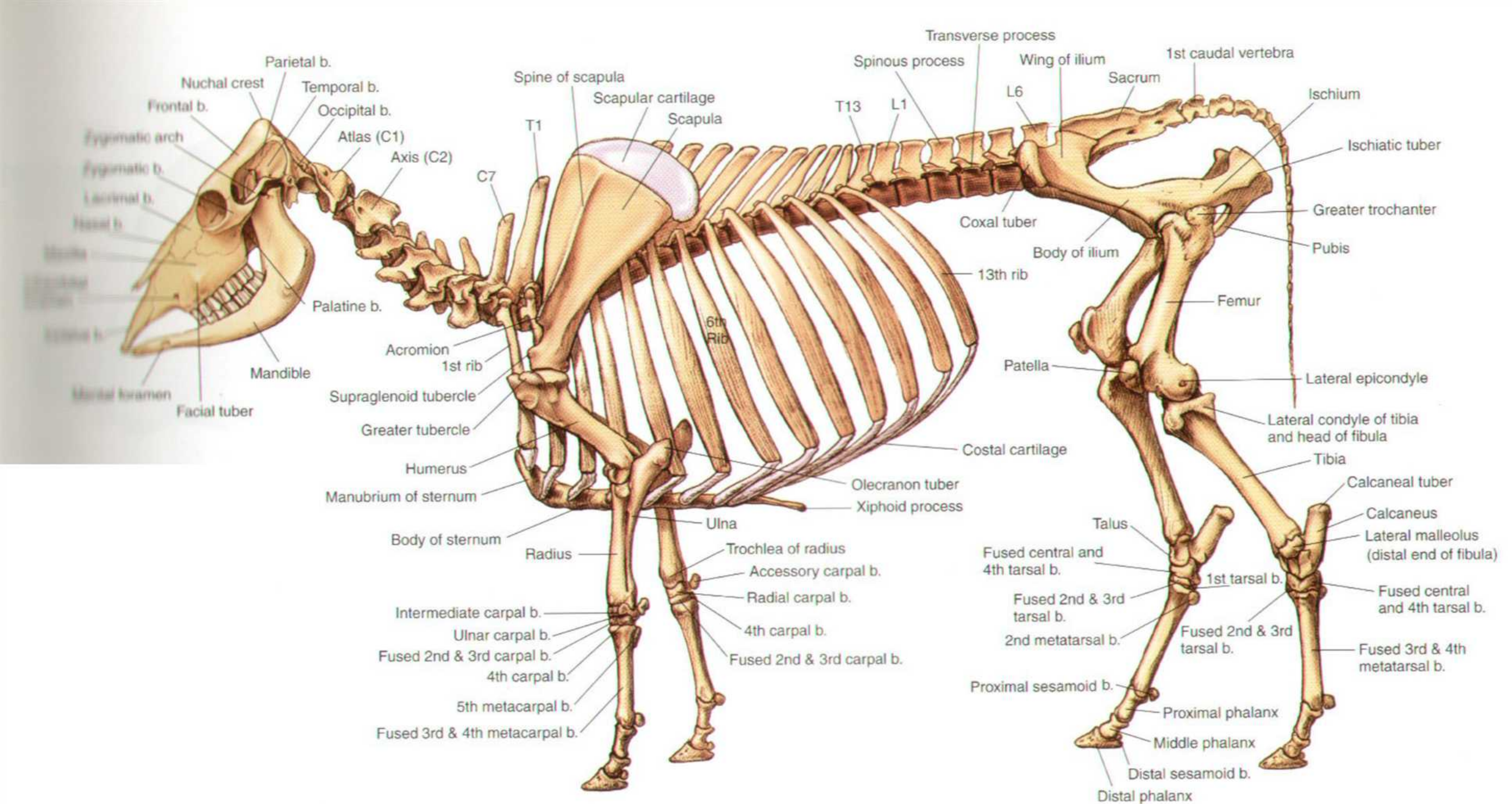


PLATE 2.3 Body regions of the ox. Right lateral view.



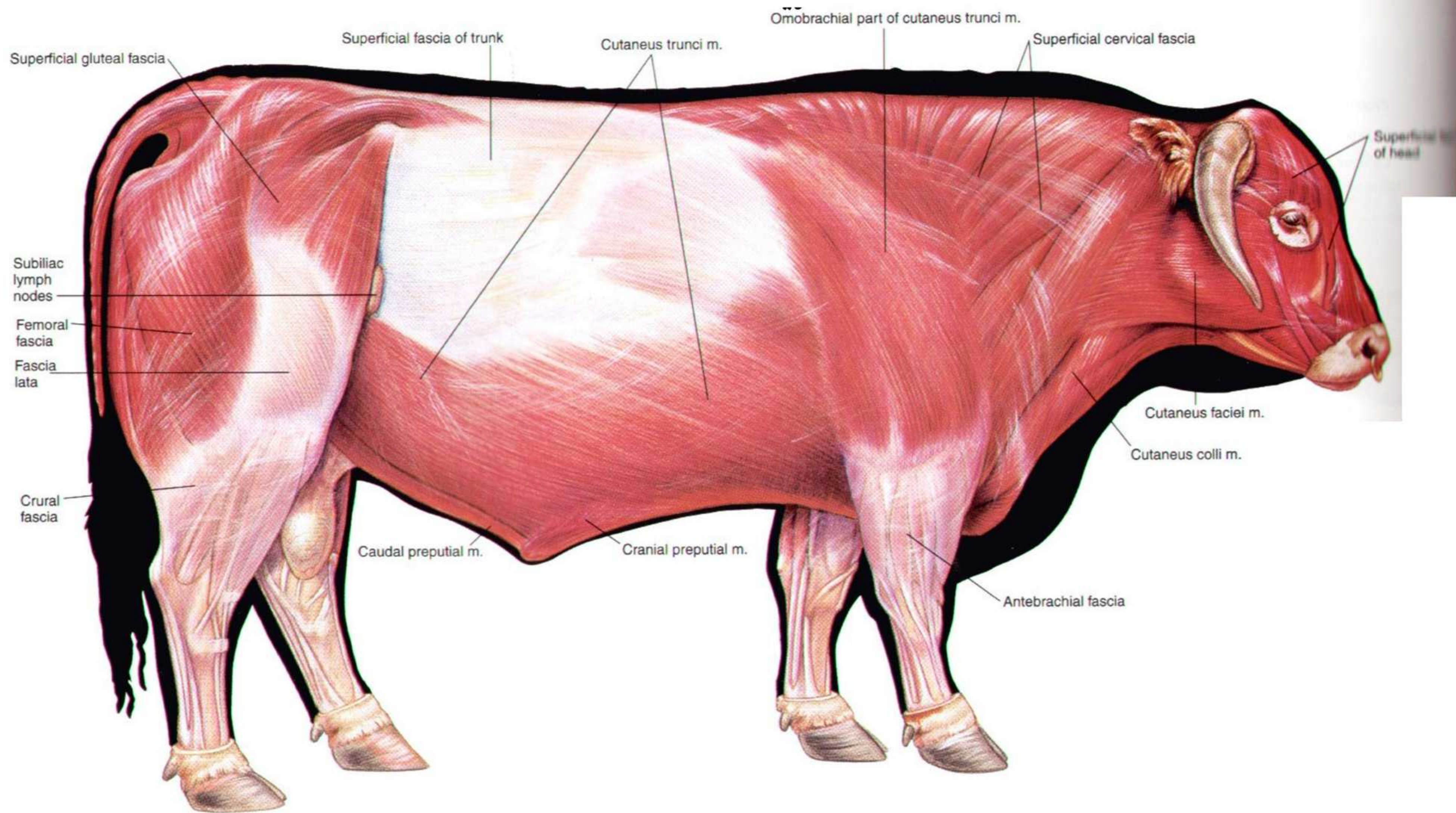




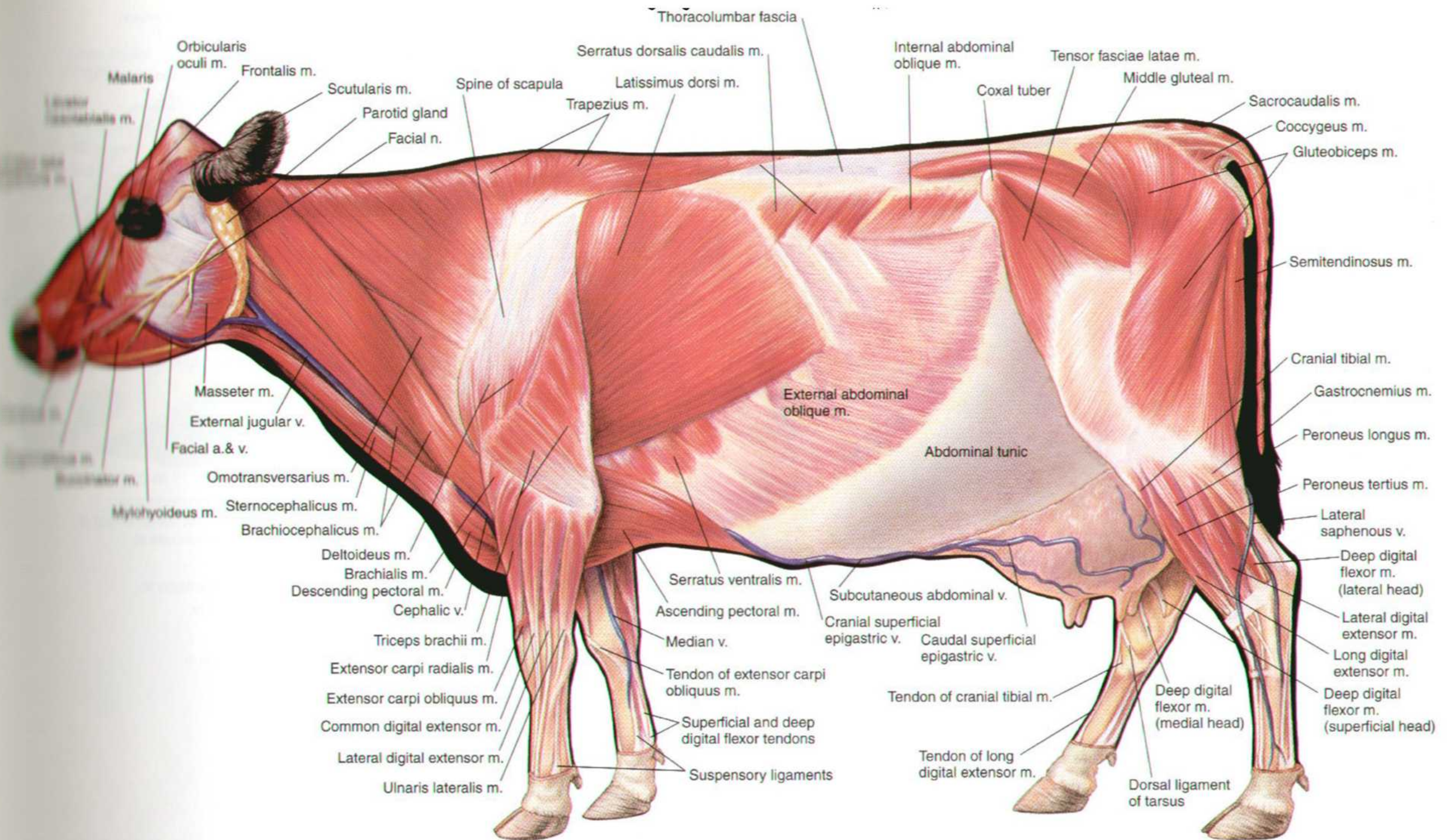


**PLATE 2.4** Skeleton of the ox. Left lateral view. C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra, b = bone



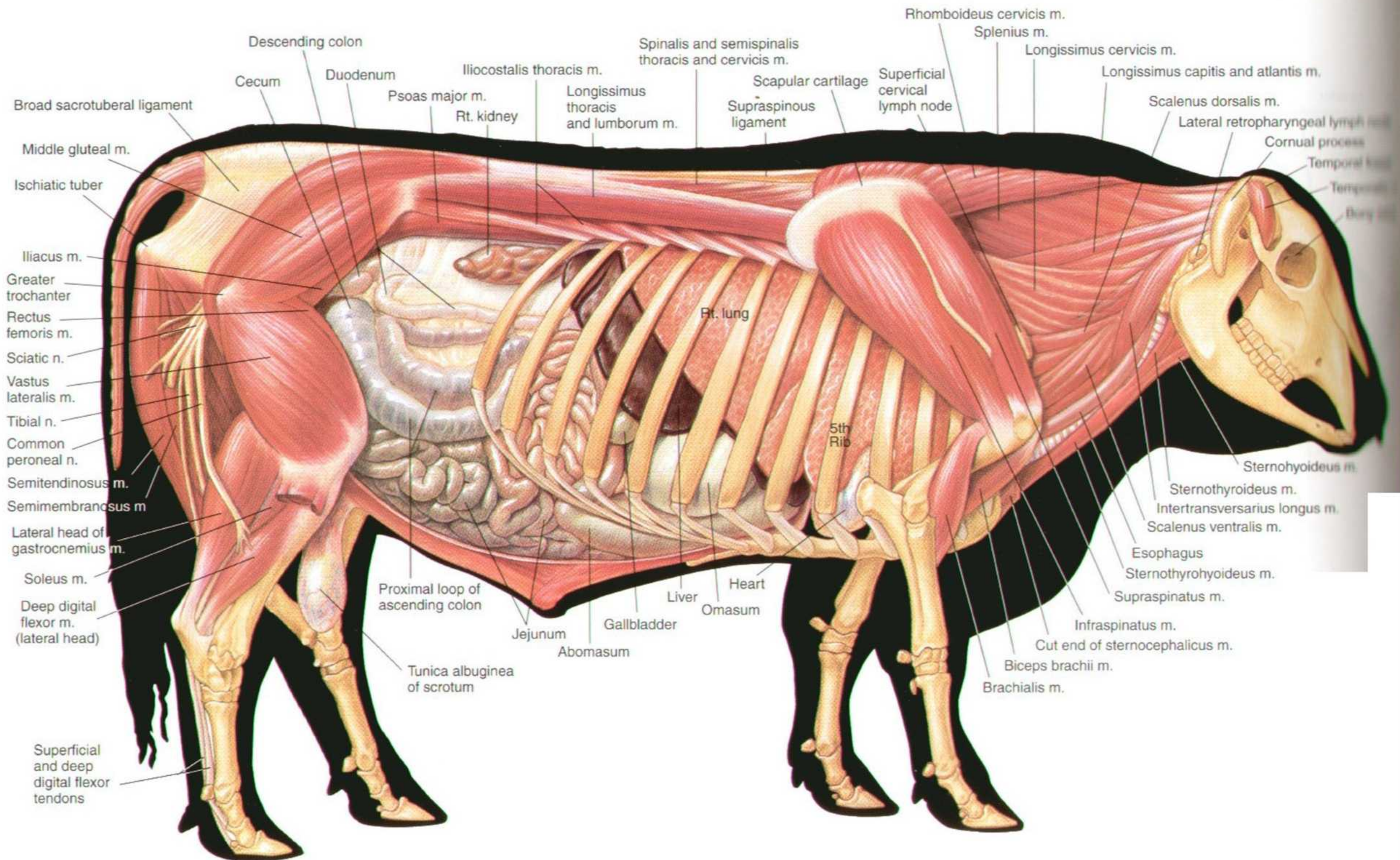






**PLATE 2.6** Superficial muscles and veins of the cow. Left lateral view.  
m = muscle, v = vein, a = artery, n = nerve







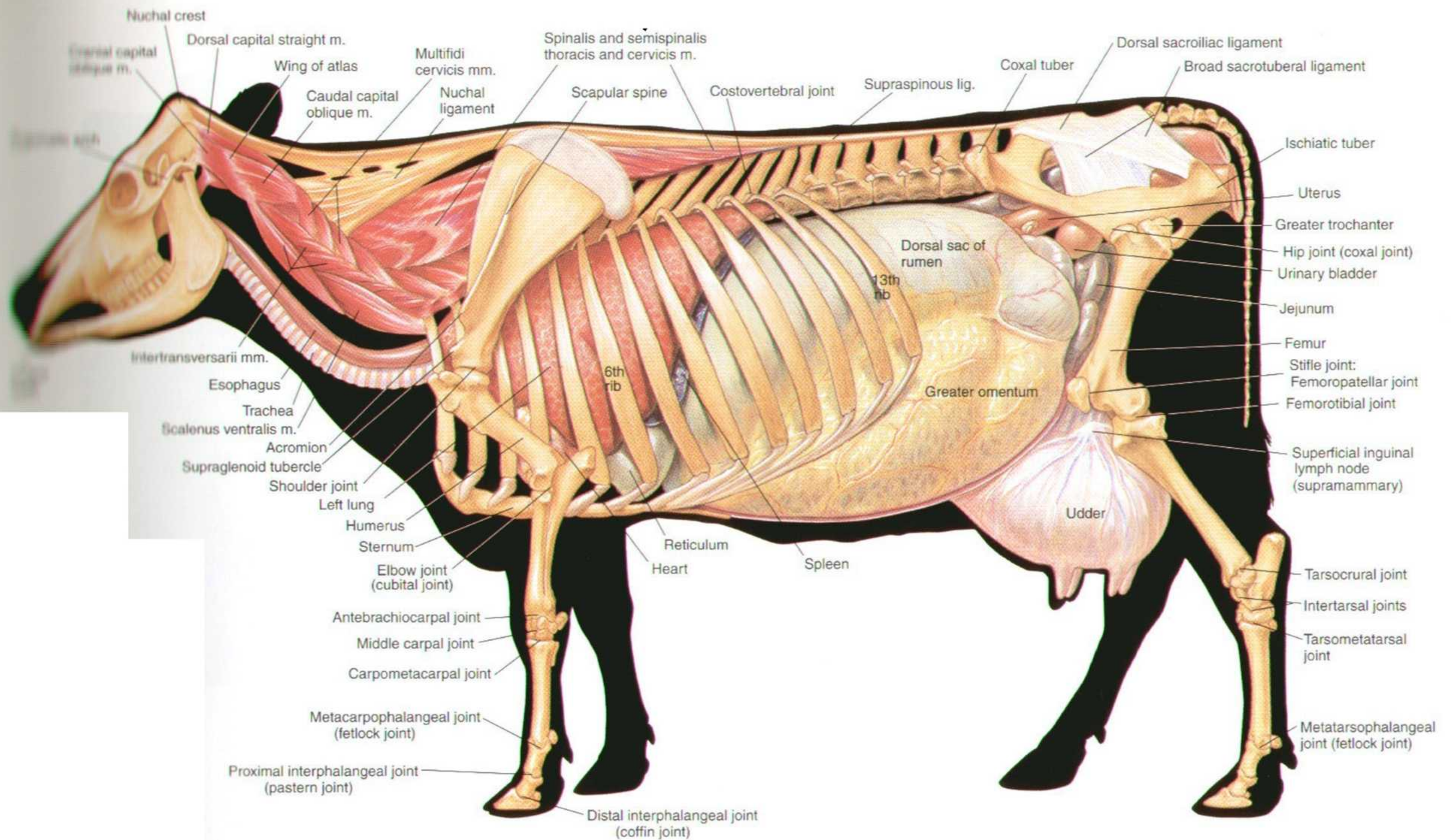
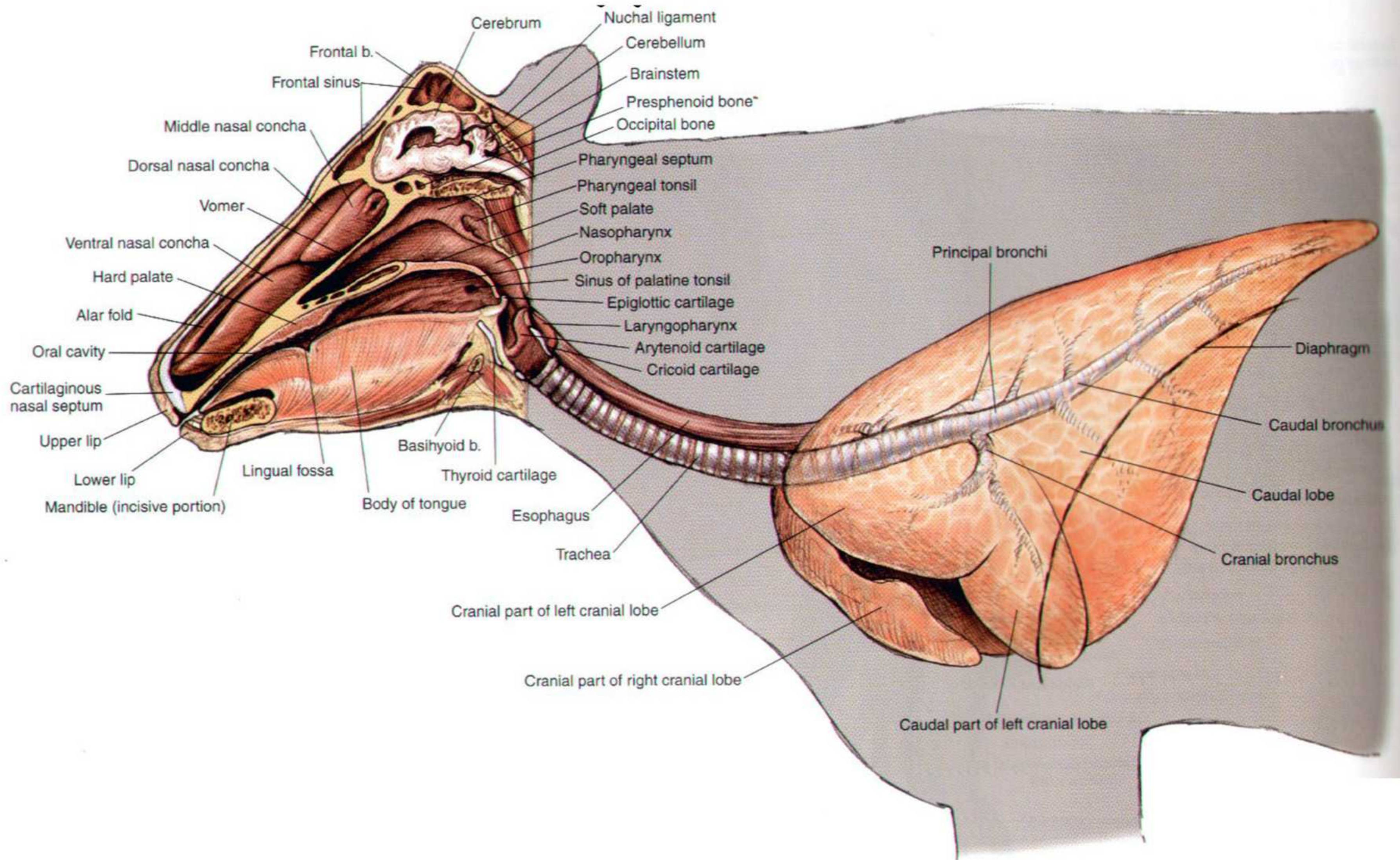


PLATE 2.8 Deep cervical muscles, major joints, *in situ* viscera, and udder of the cow. Left lateral view. m = muscle, lig = ligament







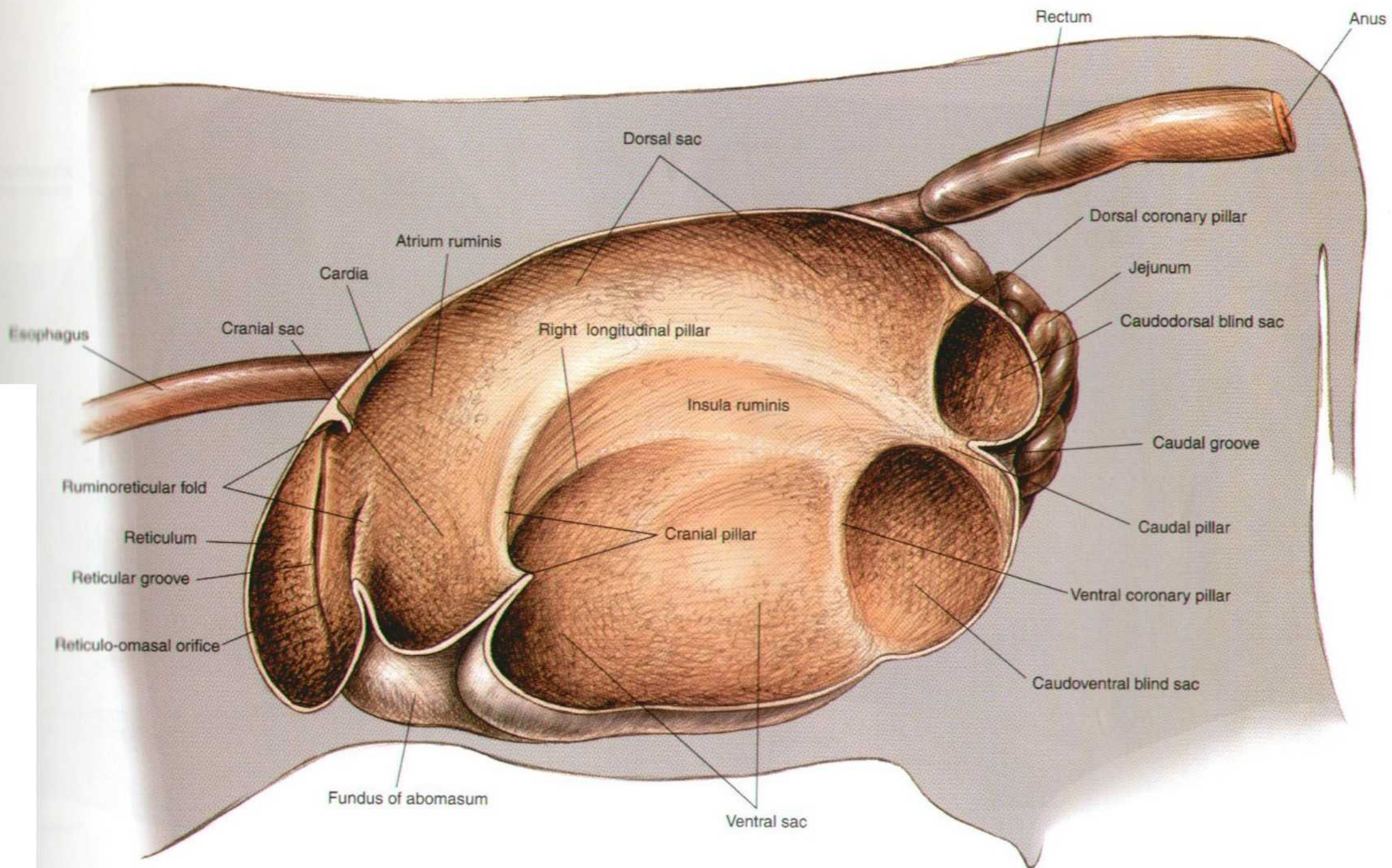
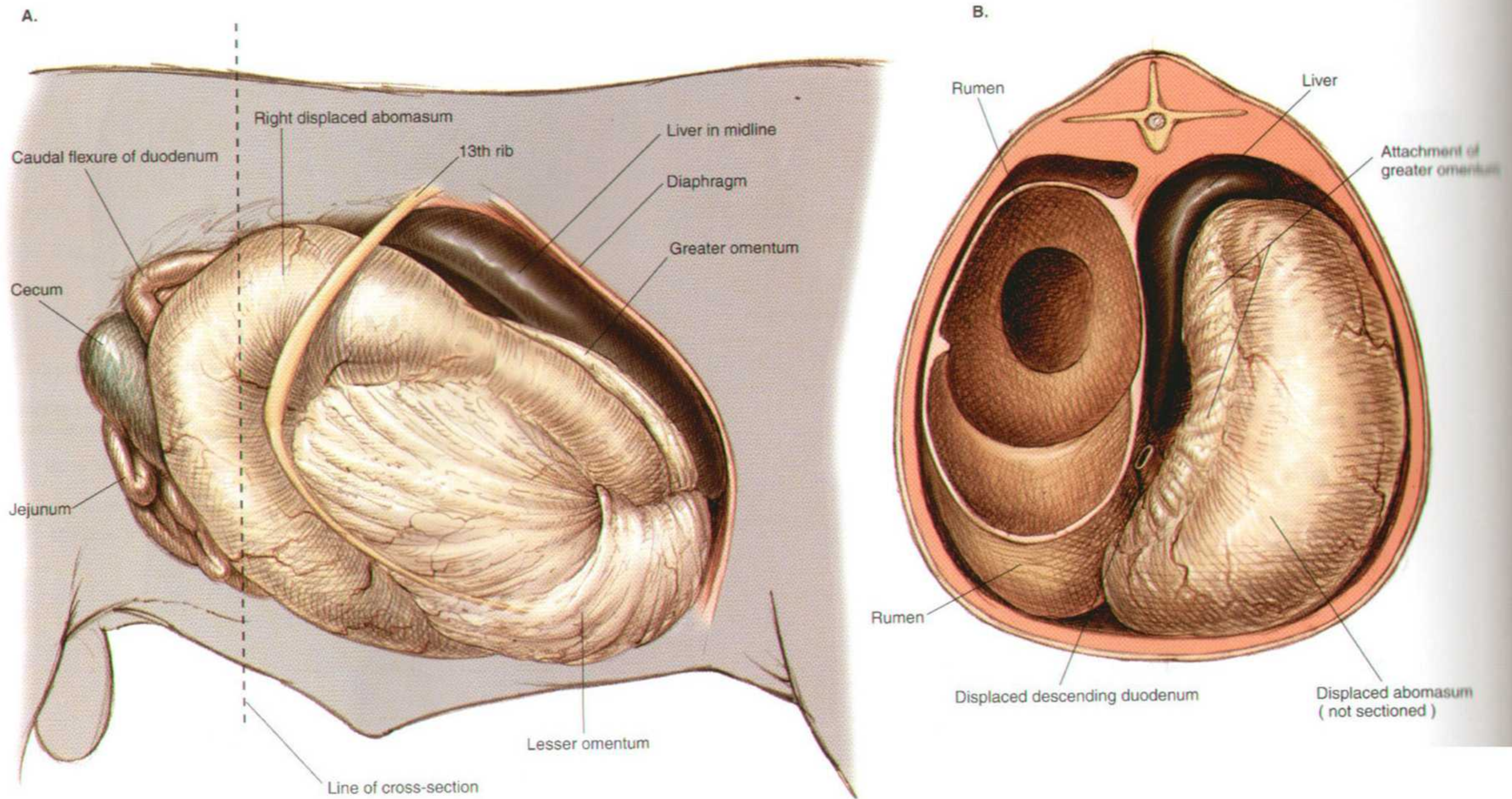


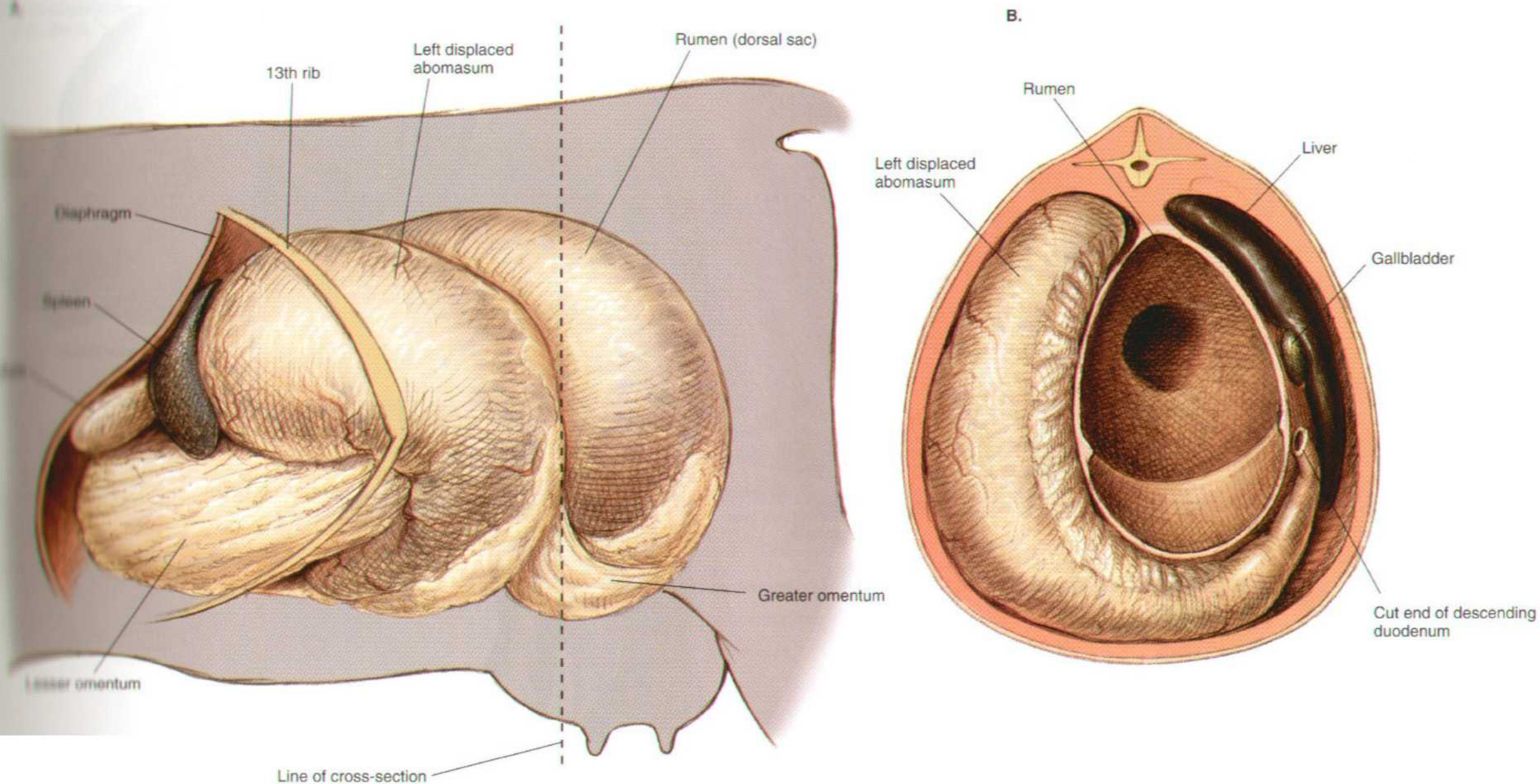
PLATE 2.10 Interior of the rumen and reticulum of the cow. Left lateral view.





**PLATE 2.11** Clinical condition: Right volvulus of the abomasum in a bull. **A.** Right lateral view. **B.** Cross-section. Caudocranial view. This problem occurs in cattle of varying types and ages. The long axis of the abomasum rotates dorsad and caudad, moving the greater curvature of the abomasum counterclockwise and toward the pelvis. This abnormal configuration displaces the liver mediad and draws the pyloric antrum and duodenum around the cranial aspect of the omasum.





**PLATE 2.12** Clinical condition: Left displacement of the abomasum in a cow. **A.** Left lateral view.

**B.** Cross-section. Caudocranial view. This problem can occur commonly in lactating dairy cattle during the first month postpartum and less frequently during other times or in other types of cattle. The gas-filled abomasum moves to the left and dorsad in the abdomen. It displaces the partially filled rumen mediad and distorts the normal position and orientation of the reticulum, omasum, and cranial rumen.



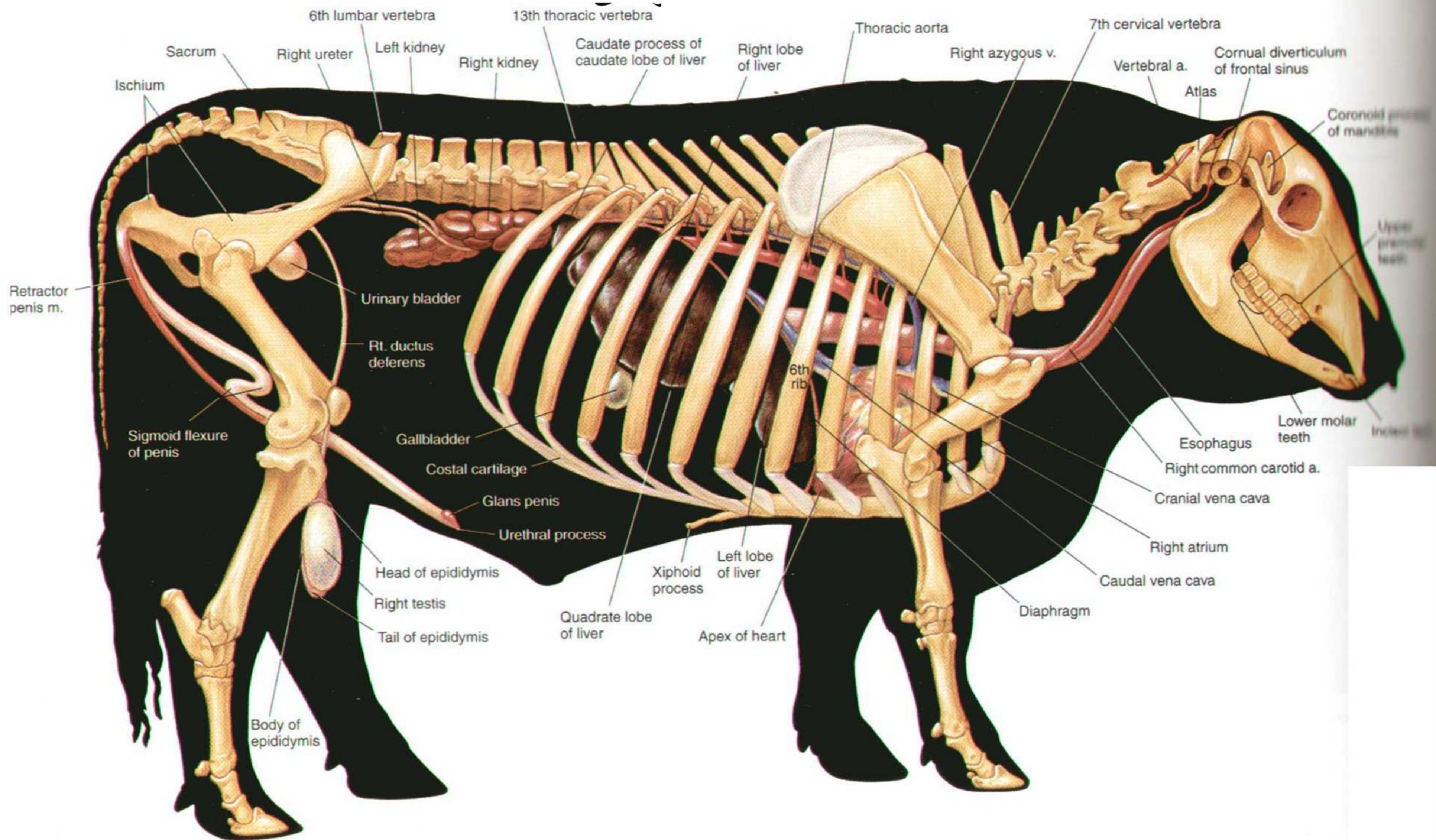
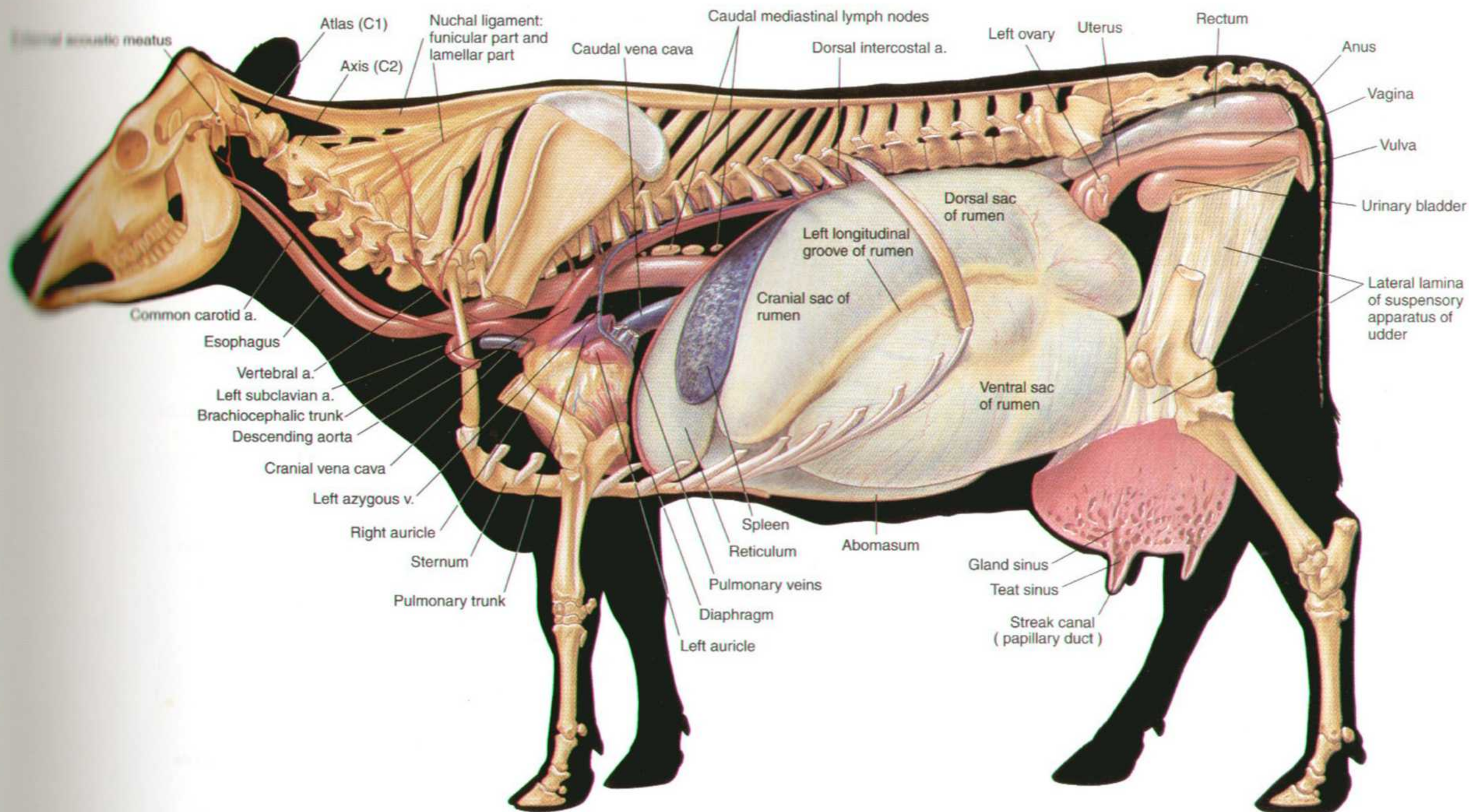


PLATE 2.13 Reproductive organs, urinary organs, liver, heart, and adjacent major vessels related to the skeleton of the bull. Stomach, intestines, and lungs are removed. Right lateral view. a = artery, v = vein, m = muscle





**PLATE 2.14** Heart and adjacent major vessels, abdominal and pelvic viscera, and udder (mammary glands) of the cow. Lungs and intestines are removed. Left lateral view. v = vein, a = artery



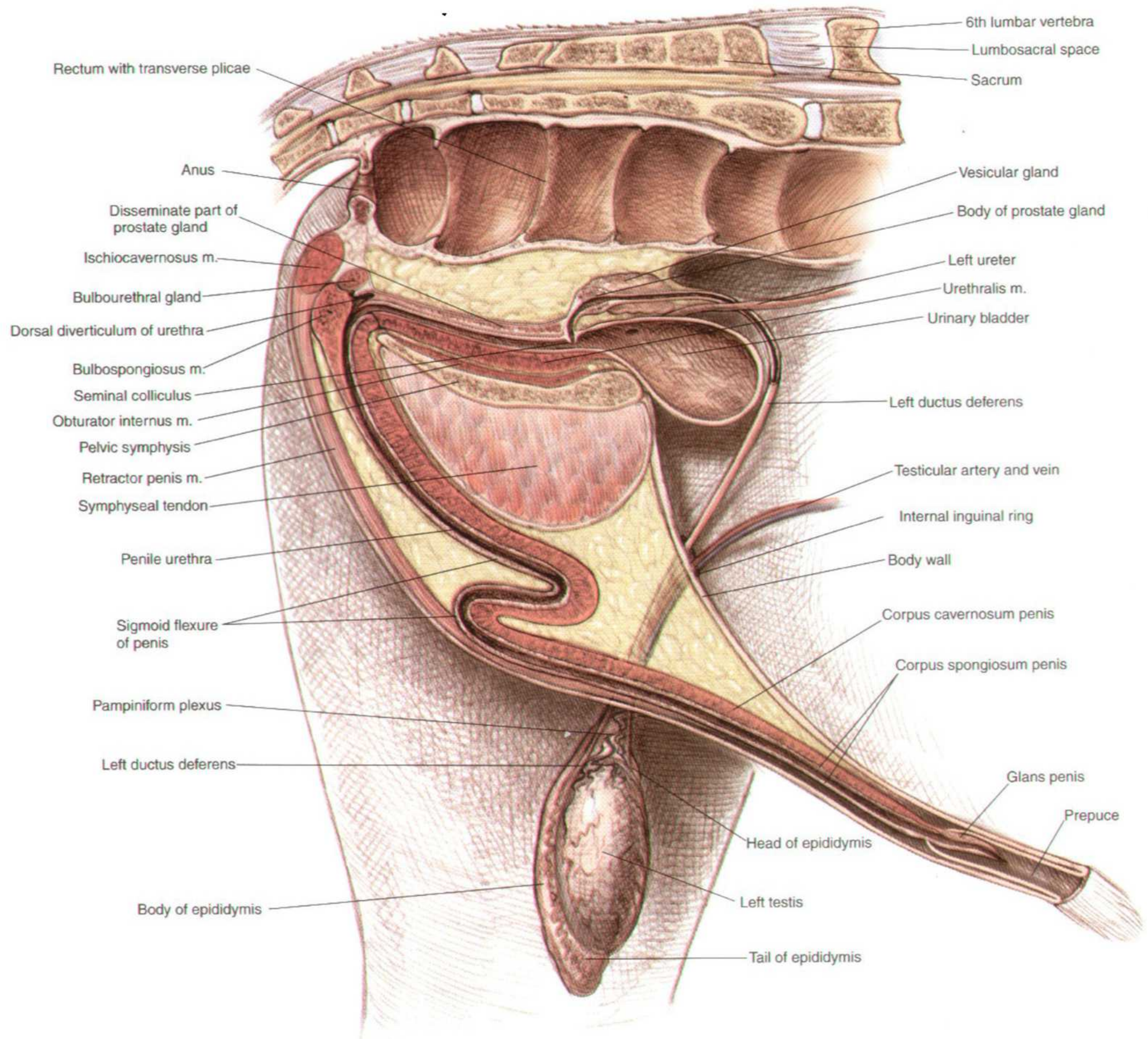
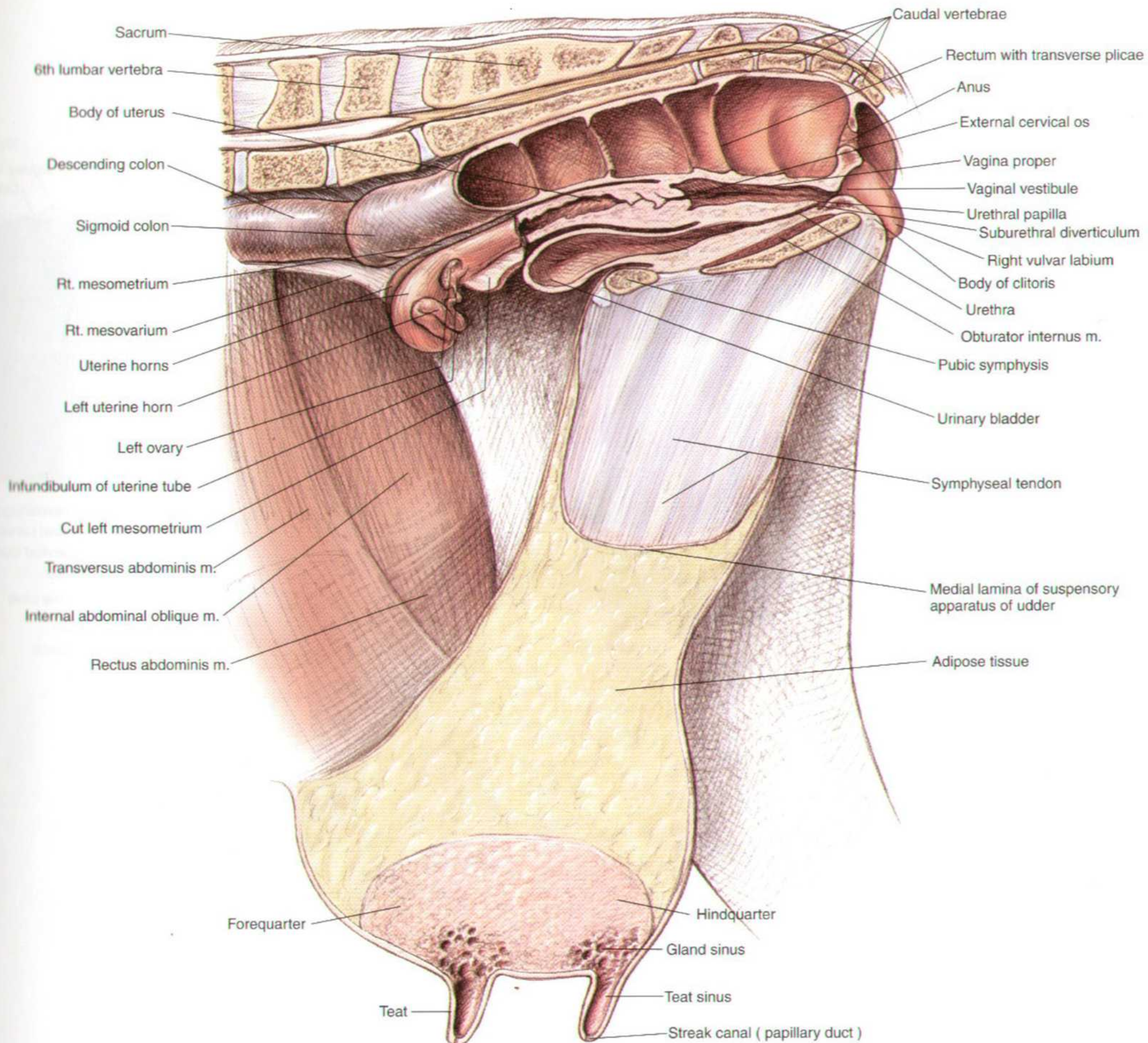


PLATE 2.15 Relations of the reproductive organs of the bull. Median section. m = muscle





**PLATE 2.16** Relations of the reproductive organs of the cow. Median section. m = muscle



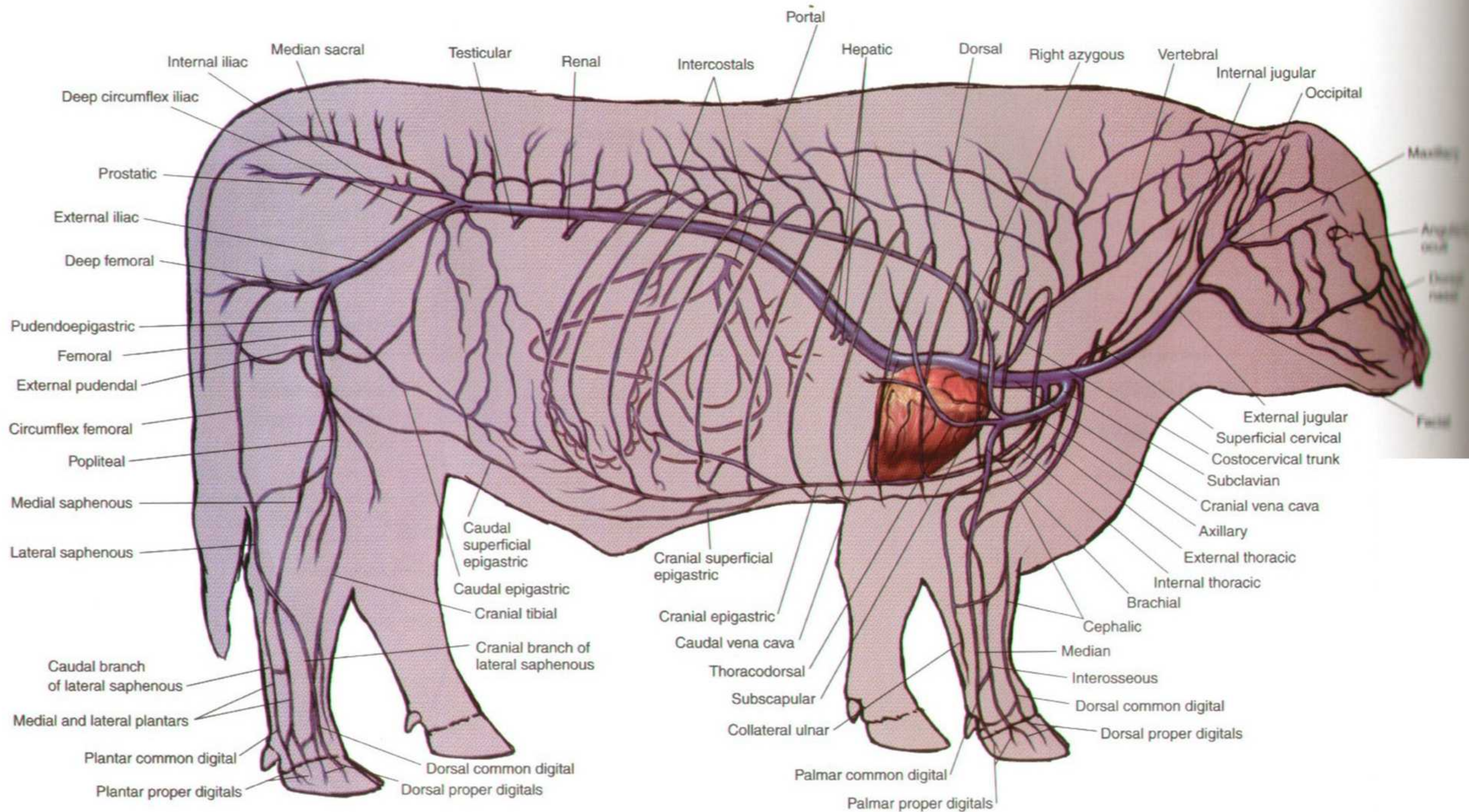


PLATE 2.17 Major veins of the bull. Right lateral view.



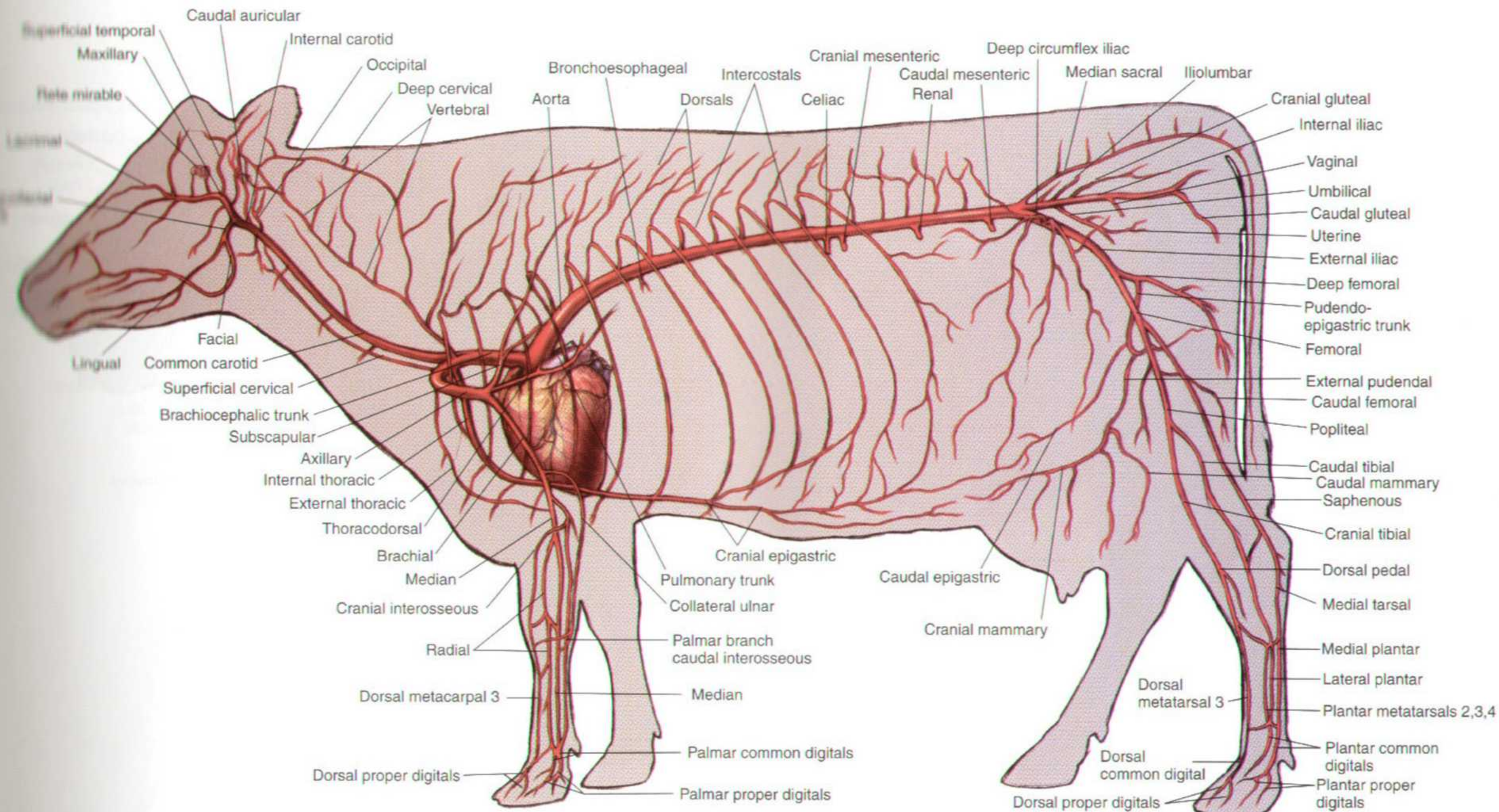


PLATE 2.18 Major arteries of the cow. Left lateral view.



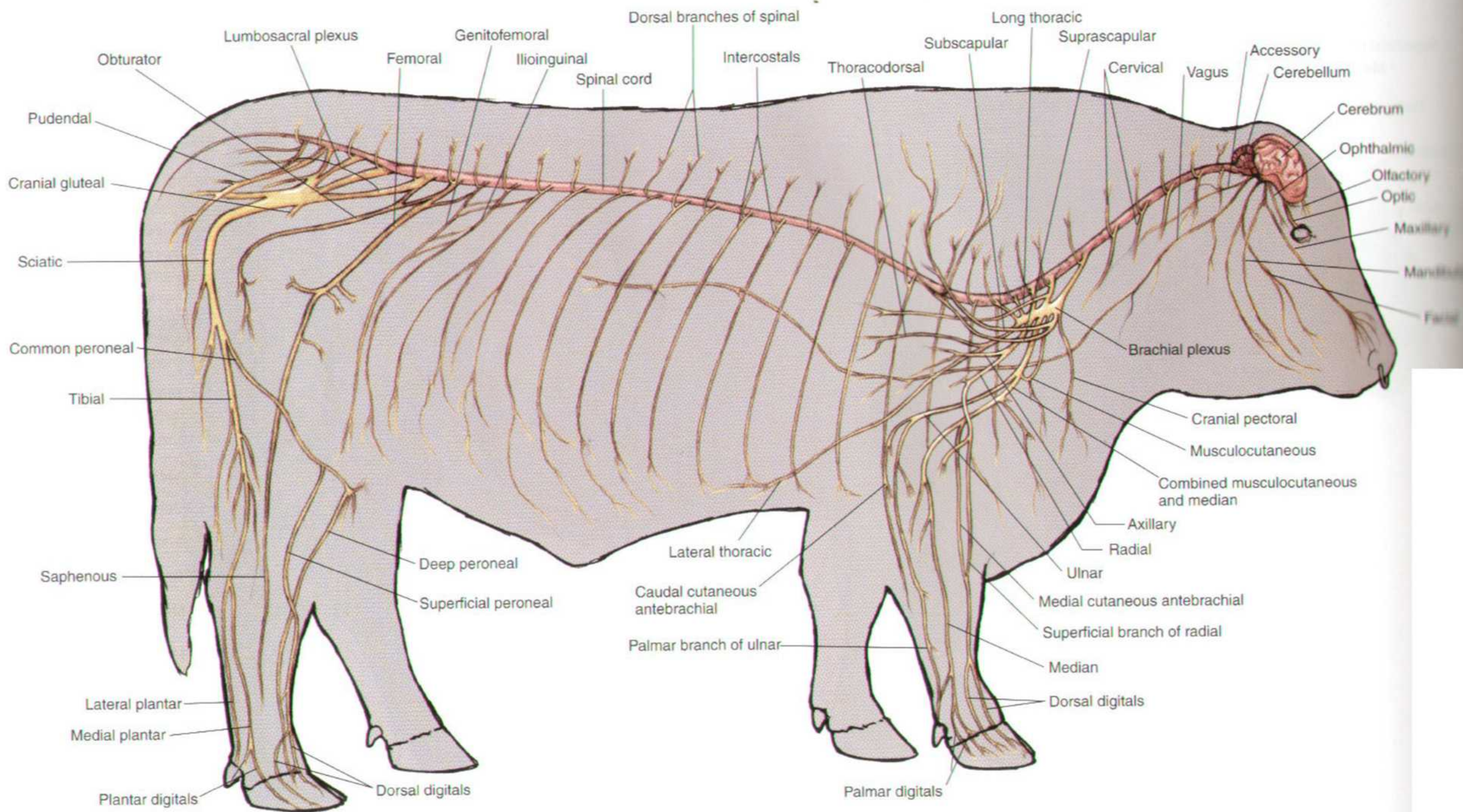


PLATE 2.19 Central nervous system and principal nerves of the peripheral nervous system of the bull. Right lateral view.



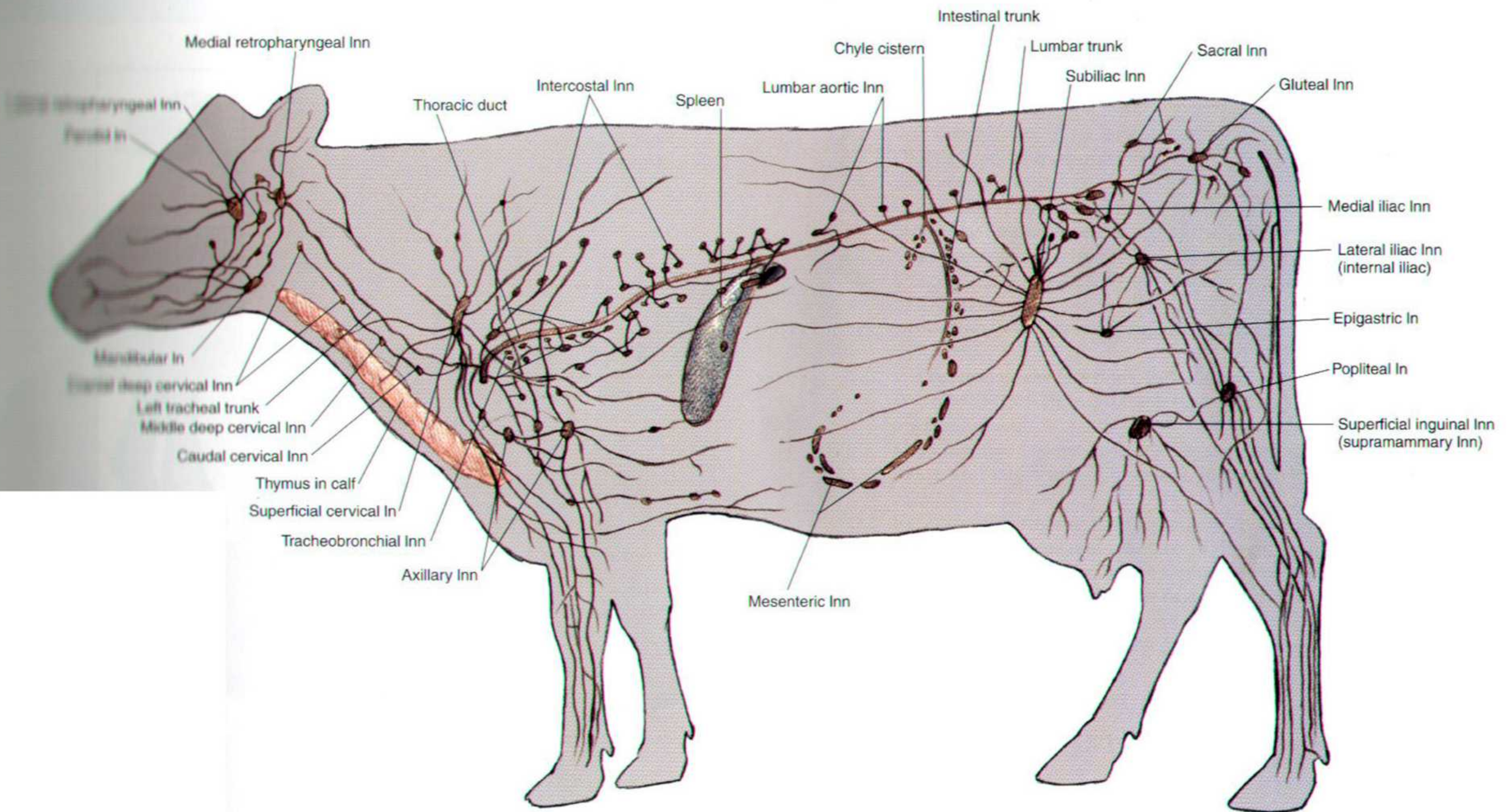
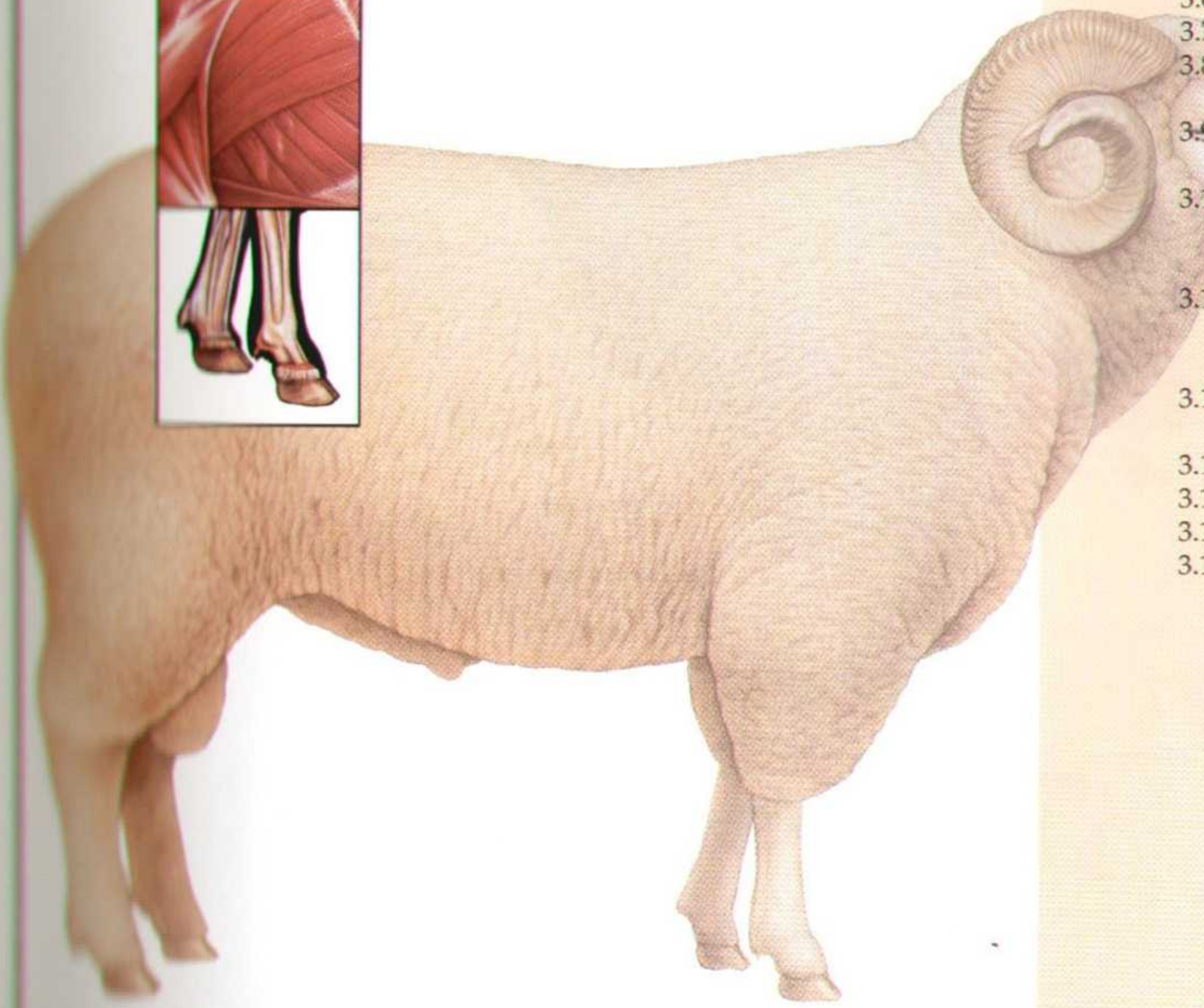


PLATE 2.20 Significant lymphatic organs of the cow. Left lateral view. In = lymph node



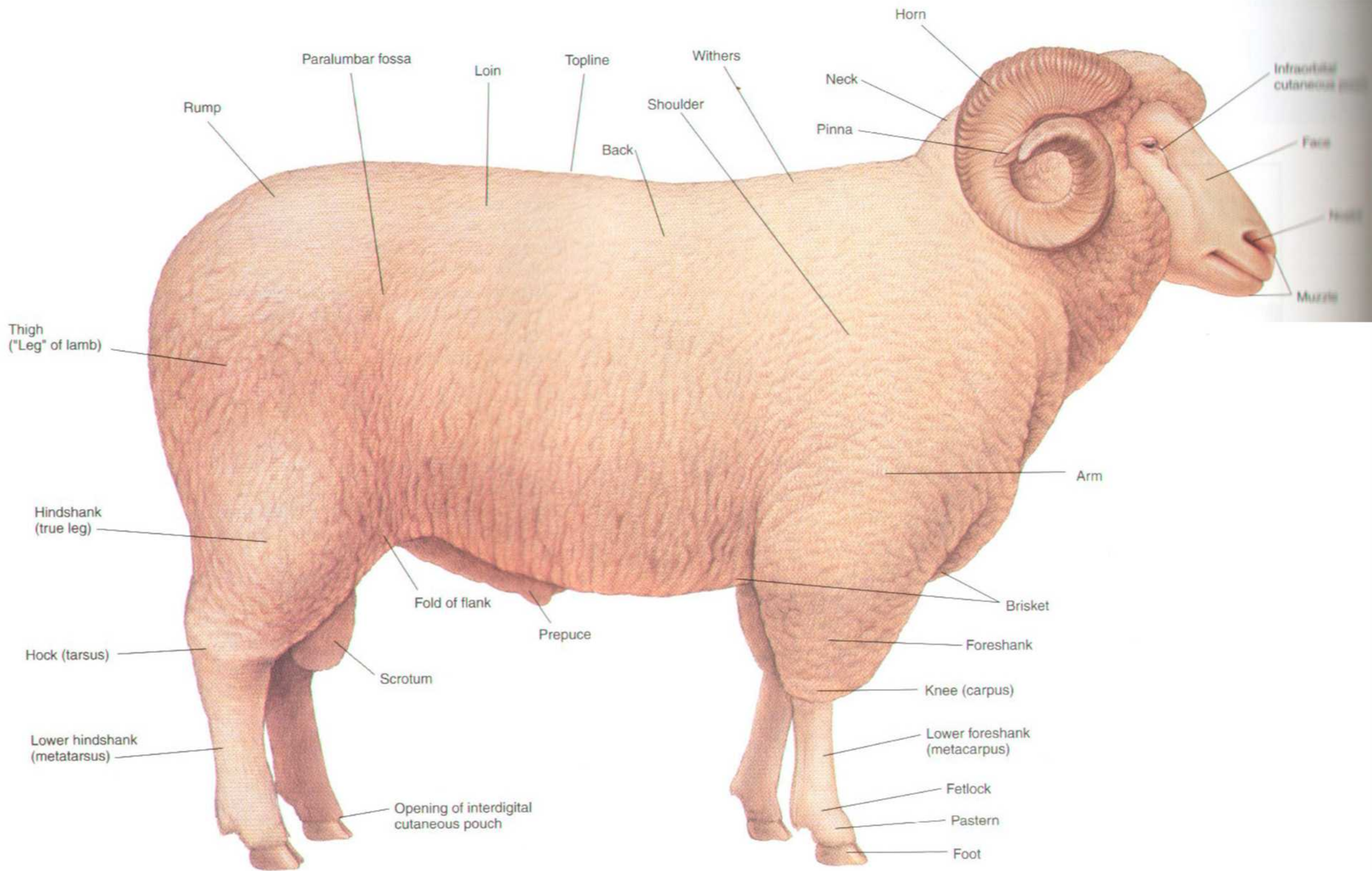
# SECTION 3 THE SHEEP (*Ovis aries*)



## PLATES

- 3.1 Right lateral view of a ram.
- 3.2 Left lateral view of an ewe.
- 3.3 Carcass cuts of the lamb.
- 3.4 Skeleton of the sheep.
- 3.5 Cutaneous muscles and major fasciae of the ram.
- 3.6 Superficial muscles and veins of the ewe.
- 3.7 Deep cervical muscles and *in situ* viscera of the ram.
- 3.8 Deep cervical muscles, *in situ* viscera, skeleton, and major joints of the ewe.
- 3.9 Dissection of the parotid region and cross-section of the neck of the sheep.
- 3.10 A. Location of the left flank incision.  
B. Cross-section through the left abdominal wall and subjacent ruminal wall.
- 3.11 Reproductive organs, urinary organs, esophagus and stomach, heart, and adjacent major vessels related to the skeleton of the ram.
- 3.12 Reproductive organs, urinary organs, heart, and adjacent major vessels, esophagus and stomach of the ewe.
- 3.13 Relations of the reproductive organs of the ram.
- 3.14 Relations of the reproductive organs of the ewe.
- 3.15 Penis of the ram.
- 3.16 Isolated reproductive organs of the ewe.







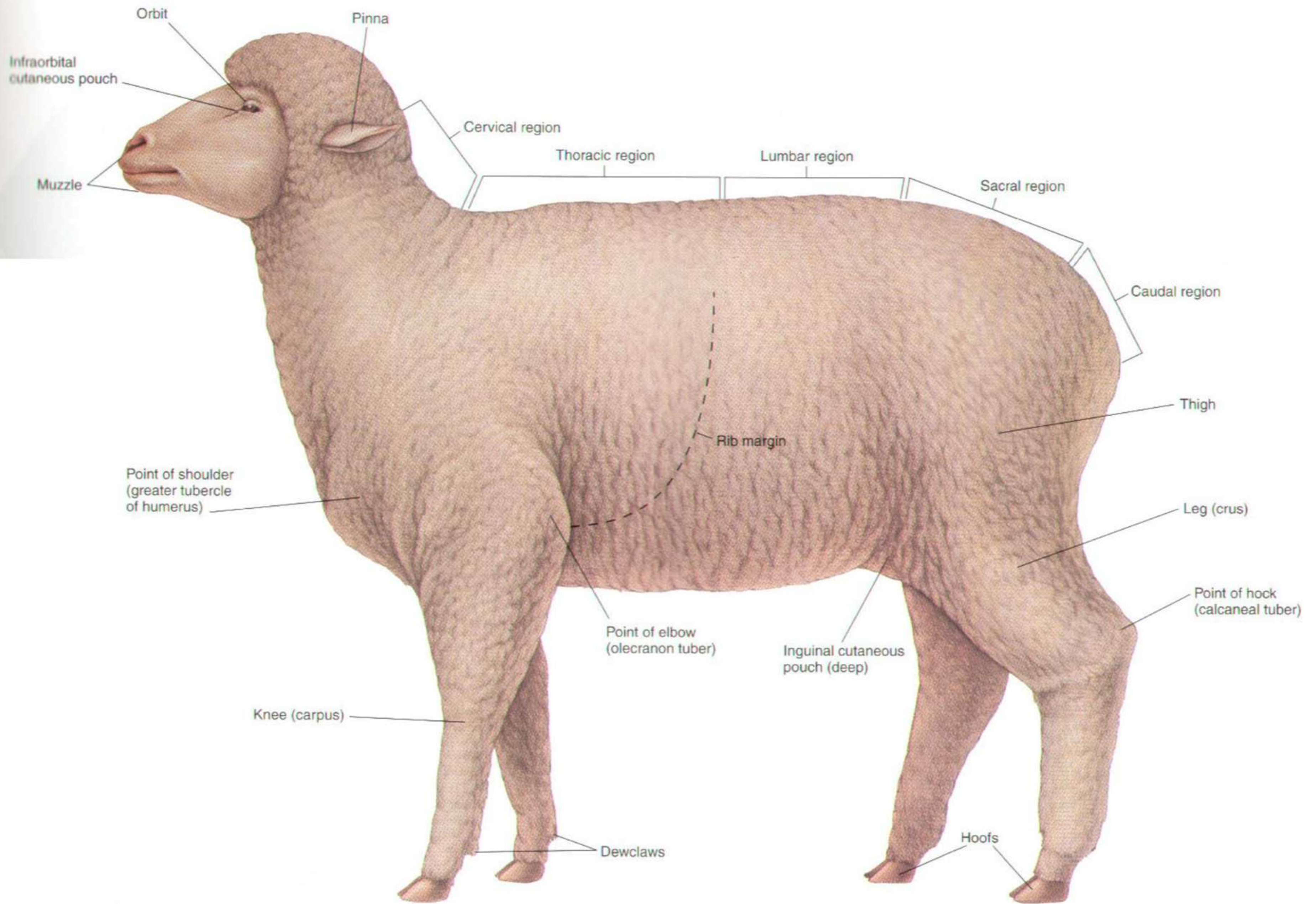


PLATE 3.2 Left lateral view of an ewe.



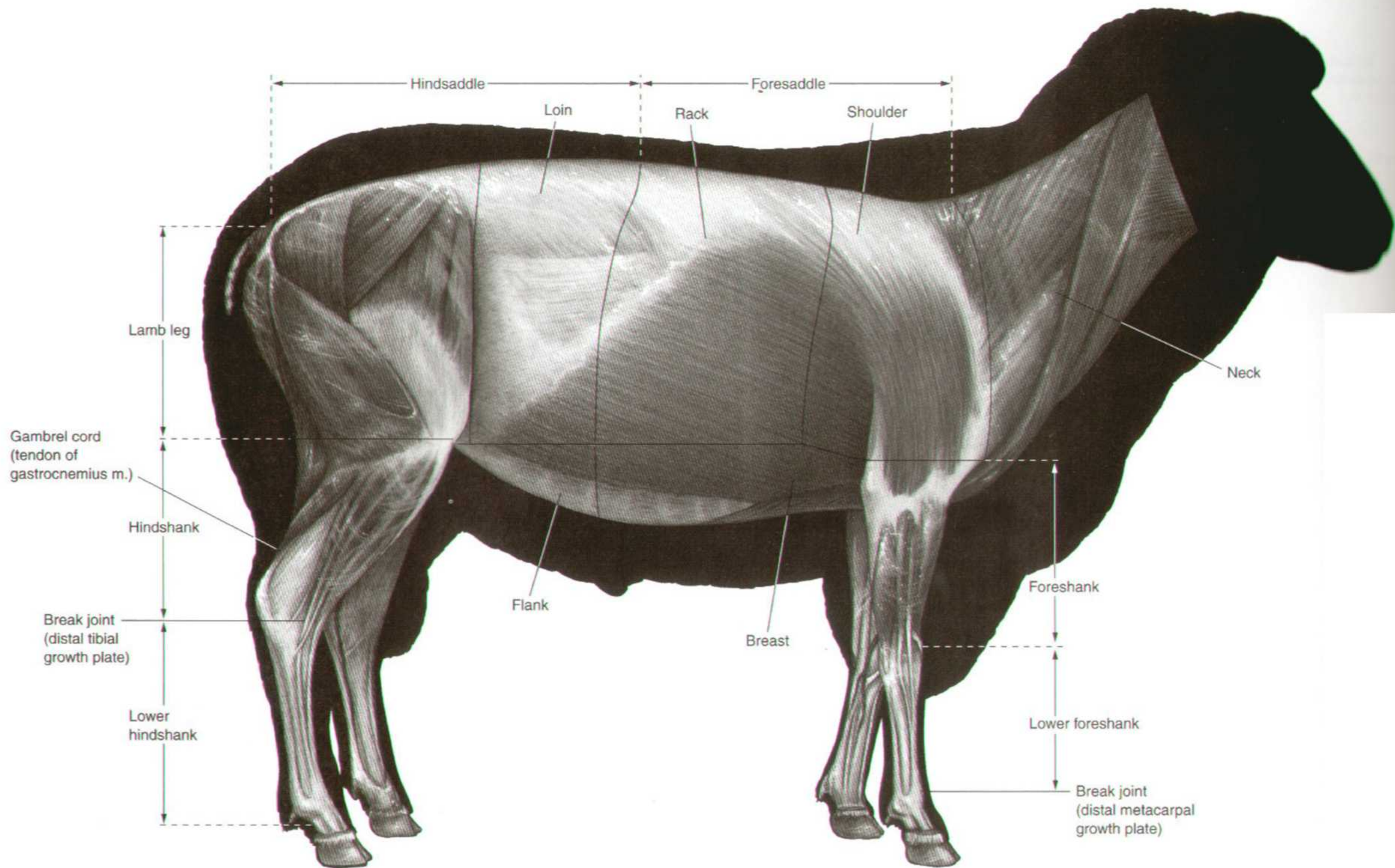


PLATE 3.3 Carcass cuts of the lamb. m = muscle



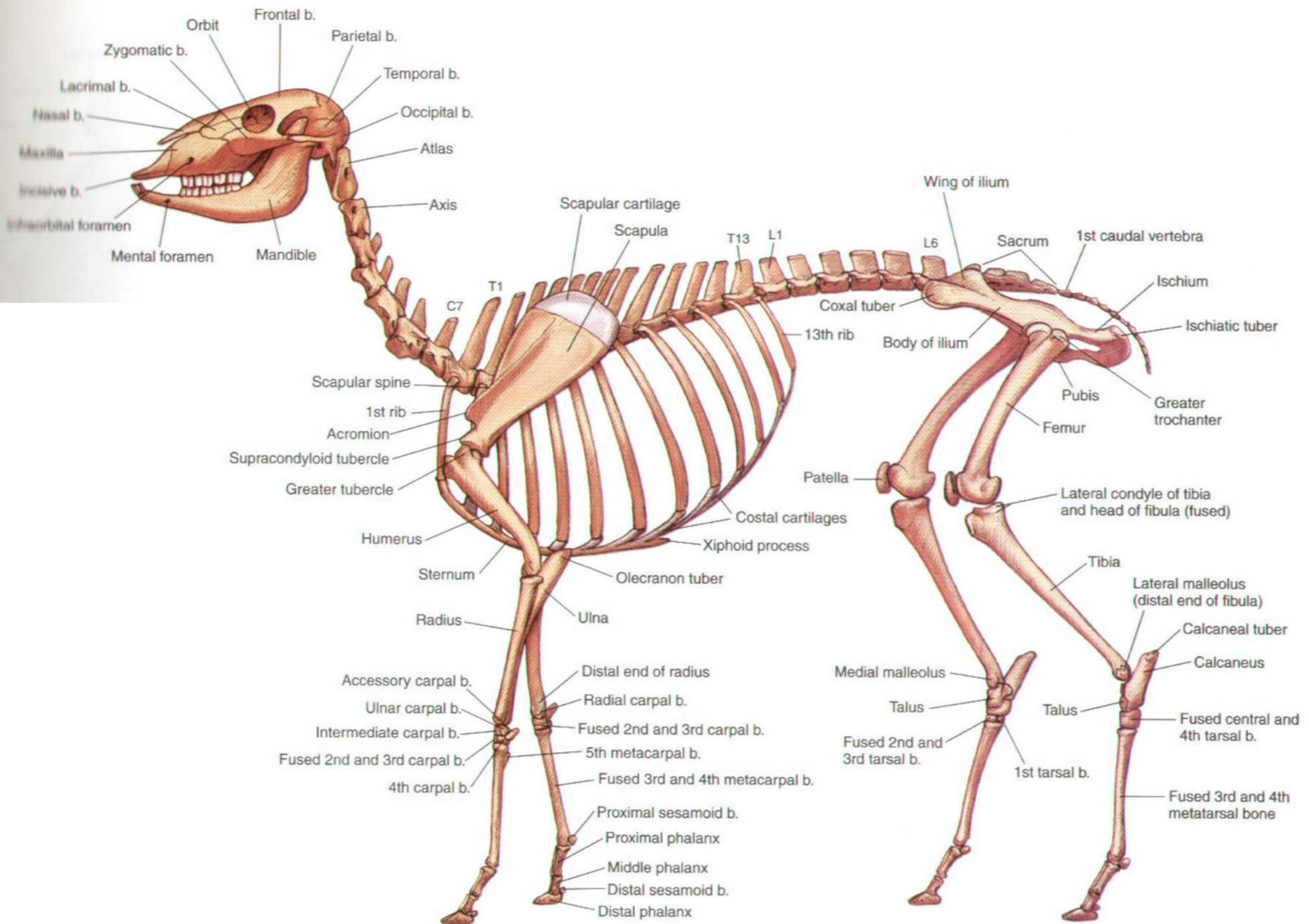
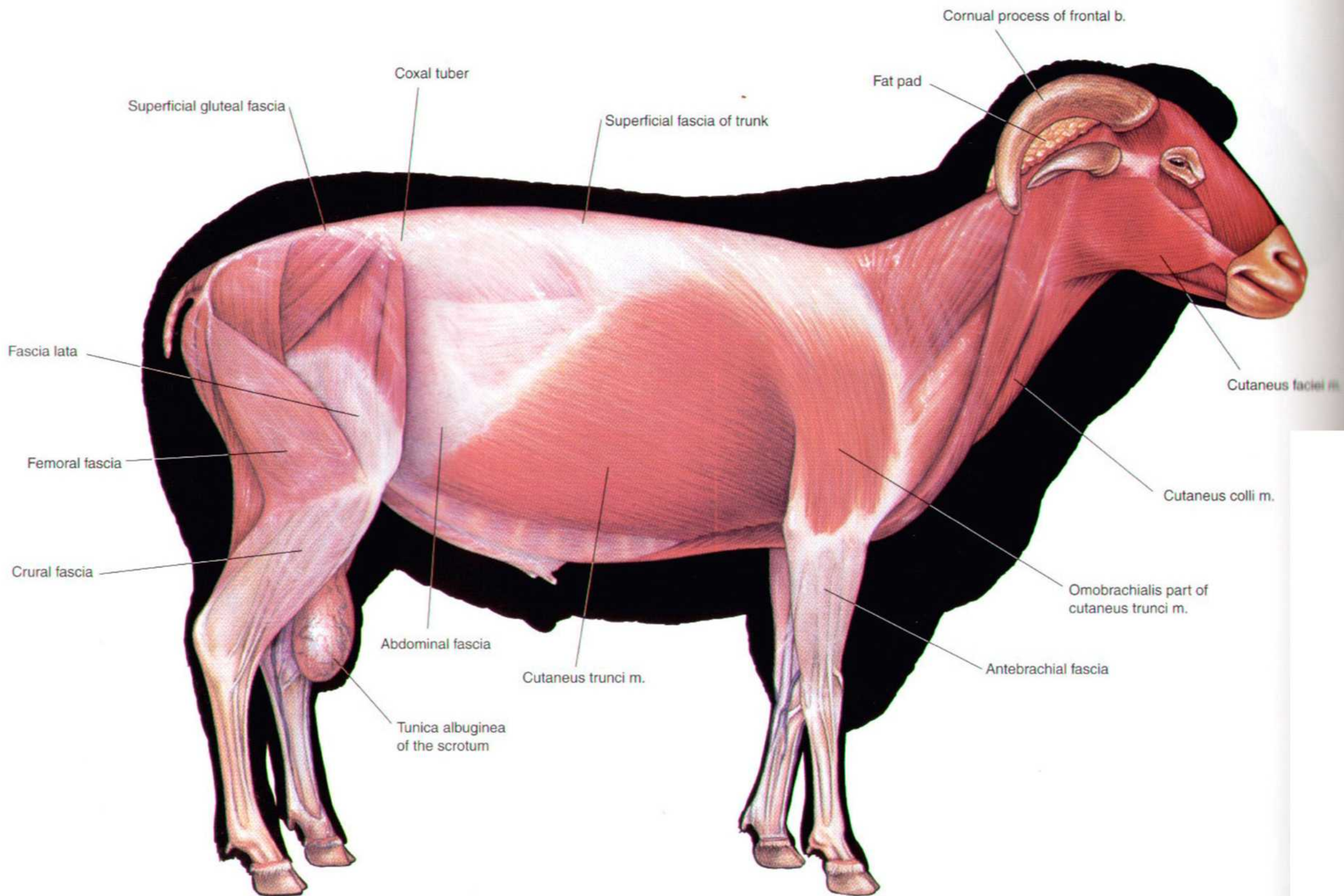


PLATE 3.4 Skeleton of the sheep. b = bone, C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra





**PLATE 3.5** Cutaneous muscles and major fasciae of the ram.  
Right lateral view. m = muscle, b = bone



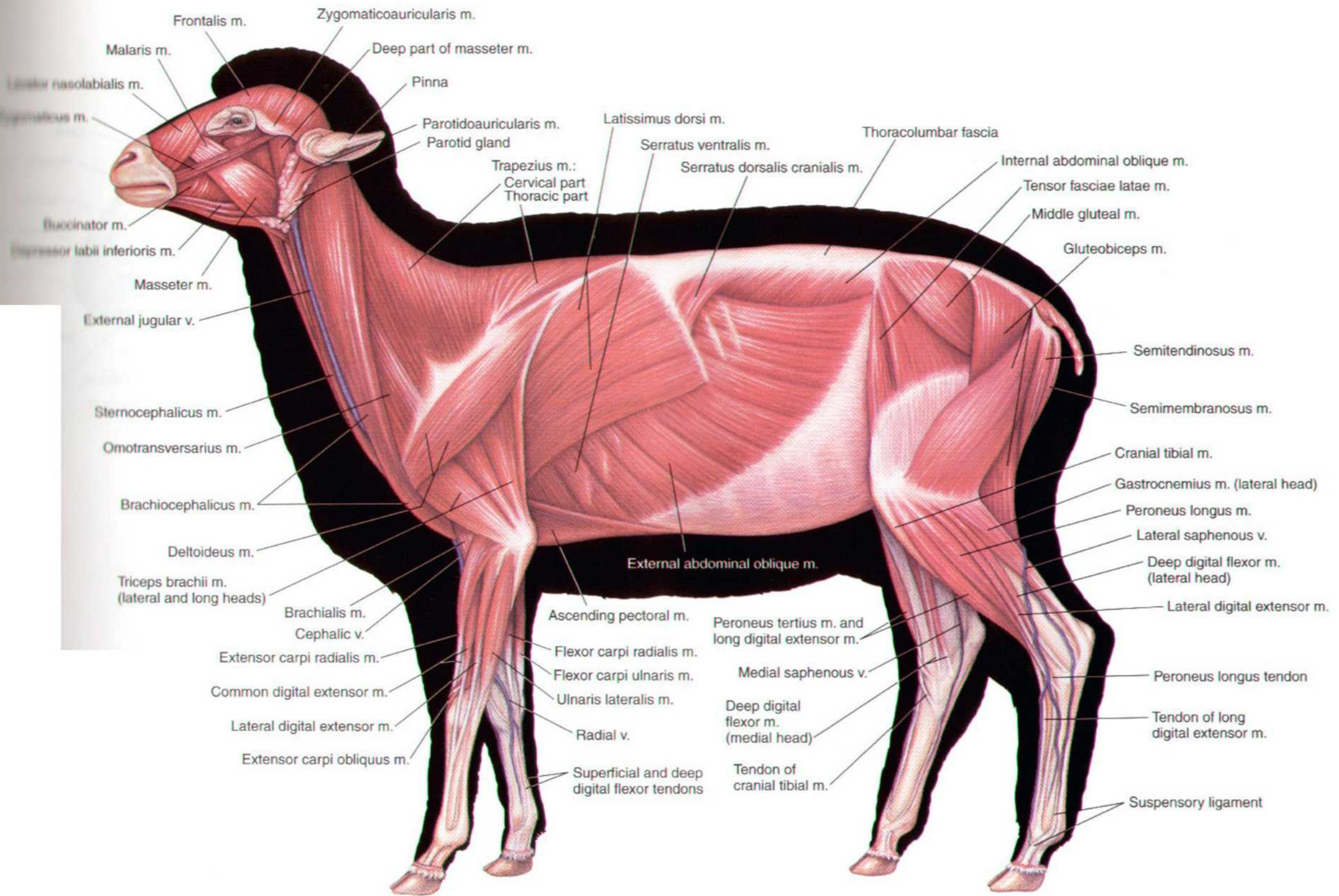


PLATE 3.6 Superficial muscles and veins of the ewe. Left lateral view. m = muscle, v = vein



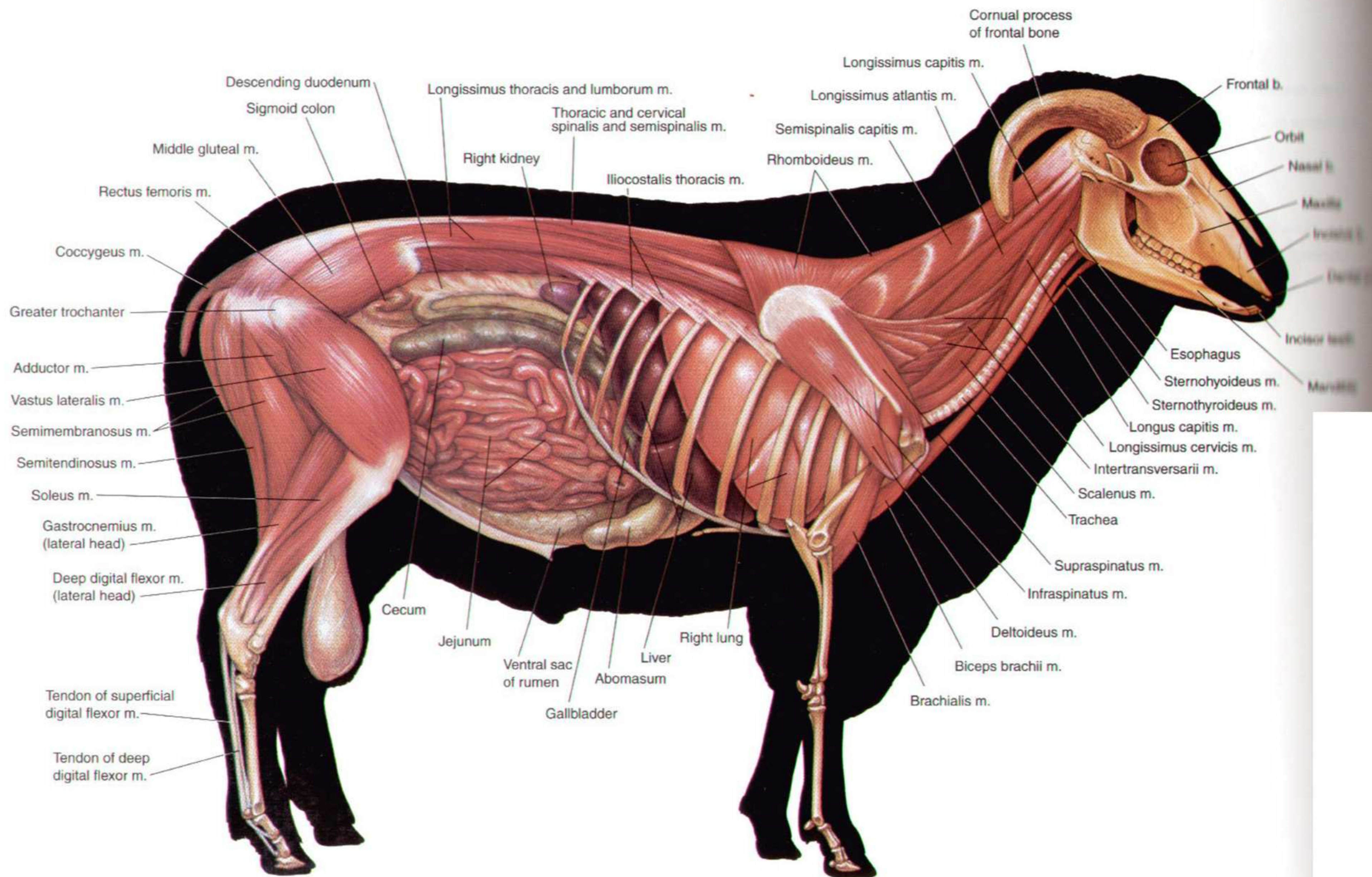


PLATE 3.7 Deep cervical muscles and *in situ* viscera of the ram. Omentum removed.  
Right lateral view. m = muscle, b = bone



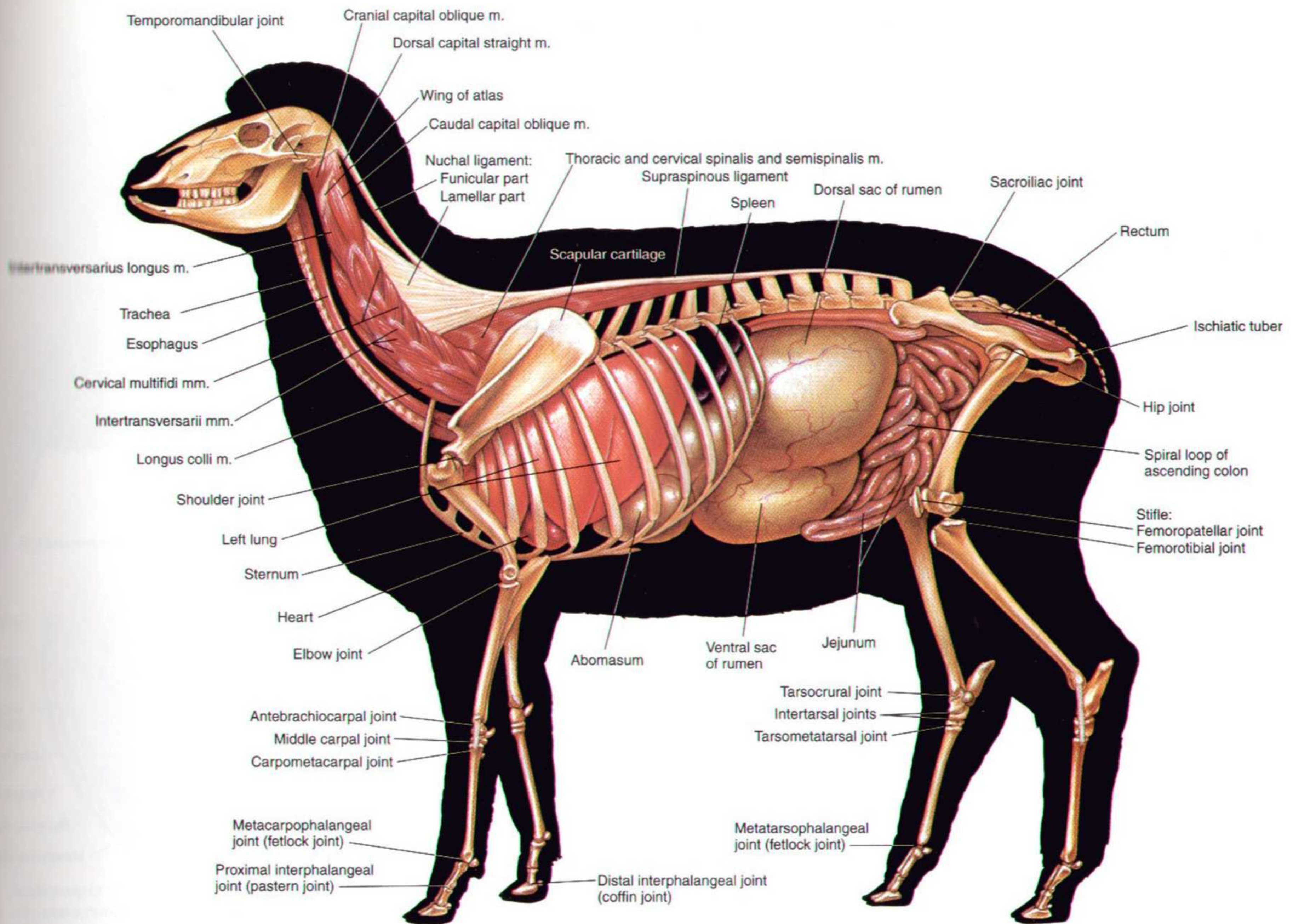
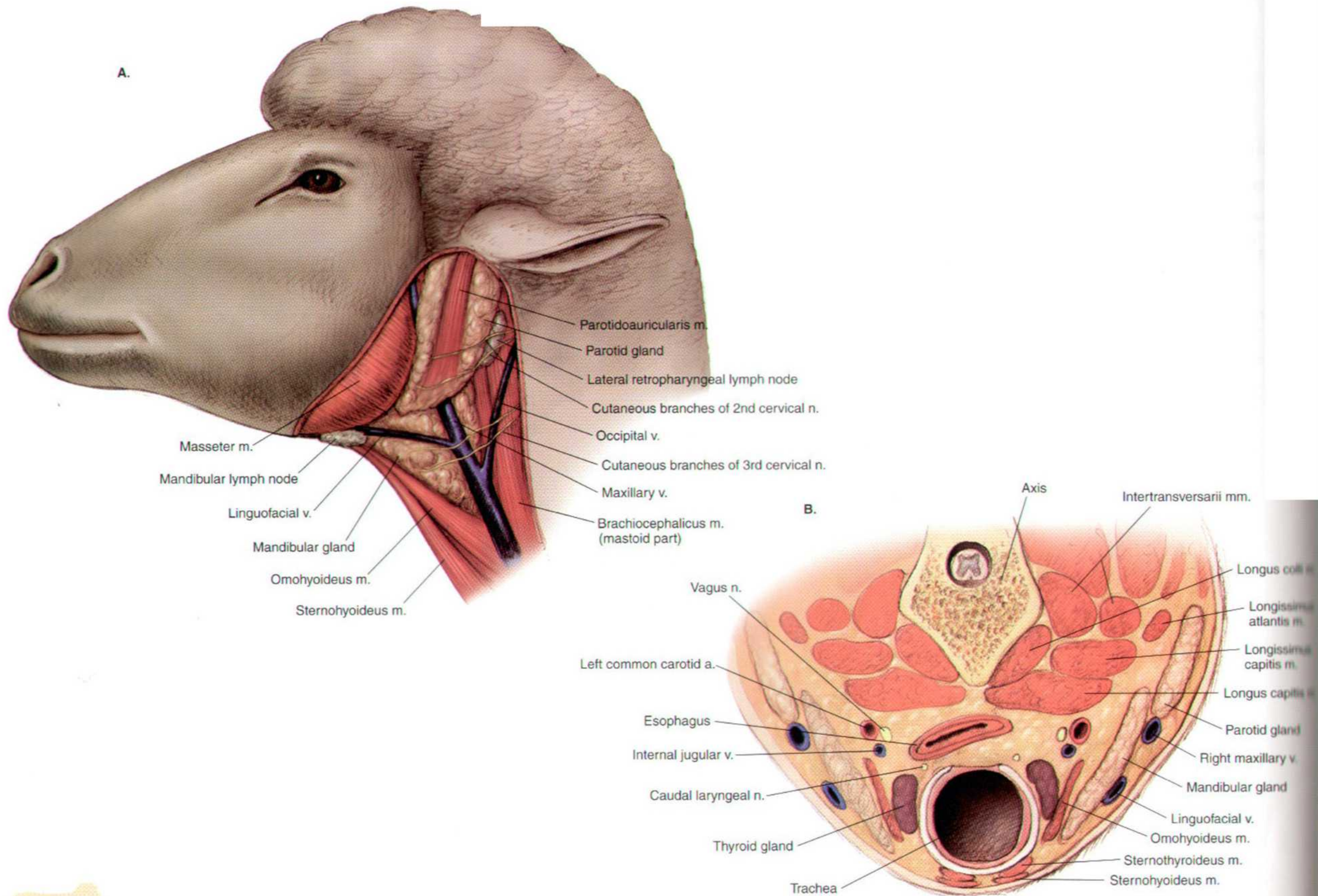


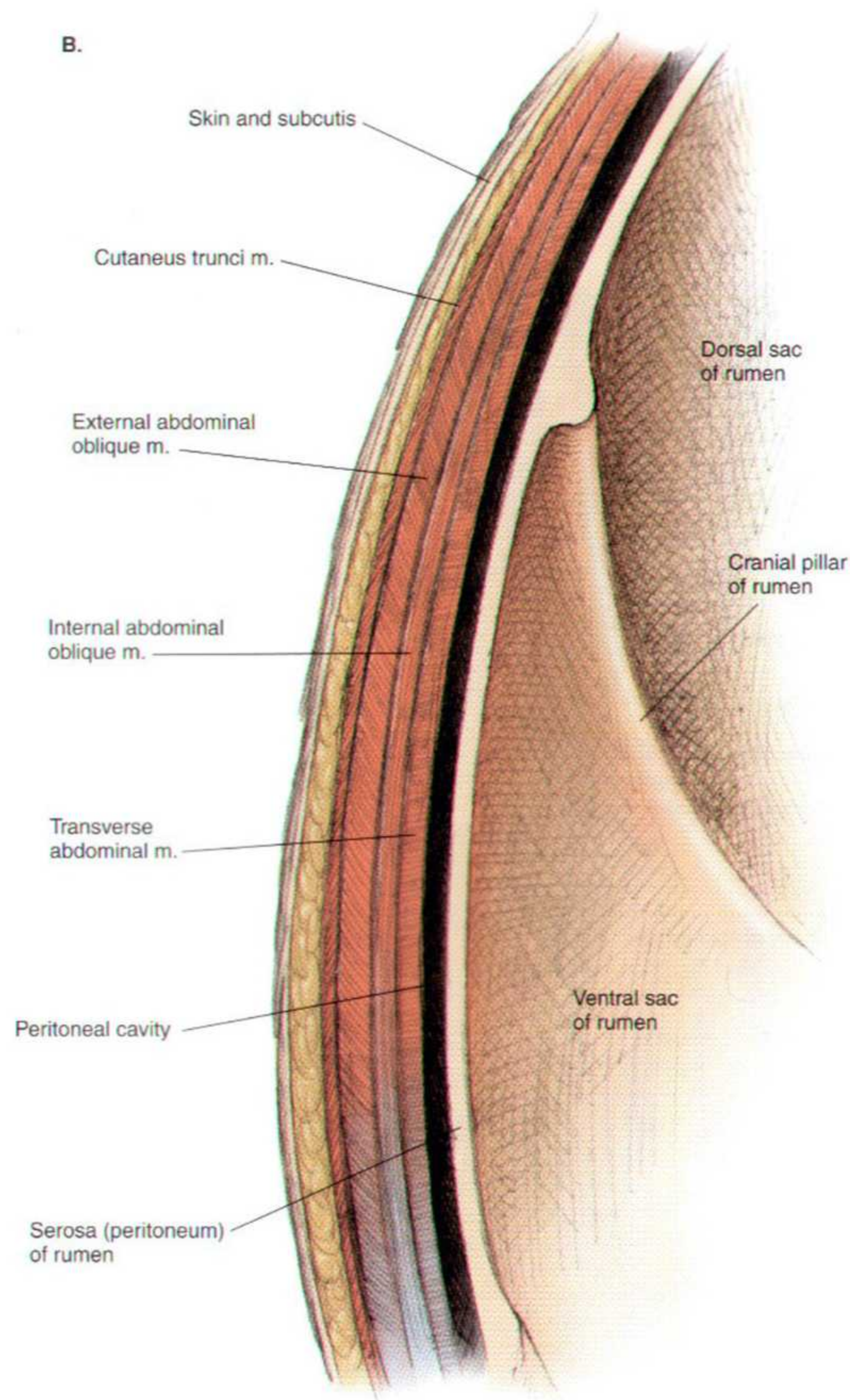
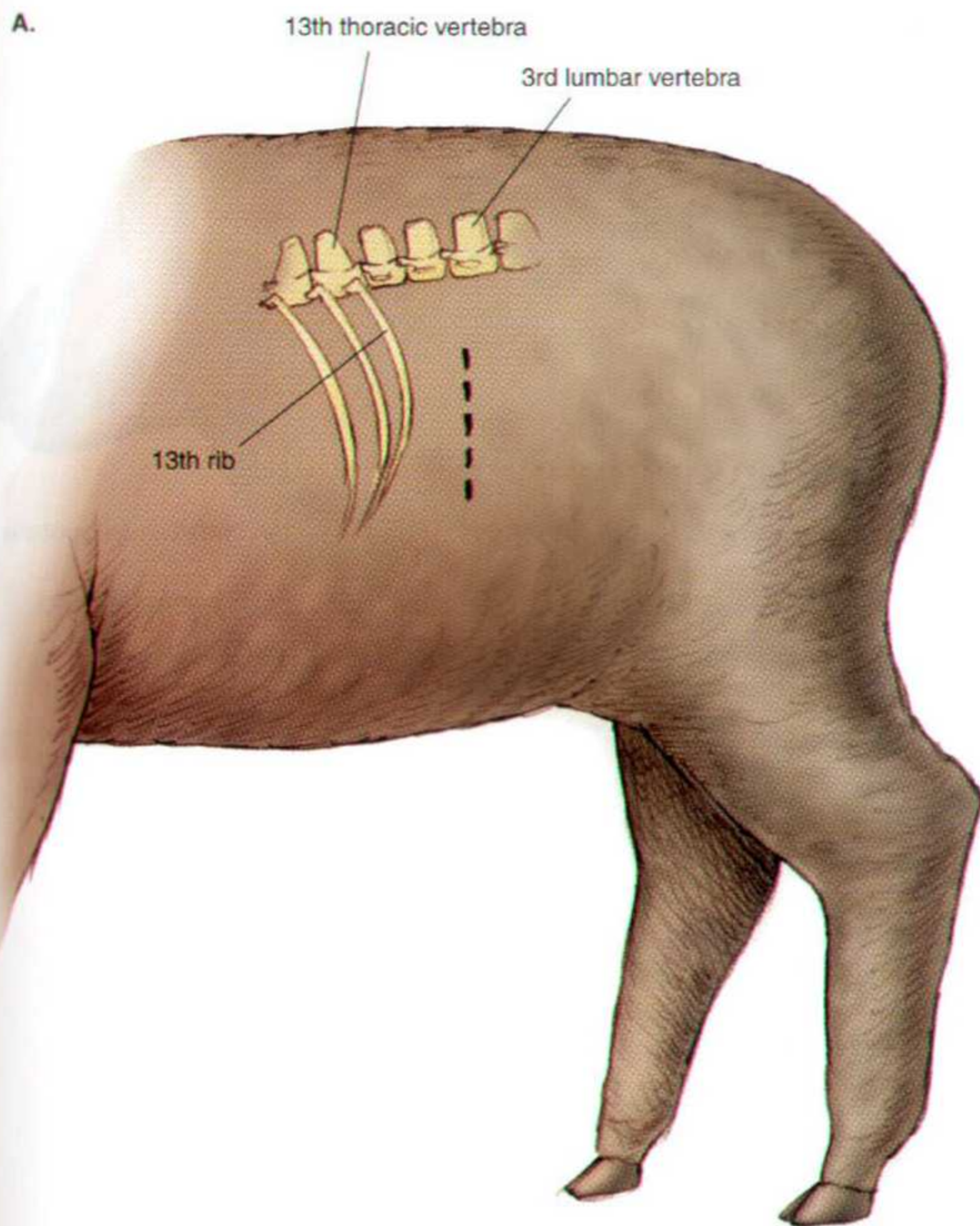
PLATE 3.8 Deep cervical muscles, *in situ* viscera, skeleton, and major joints of the ewe. Left lateral view. m = muscle





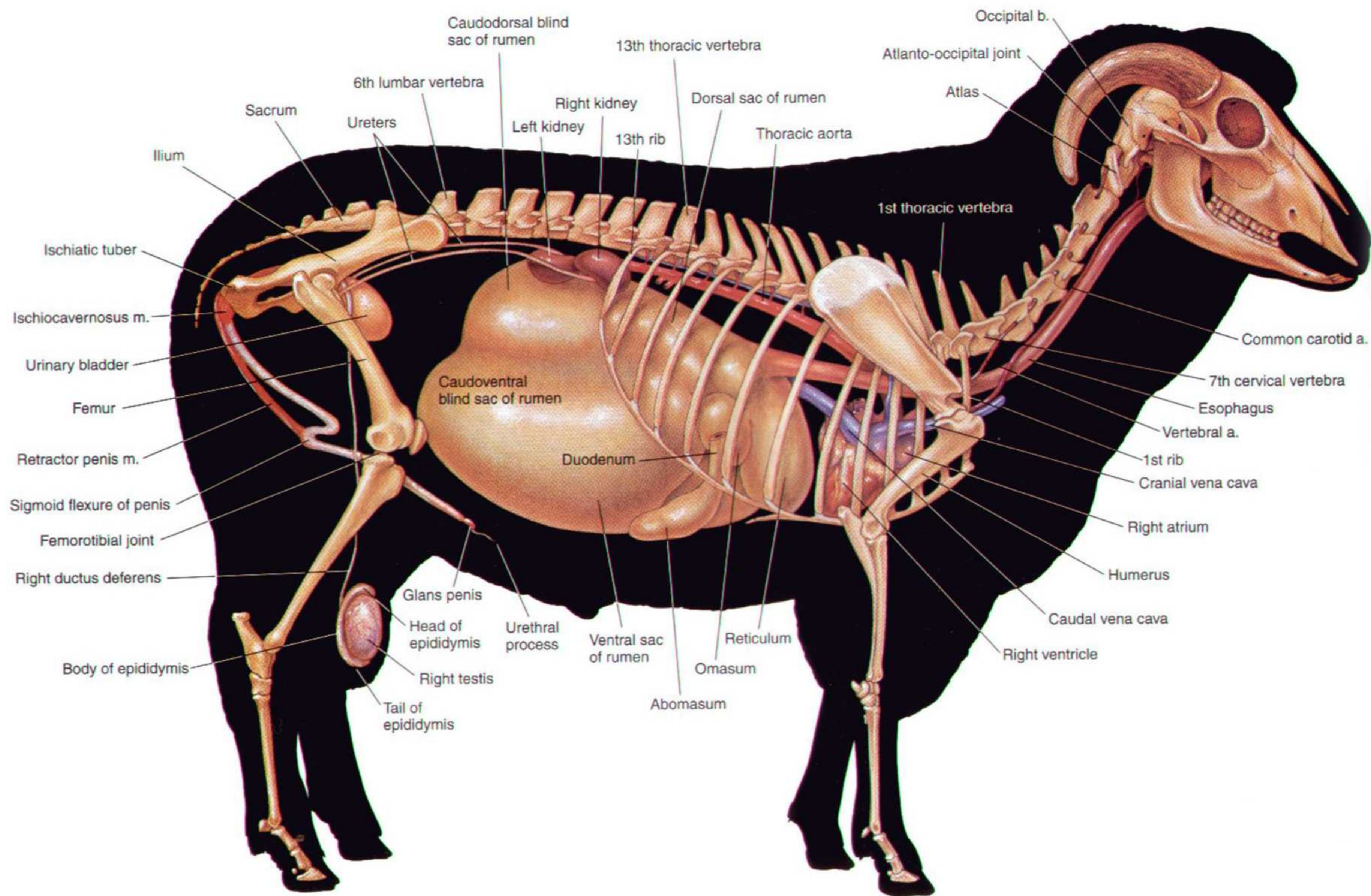
**PLATE 3.9** **A.** Dissection of the parotid region of a sheep. Skin, cutaneous muscles, and fascia are removed. Left lateral view. **B.** Cross-section of the neck at the level of the thyroid gland. Caudocranial view. m = muscle, v = vein, a = artery, n = nerve





**PLATE 3.10** A. Location of the left flank incision: *dashed line*. B. Cross-section through the left abdominal wall and subjacent ruminal wall. Caudocranial view. m = muscle





**PLATE 3.11** Reproductive organs, urinary organs, esophagus and stomach, heart, and adjacent major vessels related to the skeleton of the ram. Right lateral view.  
b = bone, m = muscle, a = artery



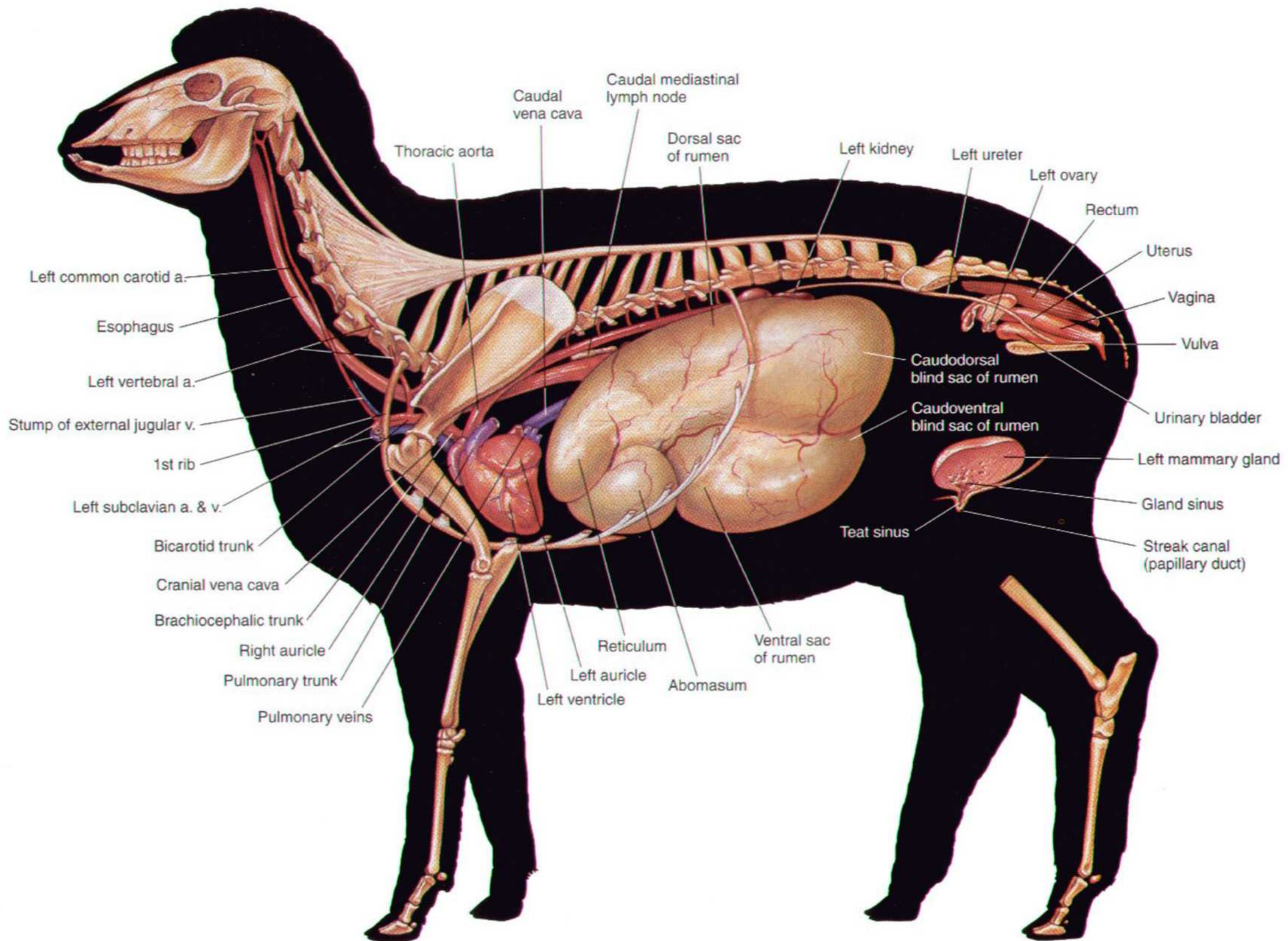
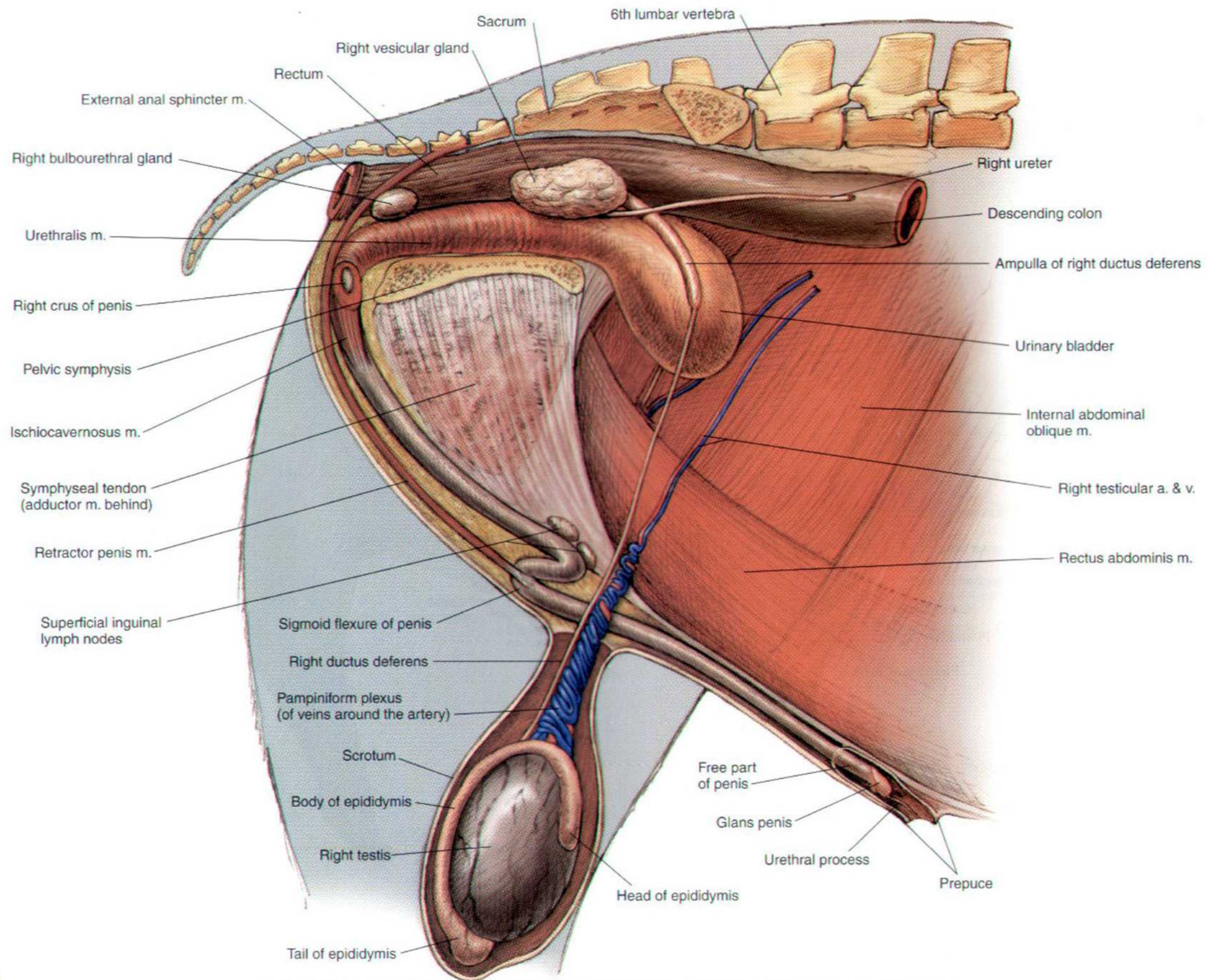


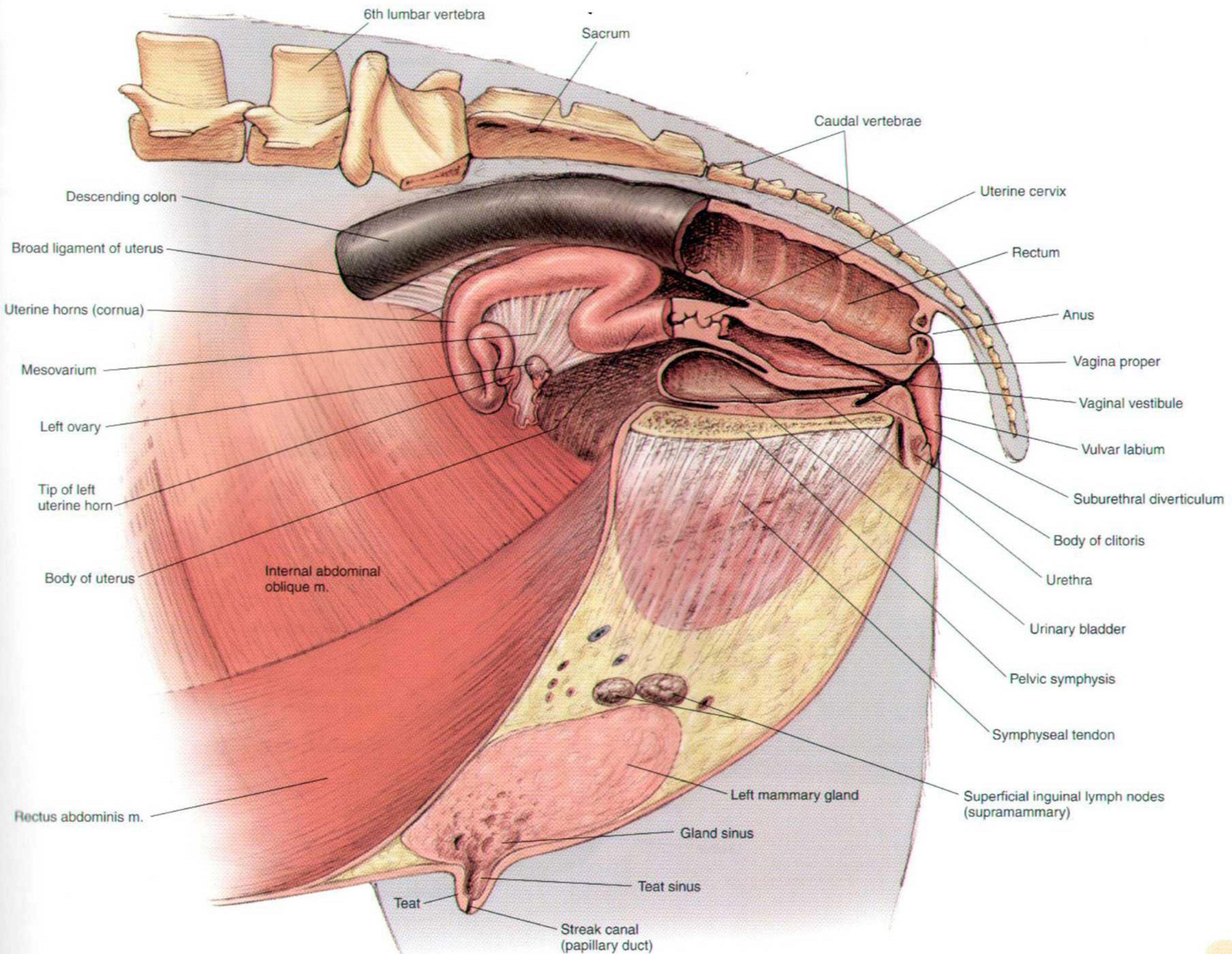
PLATE 3.12 Reproductive organs, urinary organs, heart, and adjacent major vessels, esophagus and stomach of the ewe. Left lateral view. a = artery, v = vein





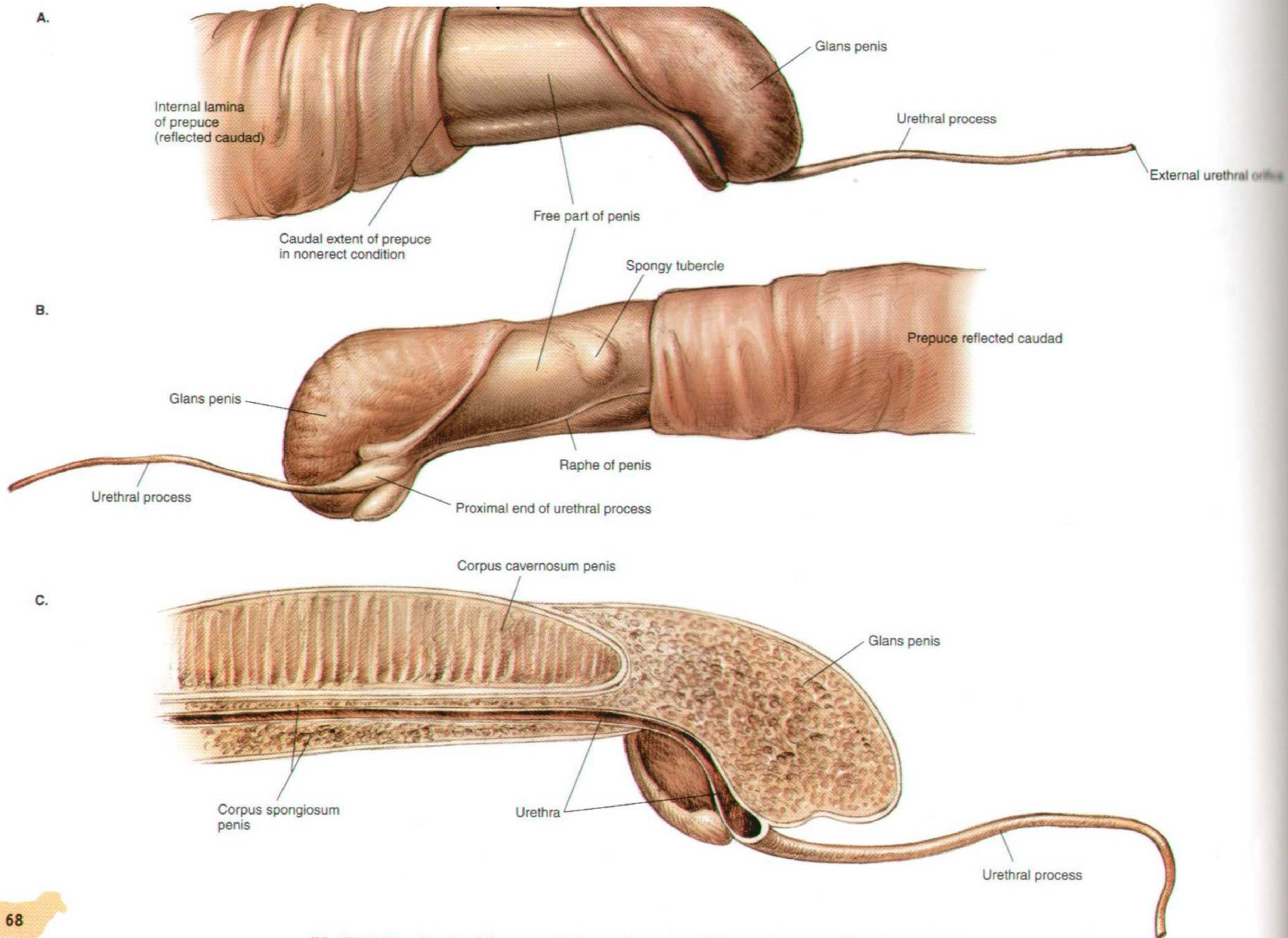
**PLATE 3.13** Relations of the reproductive organs of the ram. Right lateral view. Right pelvic limb and body wall are removed. The ram's prostate gland is entirely disseminate; it lies deep to the urethralis muscle. m = muscle, a = artery, v = vein





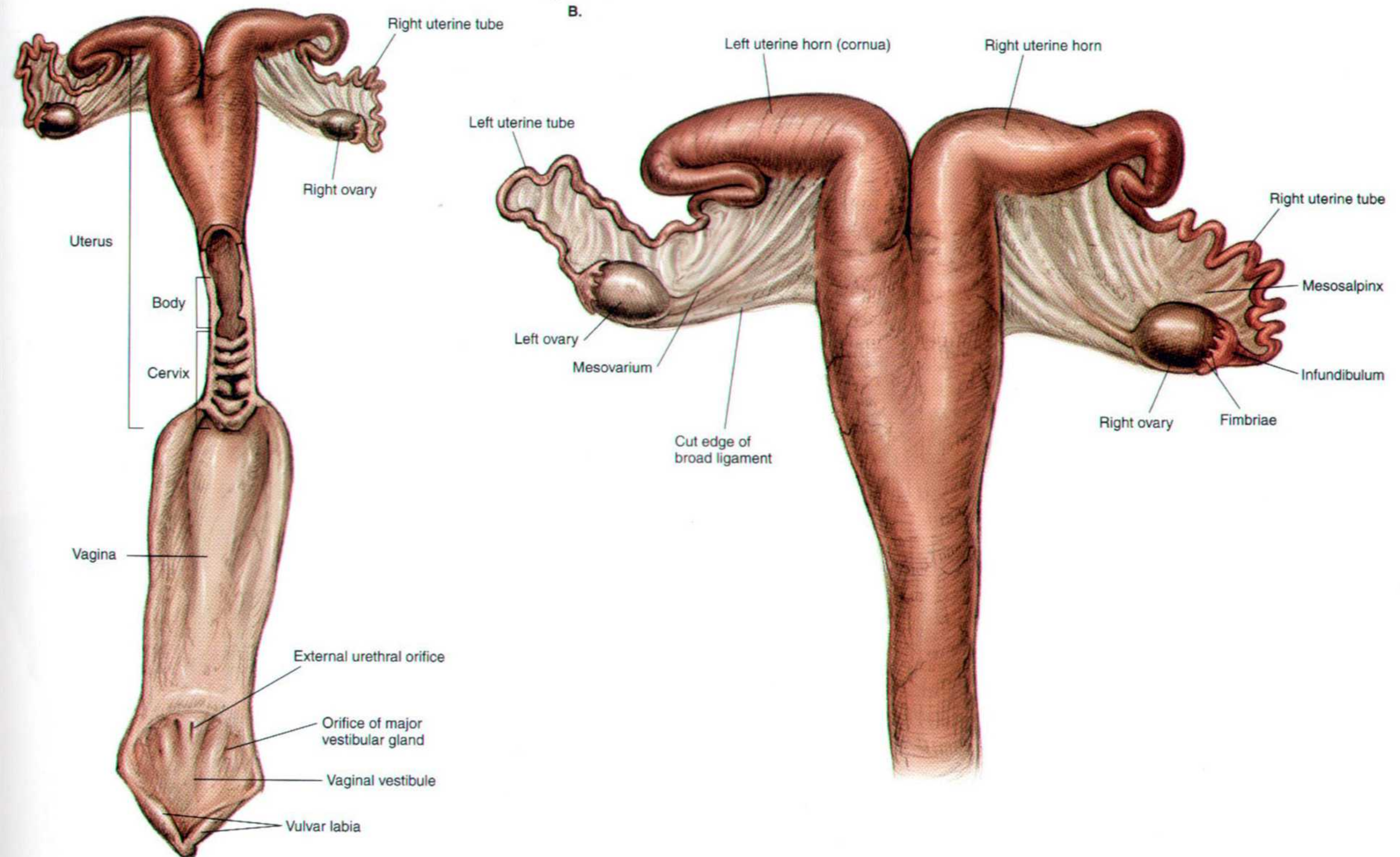
**PLATE 3.14** Relations of the reproductive organs of the ewe. Left lateral view with partial median sections of the vagina, uterine cervix, rectum, urinary bladder, and urethra. m = muscle





**PLATE 3.15** Penis of the ram. **A.** Cranial portion of the ram's penis. Right lateral view. **B.** Left lateral view. **C.** Median section. Right lateral view.





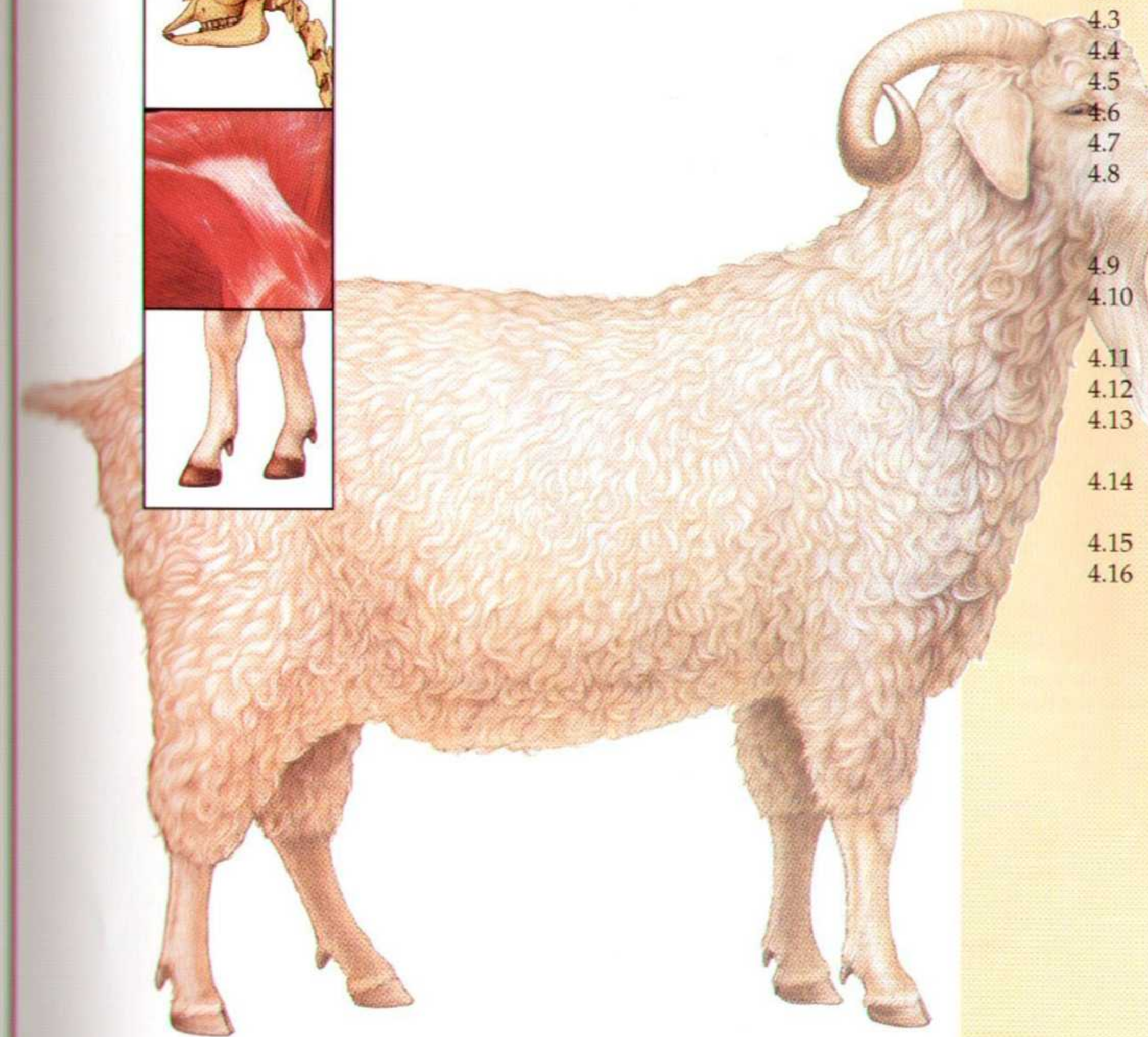
**PLATE 3.16** A. Isolated reproductive organs of the ewe. Vagina and a portion of the uterus opened dorsally. B. Isolated uterus, uterine tubes, and ovaries of the ewe. Dorsal view.



# SECTION 4 THE GOAT (*Capra hircus*)

## PLATES

- 4.1 Right lateral view of an Angora buck (billy).
- 4.2 Left lateral view of a Toggenberg doe (nanny).
- 4.3 Body regions of the goat.
- 4.4 Skeleton of the goat.
- 4.5 Cutaneous muscles and major fasciae of the buck.
- 4.6 Superficial muscles and veins of the doe.
- 4.7 Major structures of the caprine left distal metacarpus and digits.
- 4.8 A. Untrimmed hoofs of the goat.  
B. Trimmed hoofs of the goat.  
C. Parasagittal section through the fetlock and digit.
- 4.9 Deep muscles and *in situ* viscera of the buck.
- 4.10 Deep cervical muscles, *in situ* viscera, skeleton, and major joints of the doe.
- 4.11 Superficial structures of the goat's head.
- 4.12 Median section of the caprine head.
- 4.13 Reproductive organs, abdominal viscera, heart, and adjacent major vessels related to the skeleton of the buck.
- 4.14 Reproductive organs, abdominal viscera, heart, and adjacent major vessels of the doe.
- 4.15 Relations of the reproductive organs of the buck.
- 4.16 Relations of the reproductive organs of the doe.





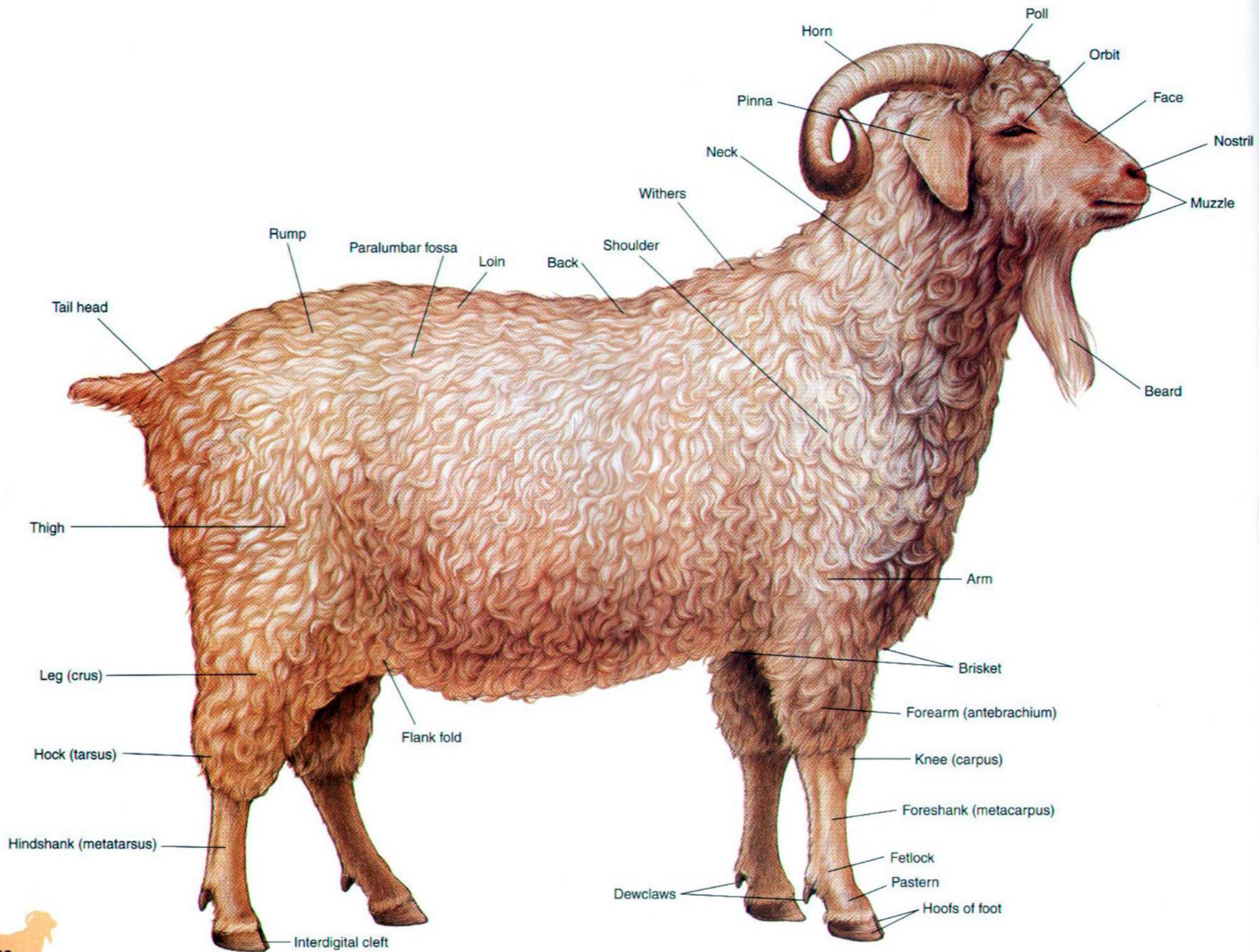
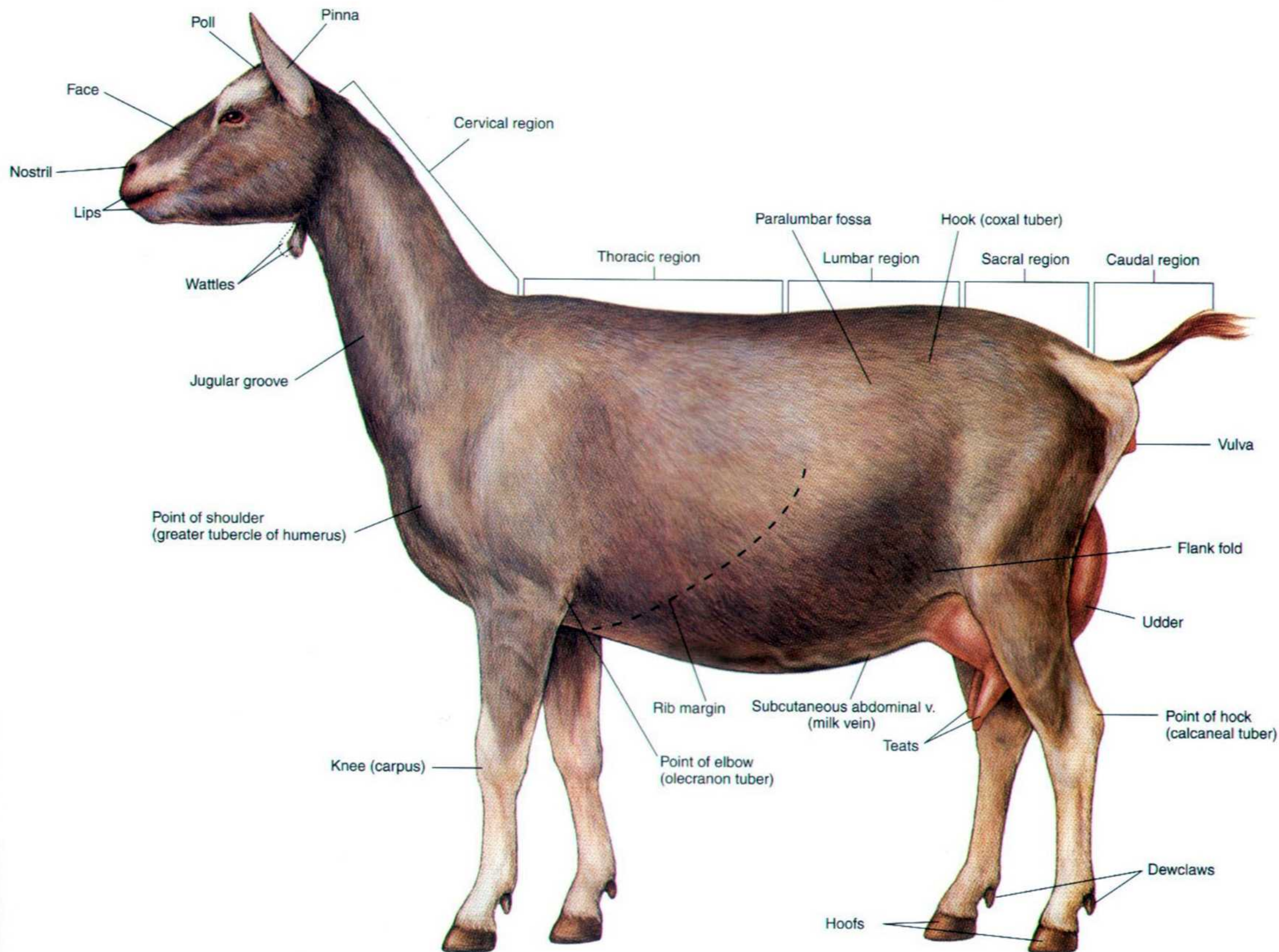


PLATE 4.1 Right lateral view of an Angora buck (billy).





**PLATE 4.2** Left lateral view of a Toggenberg doe (nanny).  
Dorsal vertebral regions are indicated. v = vein



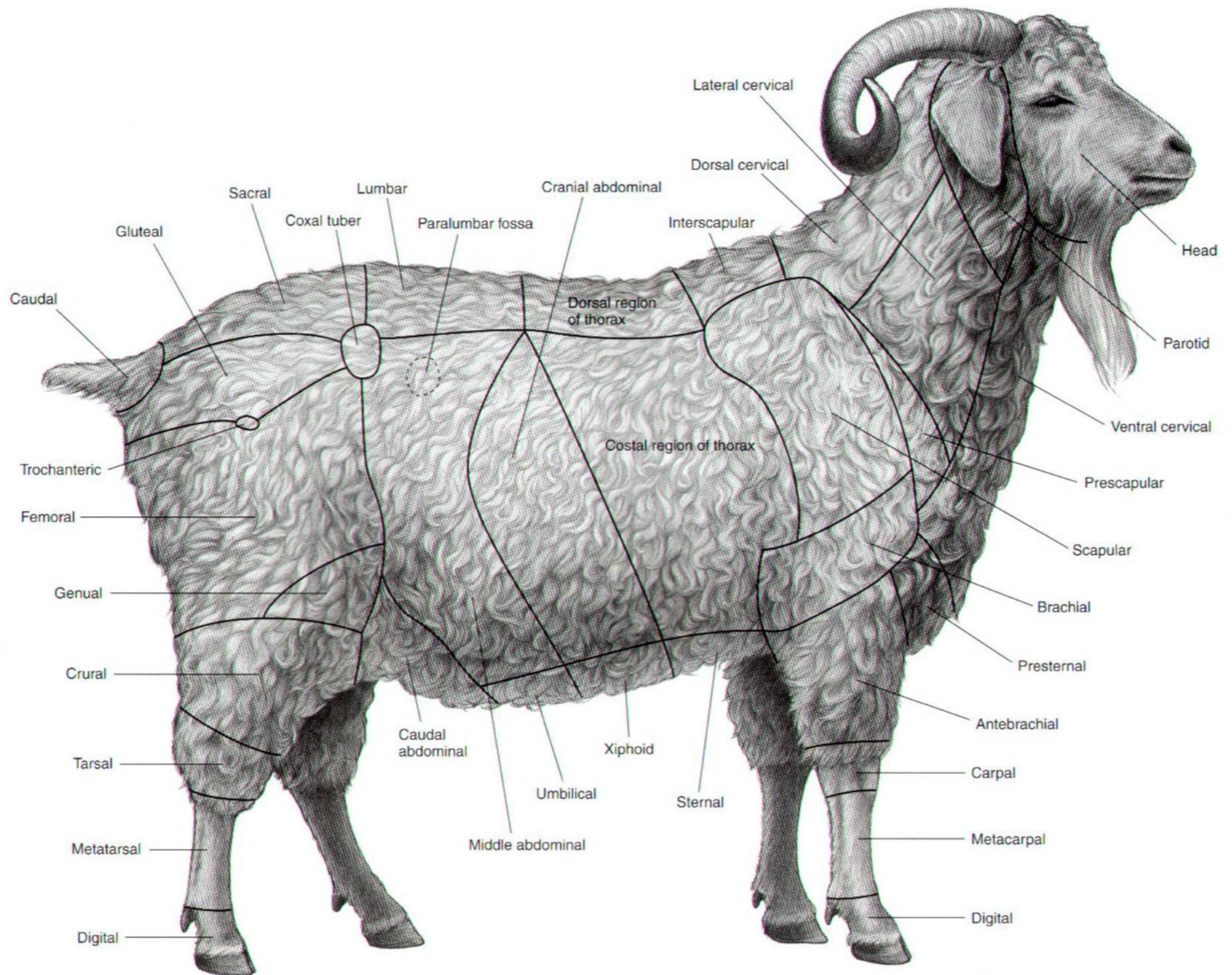
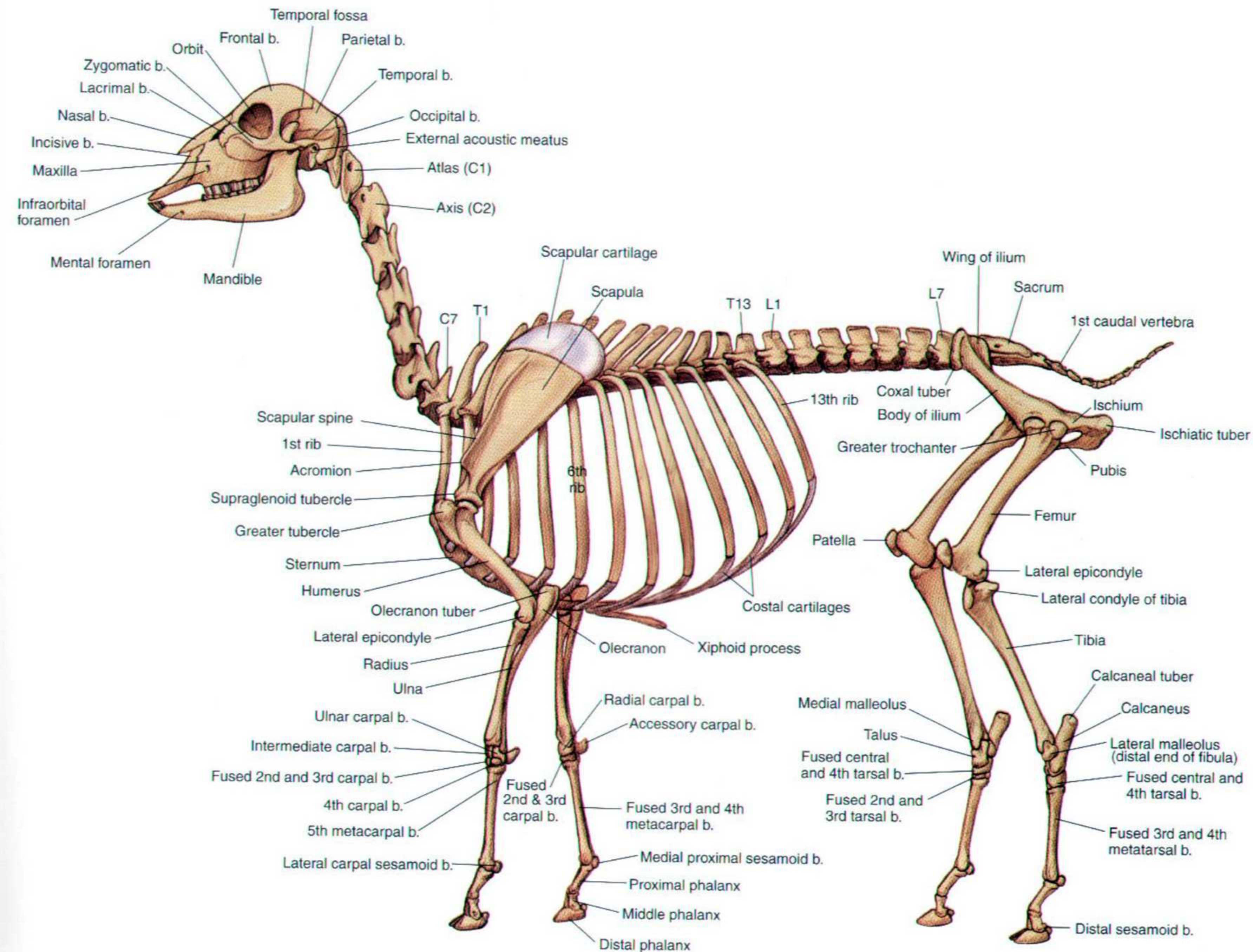


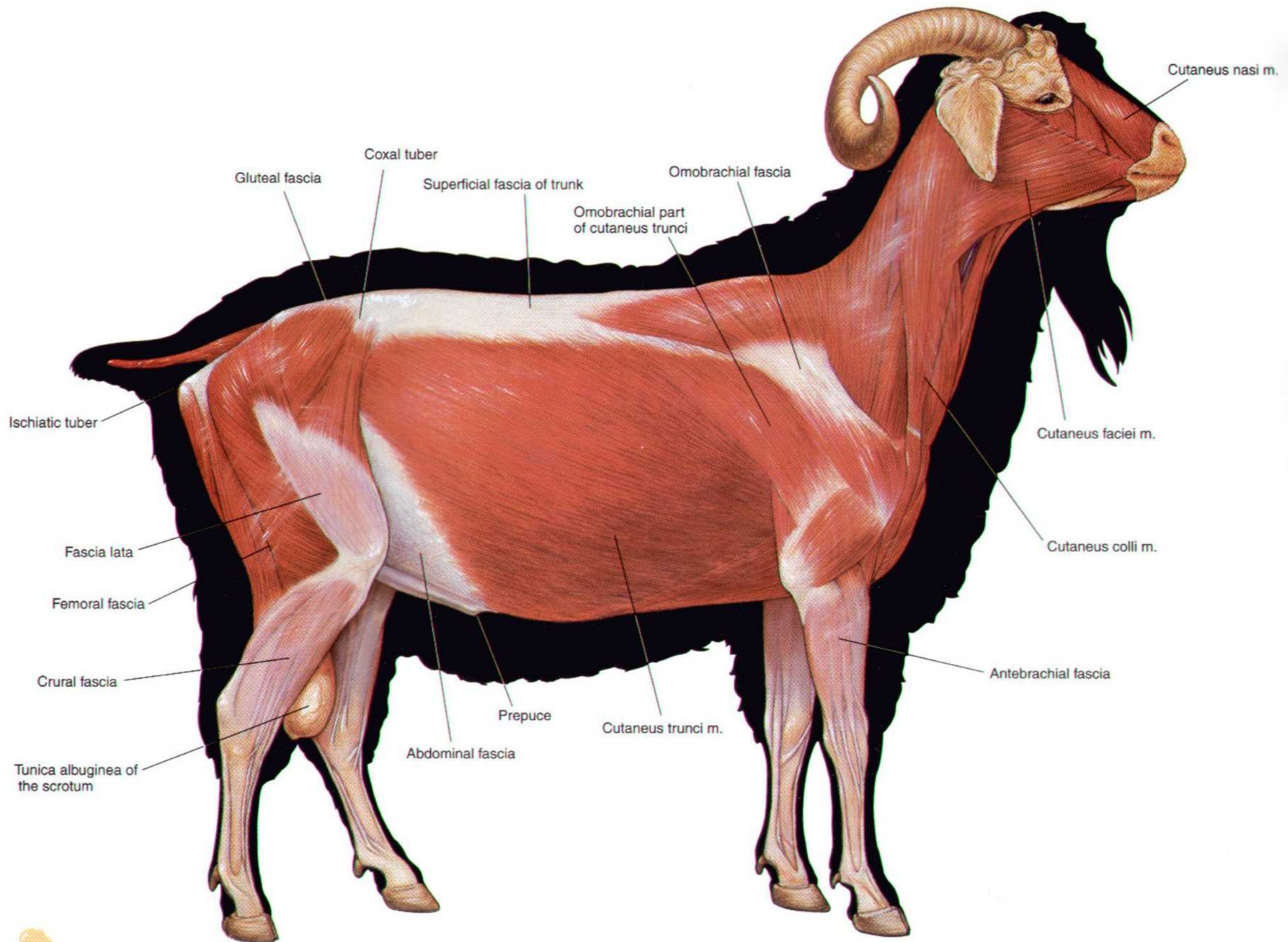
PLATE 4.3 Body regions of the goat. Right lateral view.





**PLATE 4.4** Skeleton of the goat. Left lateral view. b = bone, C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra







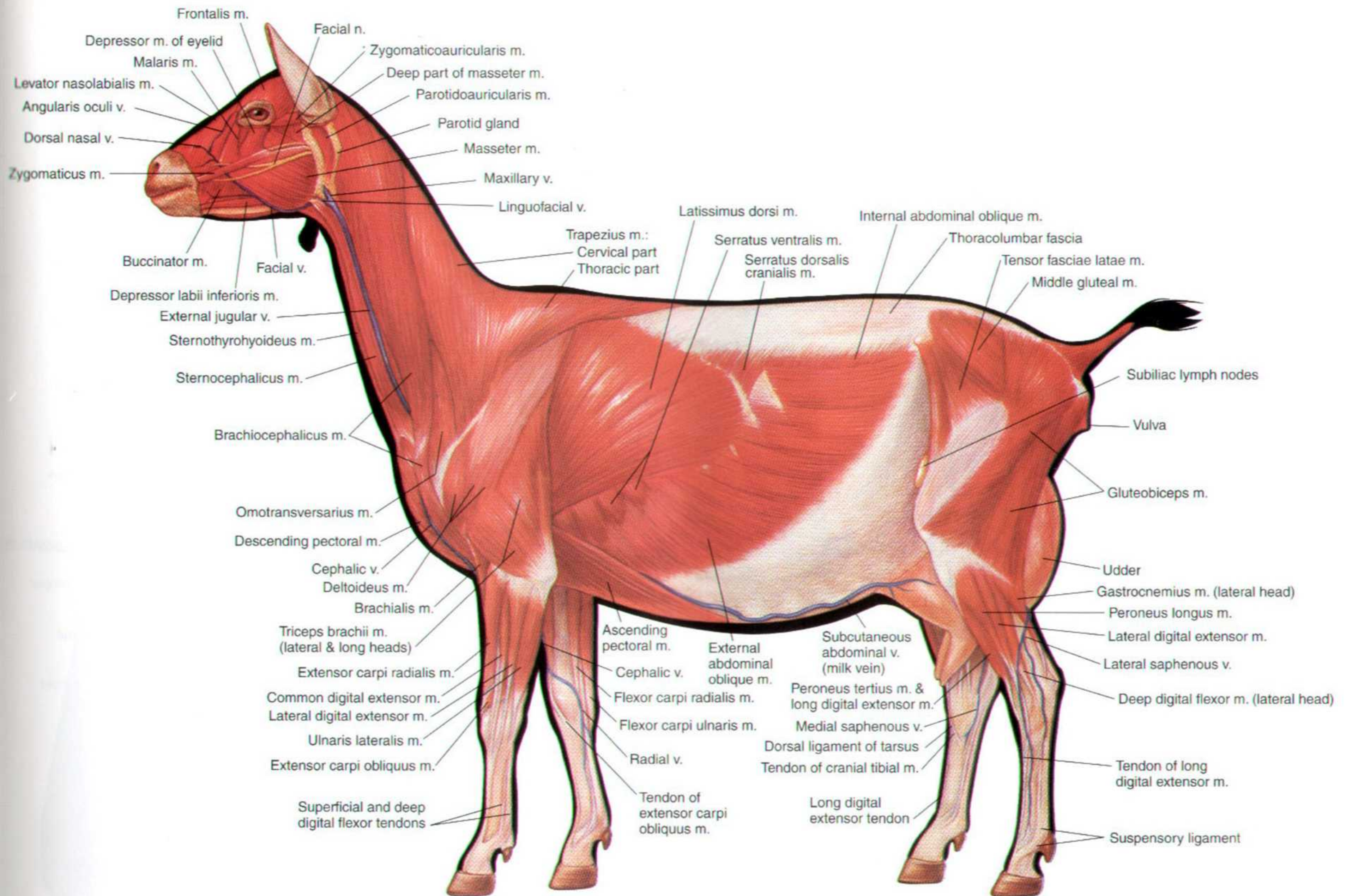
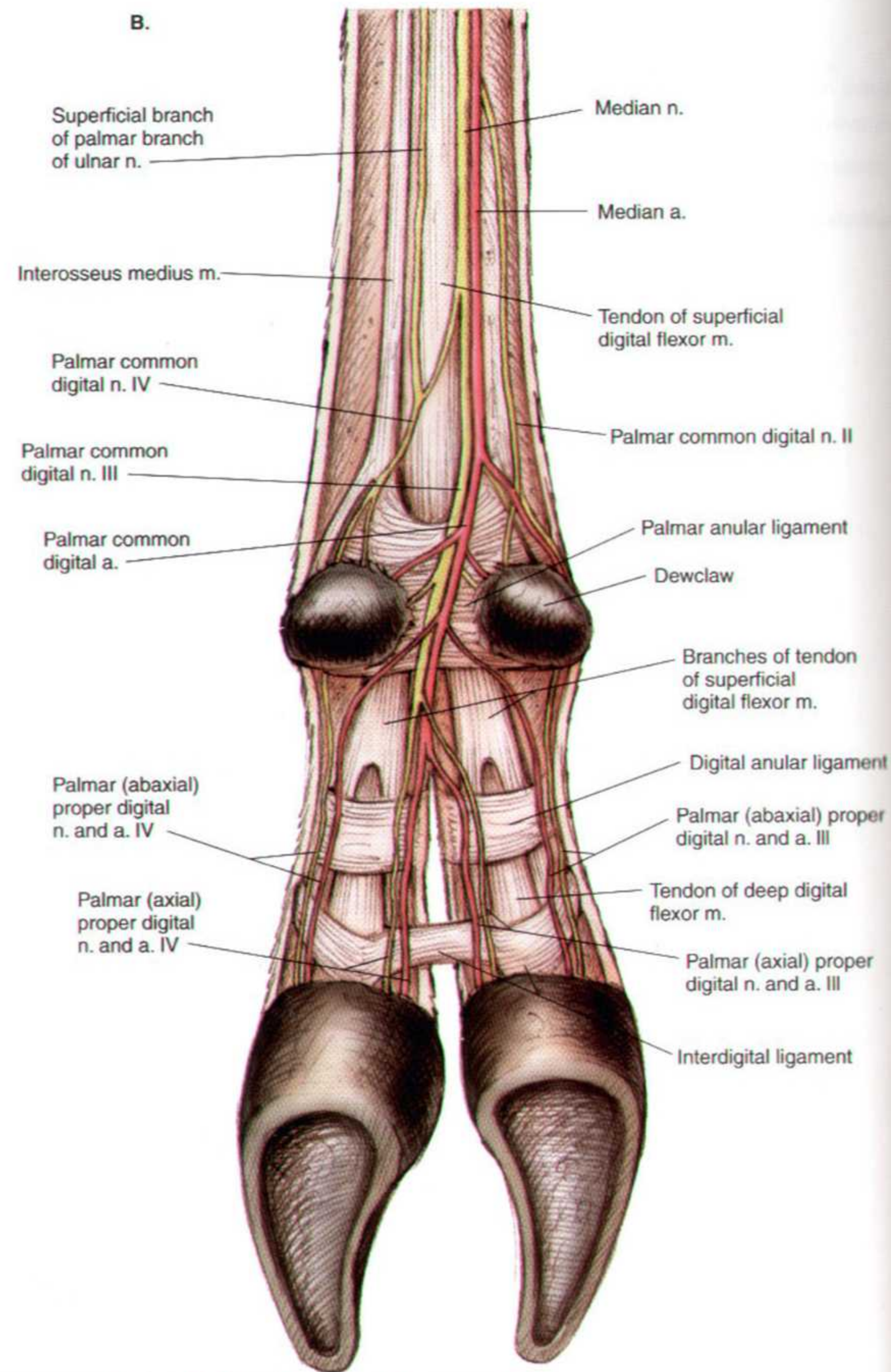
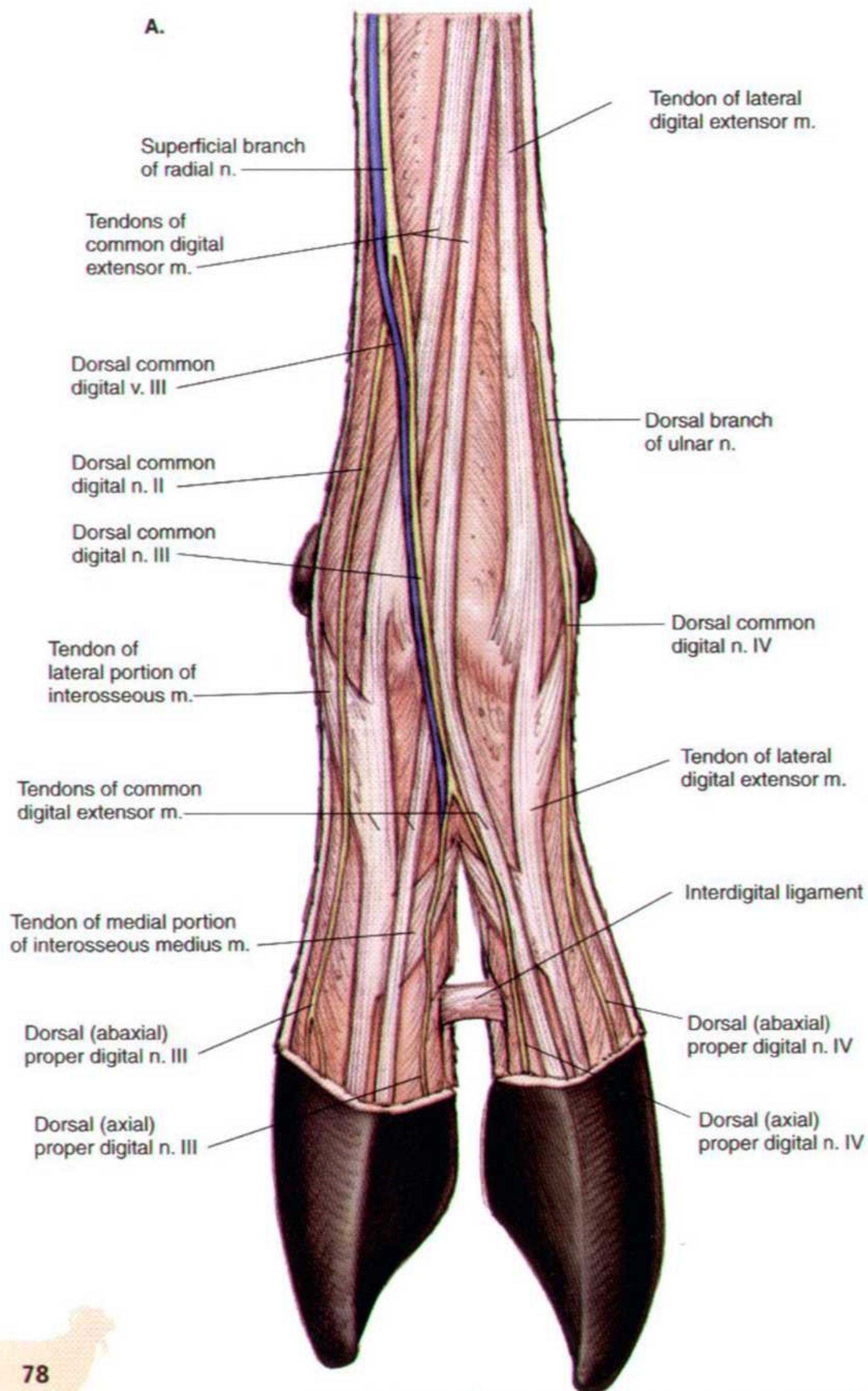


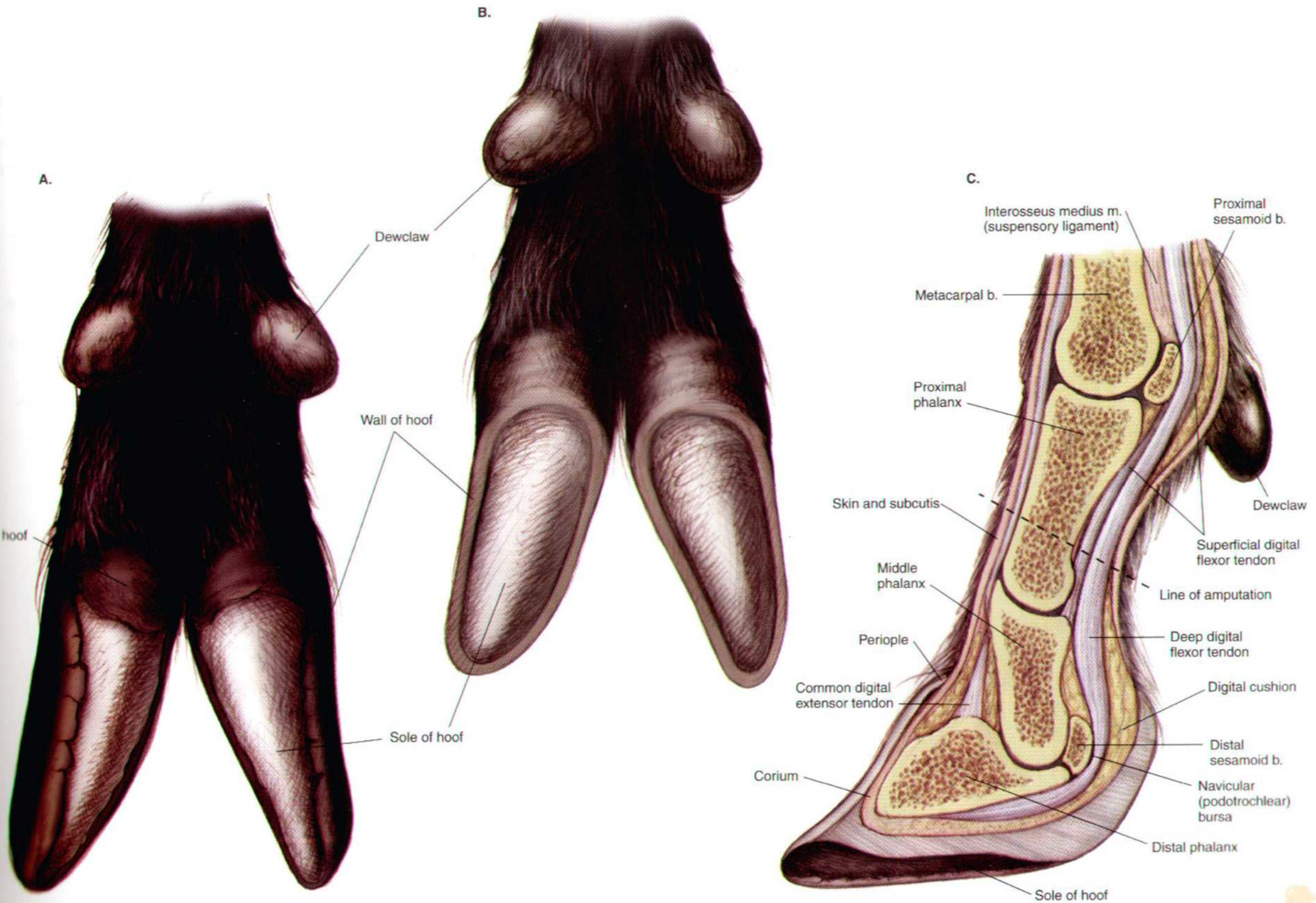
PLATE 4.6 Superficial muscles and veins of the doe. Left lateral view. m = muscle, v = vein





**PLATE 4.7** Major structures of the caprine left distal metacarpus and digits. **A.** Dorsal view, arteries excluded. **B.** Palmar view, veins excluded. n = nerve, m = muscle, a = artery





**PLATE 4.8** **A.** Untrimmed hooves of the goat. **B.** Trimmed hooves of the goat. **C.** Parasagittal section through the fetlock and digit. For artiodactyls, claw is synonymous with hoof. When kept on soft ground, a mature goat's hooves should be trimmed every 4–5 months. b = bone



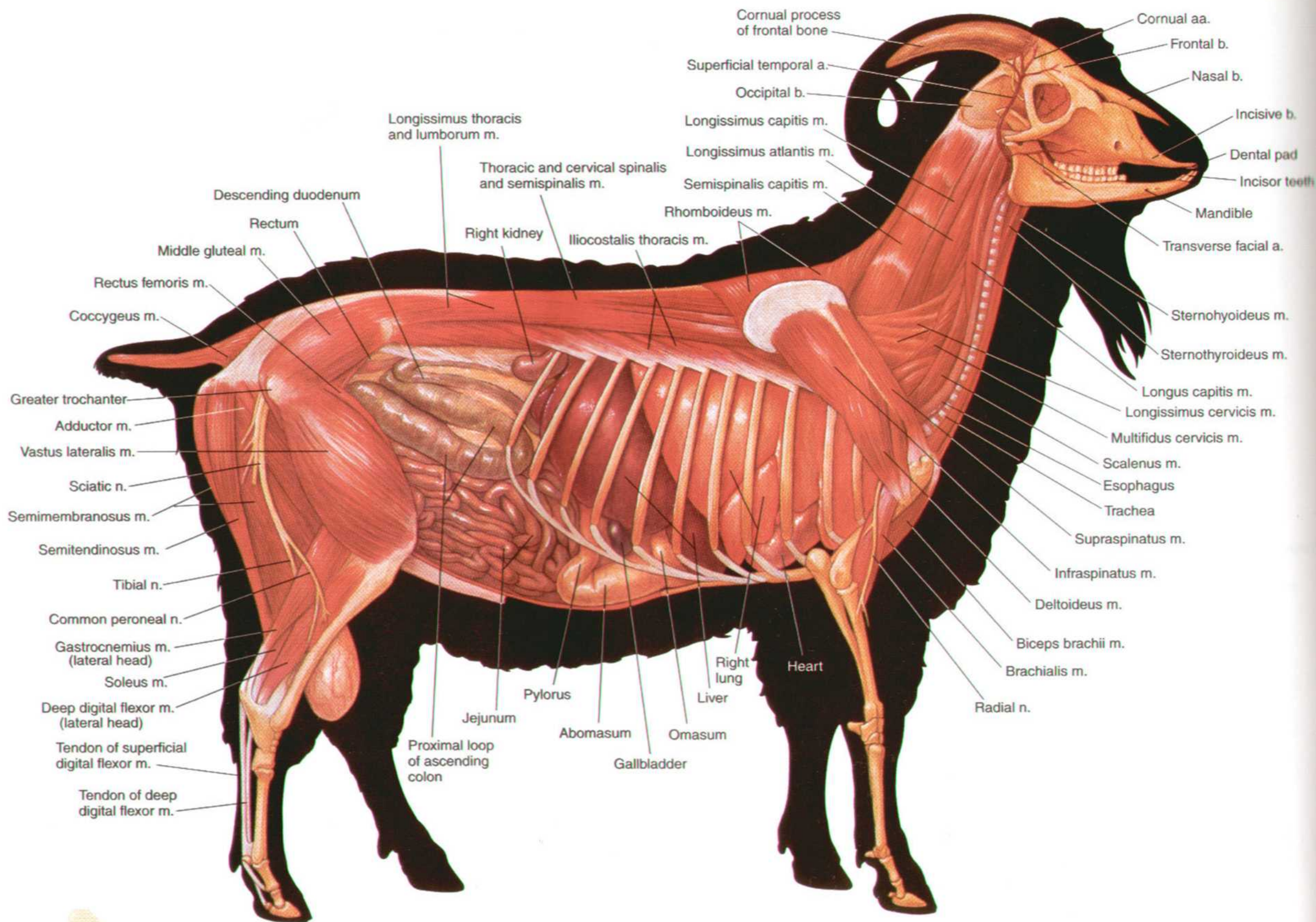
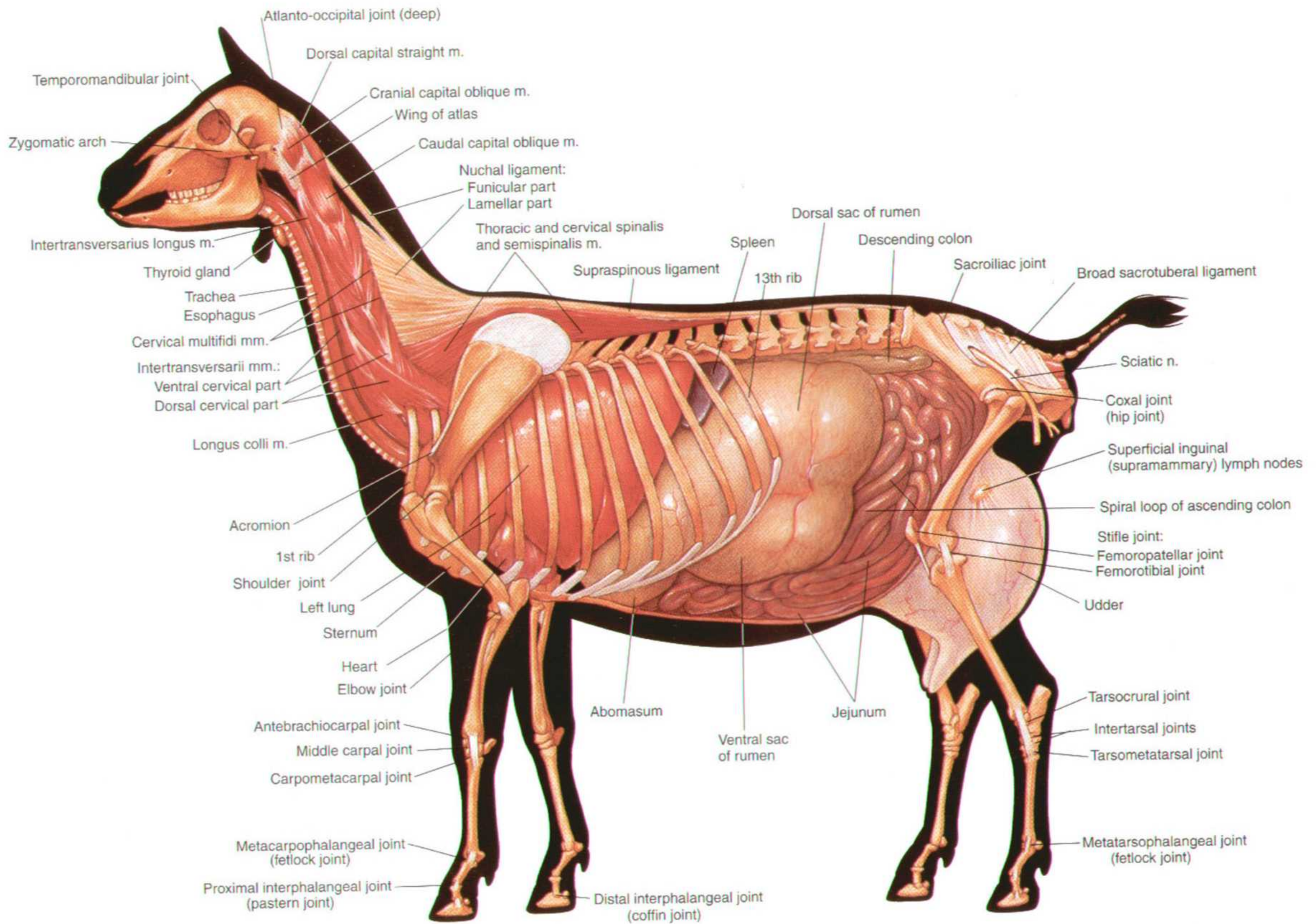


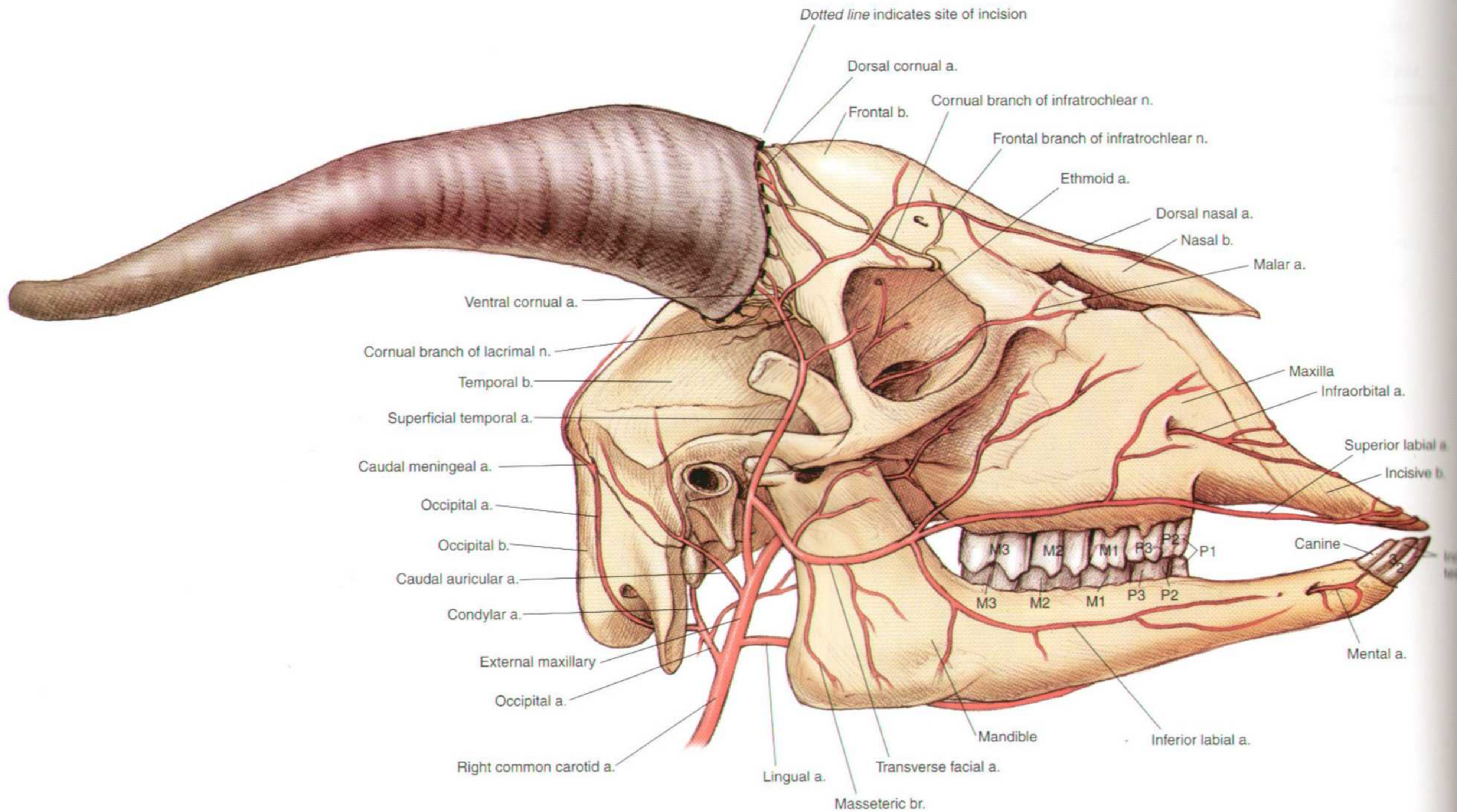
PLATE 4.9 Deep muscles and *in situ* viscera of the buck. Greater omentum is removed. Right lateral view. m = muscle, n = nerve, a = artery, b = bone





**PLATE 4.10** Deep cervical muscles, *in situ* viscera, skeleton, and major joints of the doe.  
 Left lateral view. m = muscle, n = nerve





**PLATE 4.11** Superficial structures of the goat's head. *Dashed line indicates the site of a dehorning incision.*  
a = artery, b = bone, n = nerve, M = molar tooth, P = premolar tooth



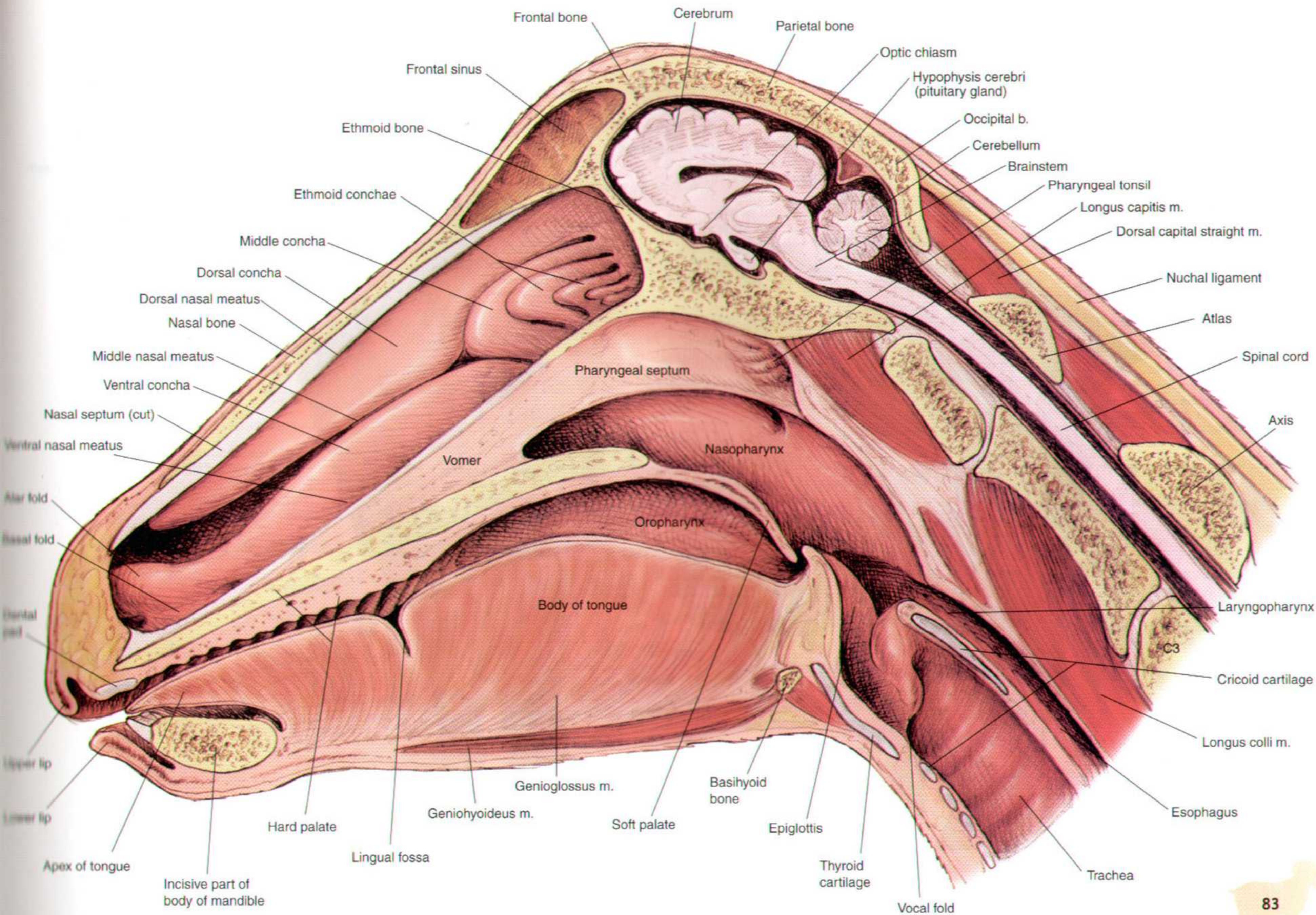
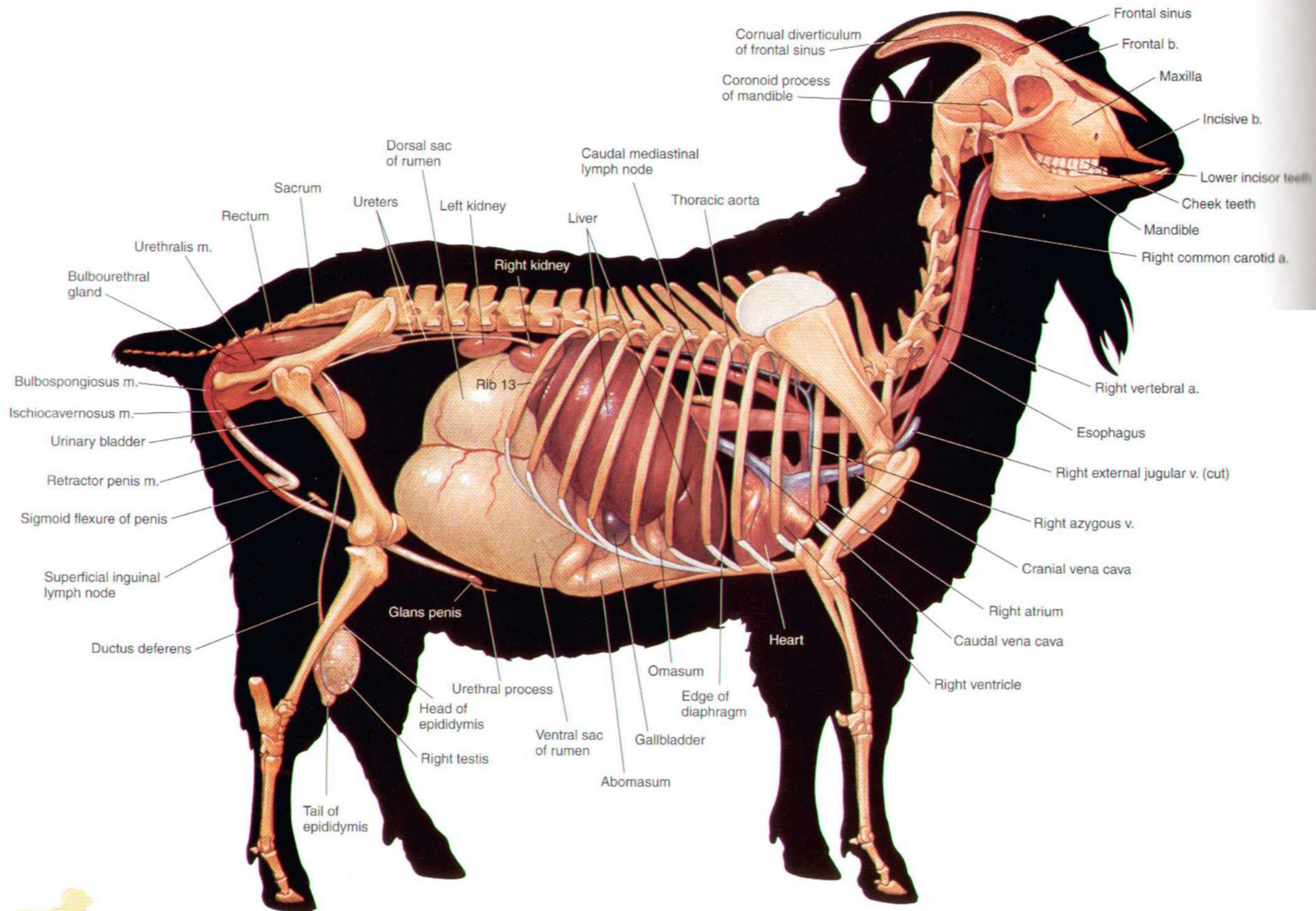


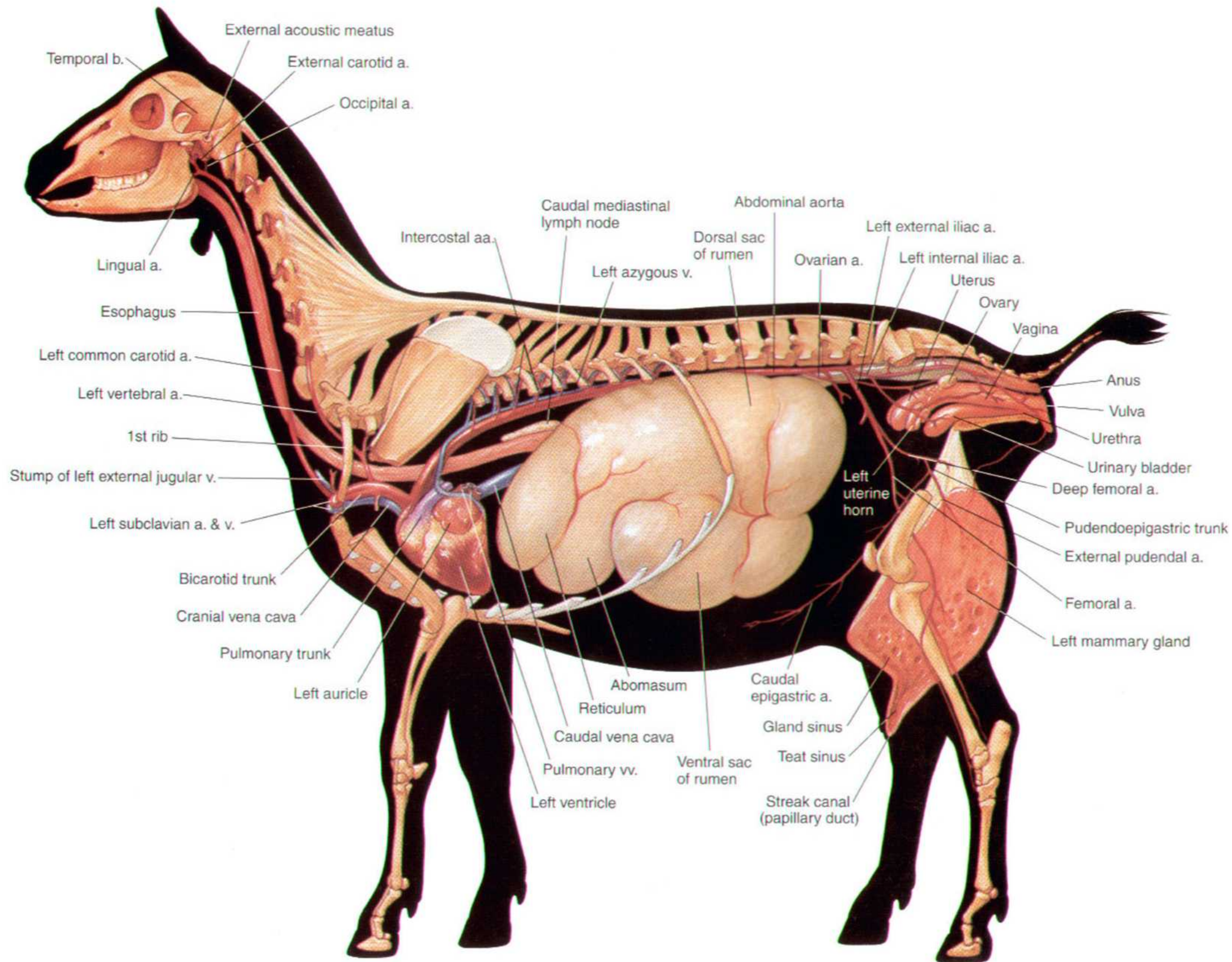
PLATE 4.12 Median section of the caprine head. Most of the nasal septum is removed. m = muscle, b = bone





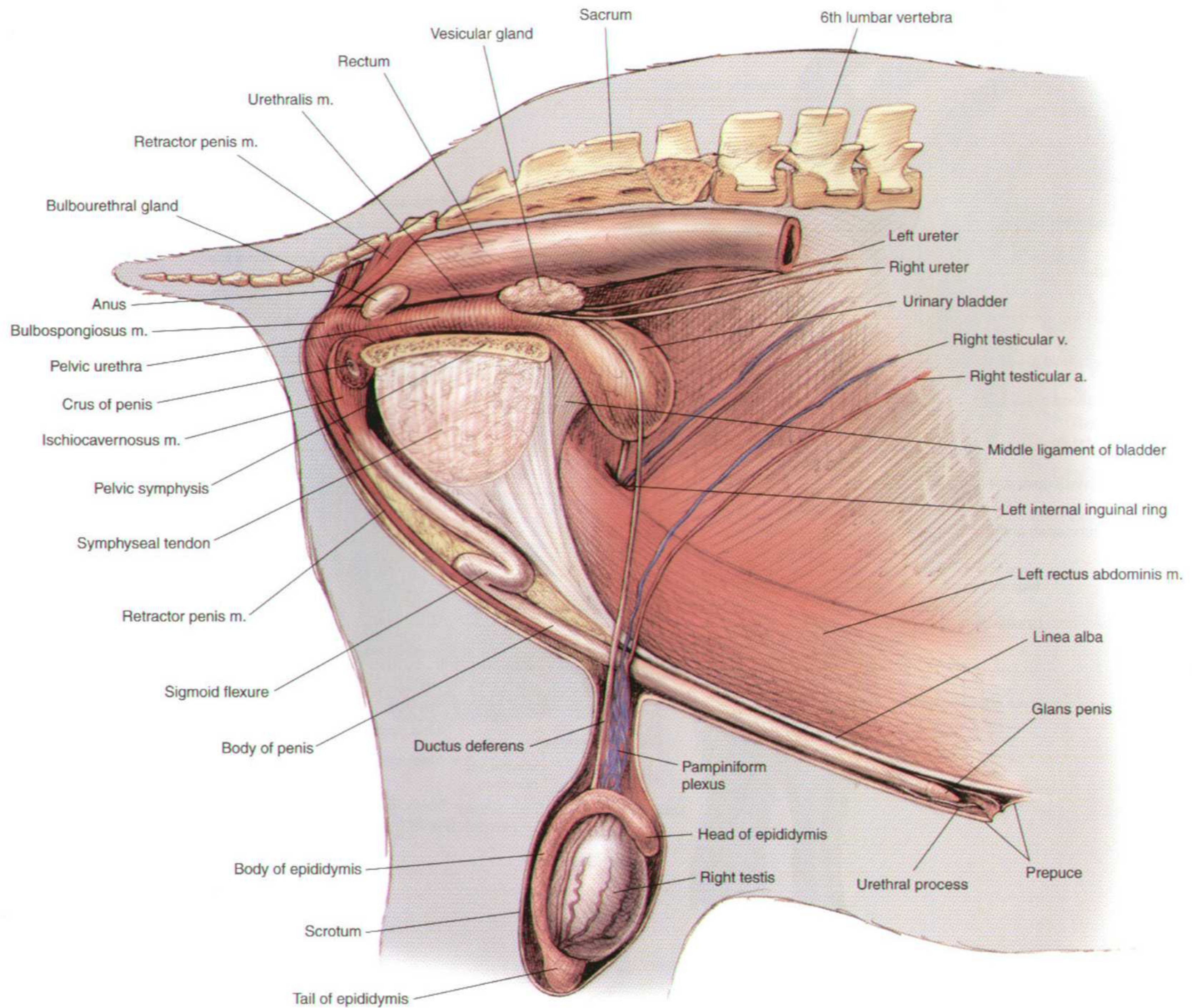
**PLATE 4.13** Reproductive organs, abdominal viscera, heart, and adjacent major vessels related to the skeleton of the buck. Intestines and lungs removed. Right lateral view.  
m = muscle, v = vein, a = artery, b = bone





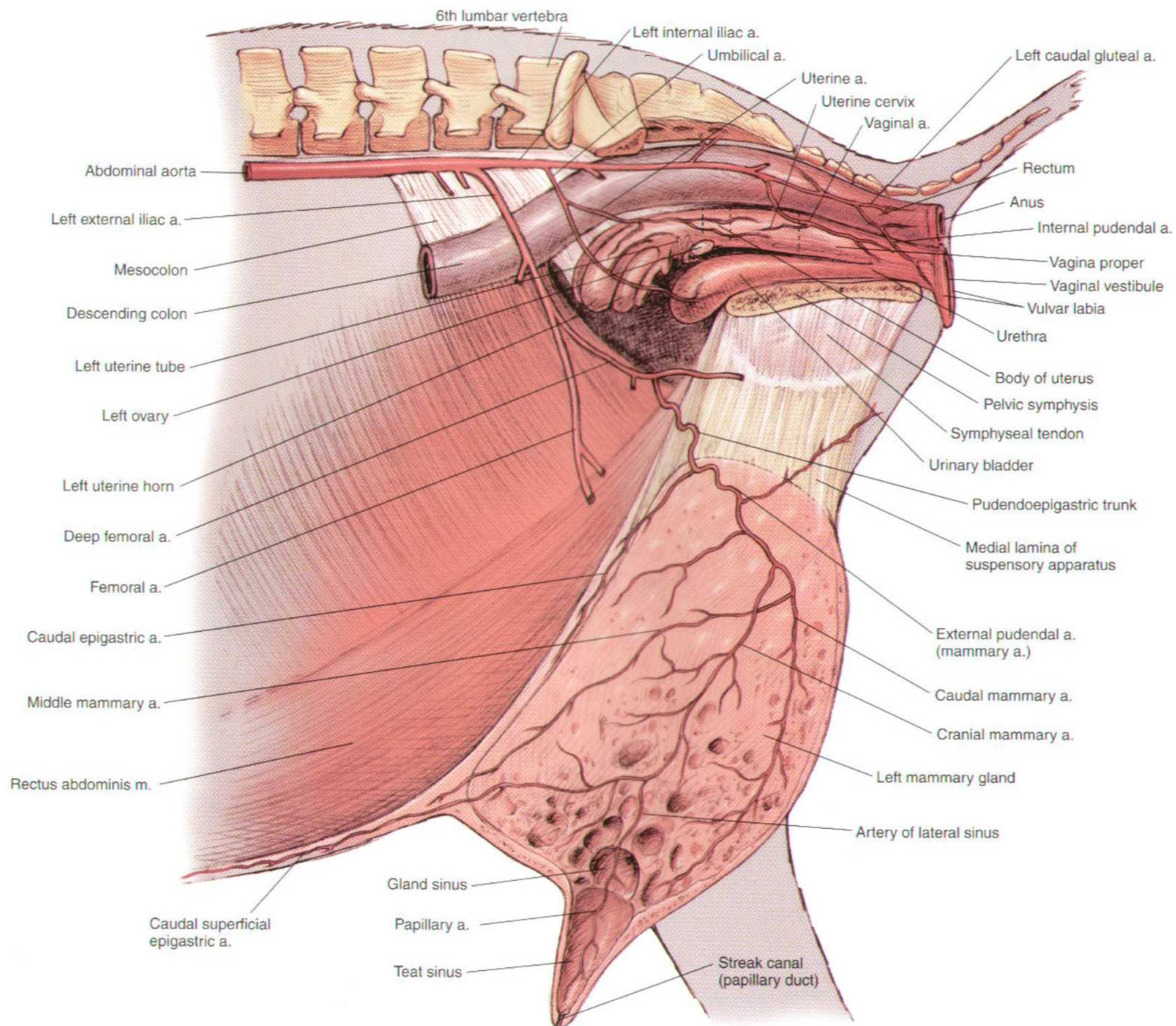
**PLATE 4.14** Reproductive organs, abdominal viscera, heart, and adjacent major vessels of the doe. Ribs 2 and 12 and the lungs and intestines are removed.  
Left lateral view. a = artery, b = bone, v = vein





**PLATE 4.15** Relations of the reproductive organs of the buck. Right pelvic limb and body wall are removed. Right lateral view. a = artery, m = muscle, v = vein





**PLATE 4.16** Relations of the reproductive organs of the doe.  
Median section. a = artery, m = muscle

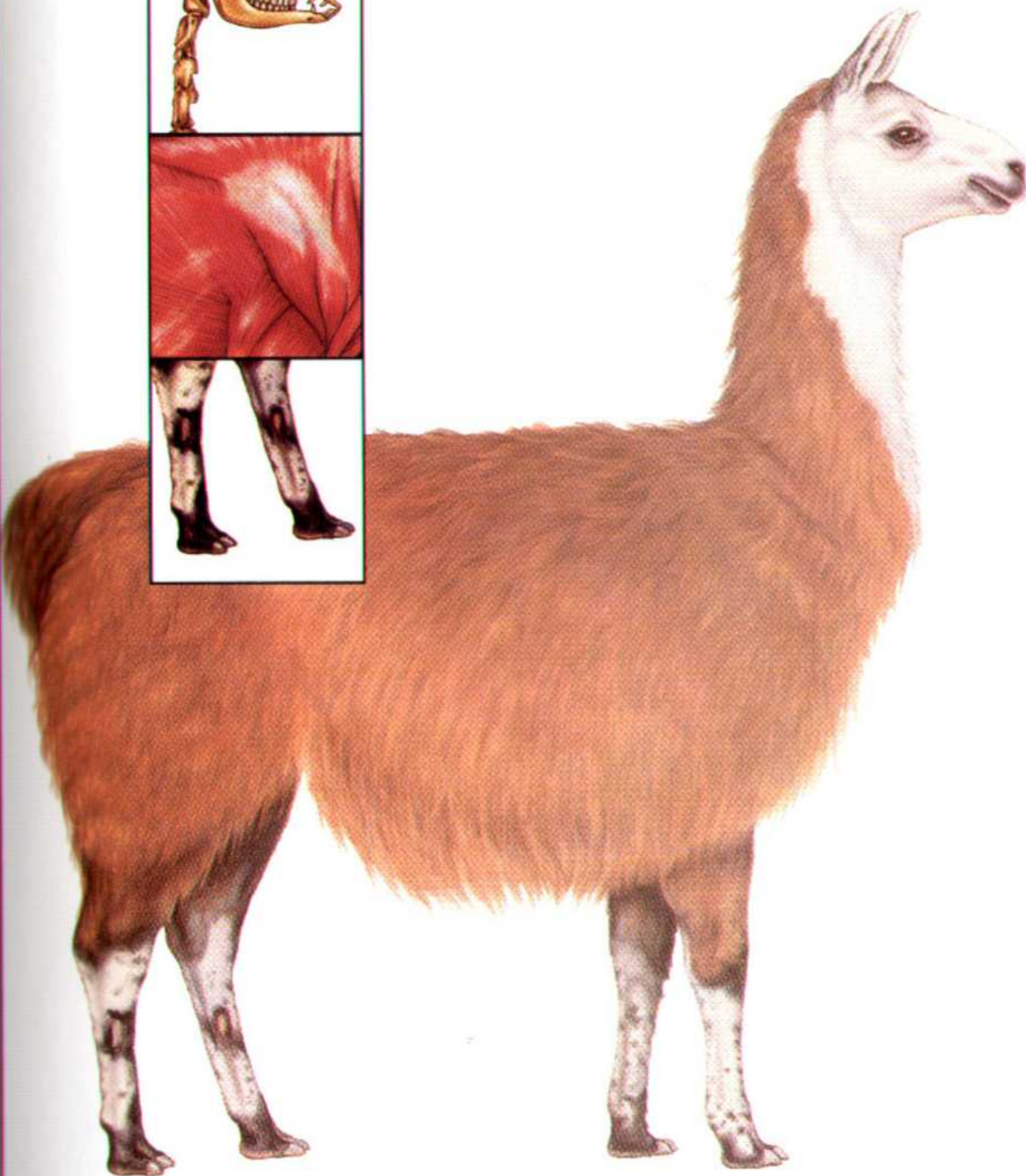


# SECTION 5 THE LLAMA AND ALPACA

(*Lama glama* and *Lama pacos*)

## PLATES

- 5.1 Right lateral view of a male llama.
- 5.2 Left lateral view of a female huacaya alpaca.
- 5.3 Body regions of the llama.
- 5.4 Skeleton of the llama.
- 5.5 Cutaneous muscles and major fasciae of the male llama.
- 5.6 Superficial muscles of the female alpaca.
- 5.7 Deep muscles and *in situ* viscera of the male llama.
- 5.8 Deep cervical muscles, *in situ* viscera, and major joints of the female alpaca.
- 5.9 Major structures of the lamoid left distal metacarpus and digits.
- 5.10 Median section of the llama's head.
- 5.11 Proper and improper placement of a halter on a llama's head.
- 5.12 Relations of the llama's common carotid artery and jugular vein.
- 5.13 Dentition of the male llama.
- 5.14 Isolated stomach and intestines of the male llama.
- 5.15 Reproductive and urinary organs, stomach, liver, heart, and adjacent major vessels related to the skeleton of the male llama.
- 5.16 Reproductive and urinary organs, stomach, heart, and adjacent major vessels of the female alpaca.
- 5.17 Relations of the reproductive organs of the male llama.
- 5.18 Relations of the reproductive organs of the female alpaca.





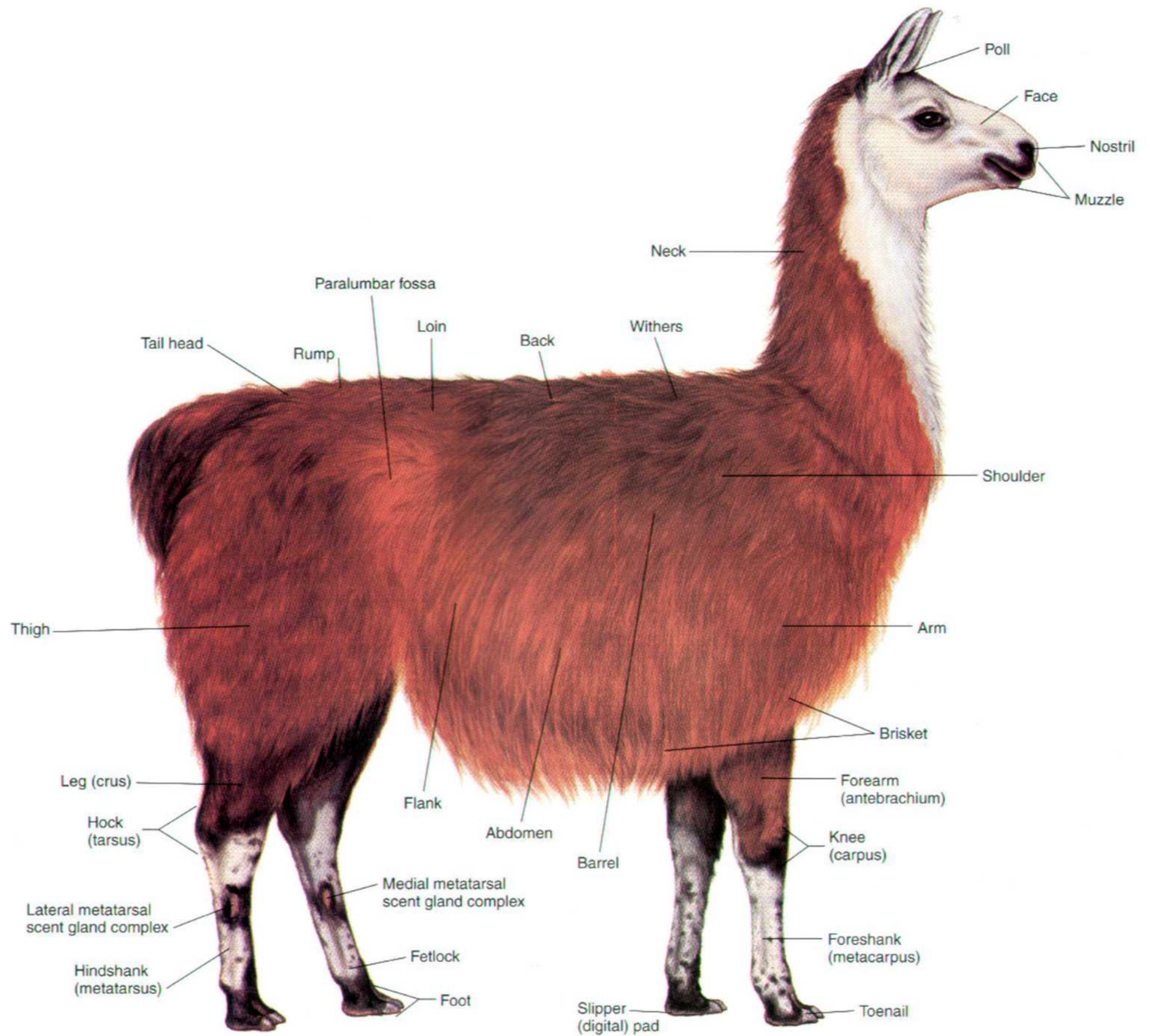


PLATE 5.1 Right lateral view of a male llama.



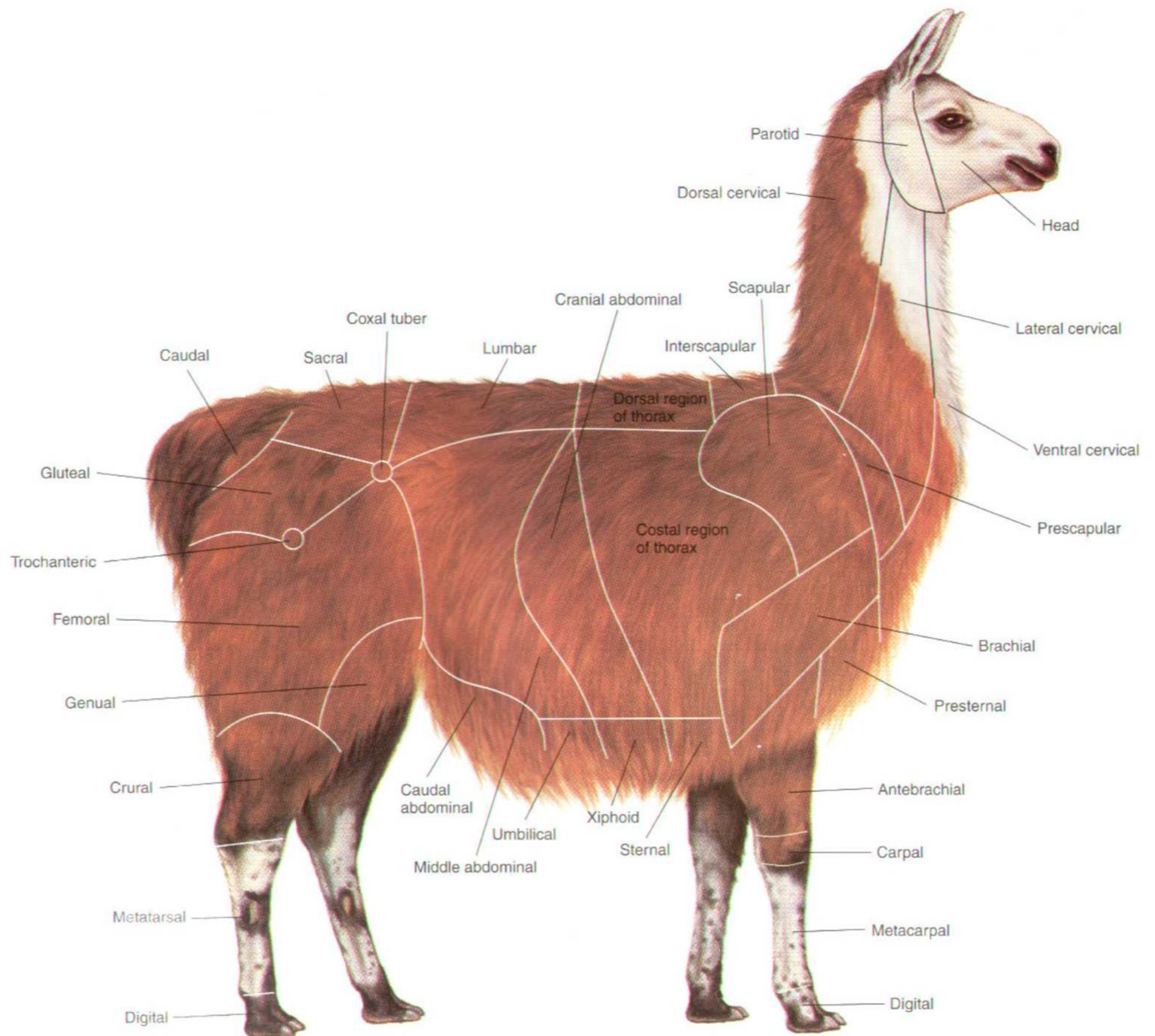
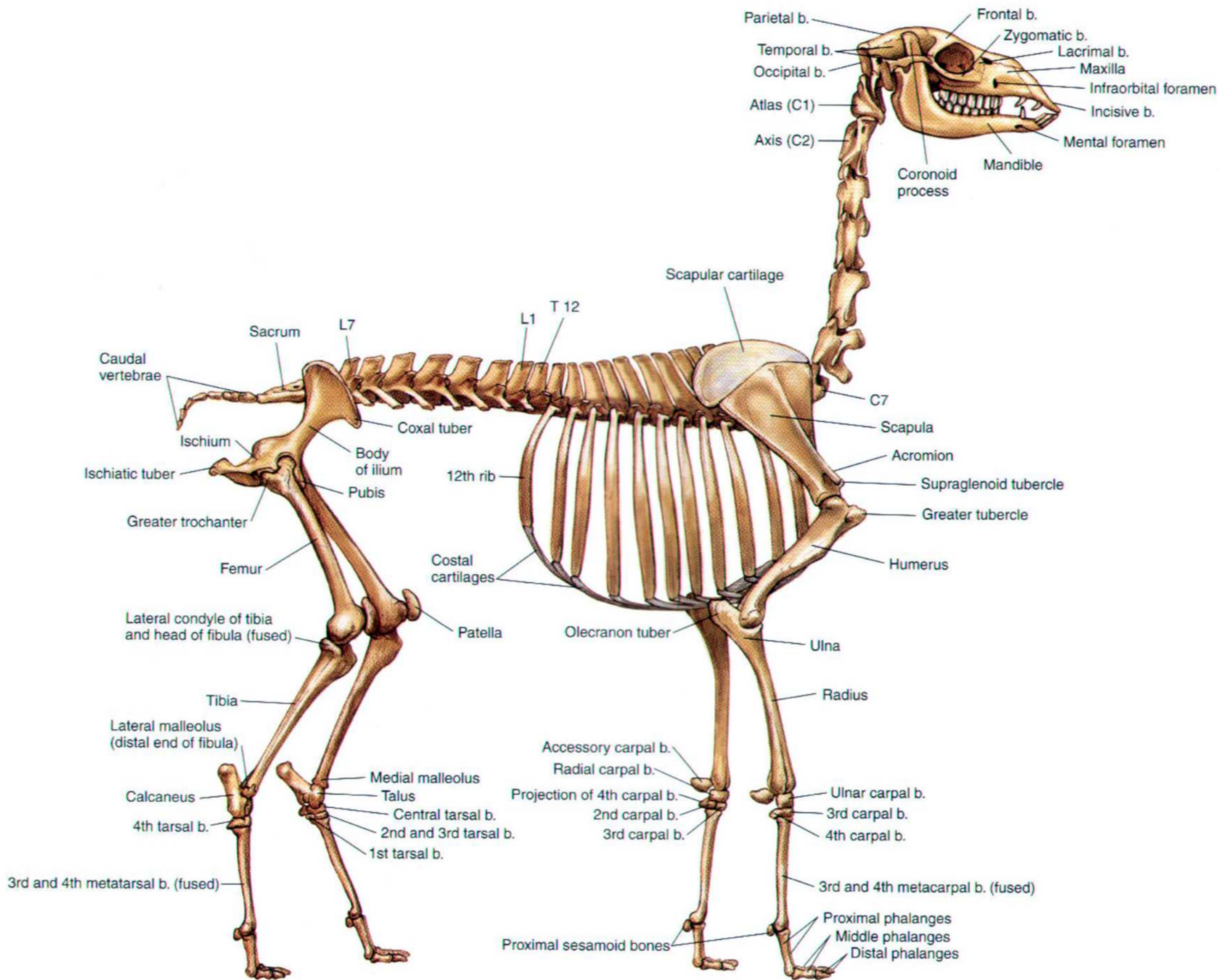


PLATE 5.3 Body regions of the llama.





**PLATE 5.4** Skeleton of the llama. Right lateral view. C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra, b = bone



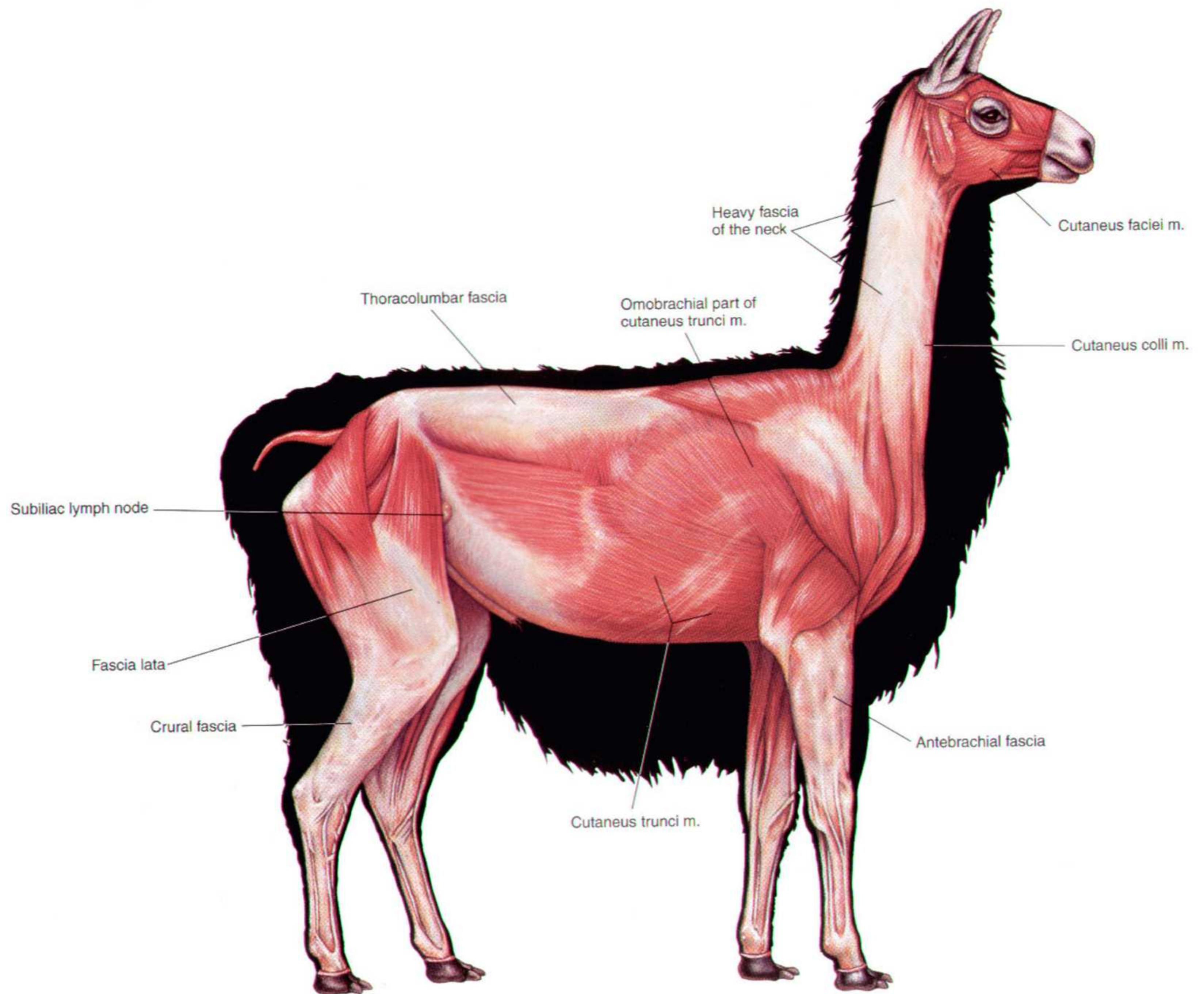


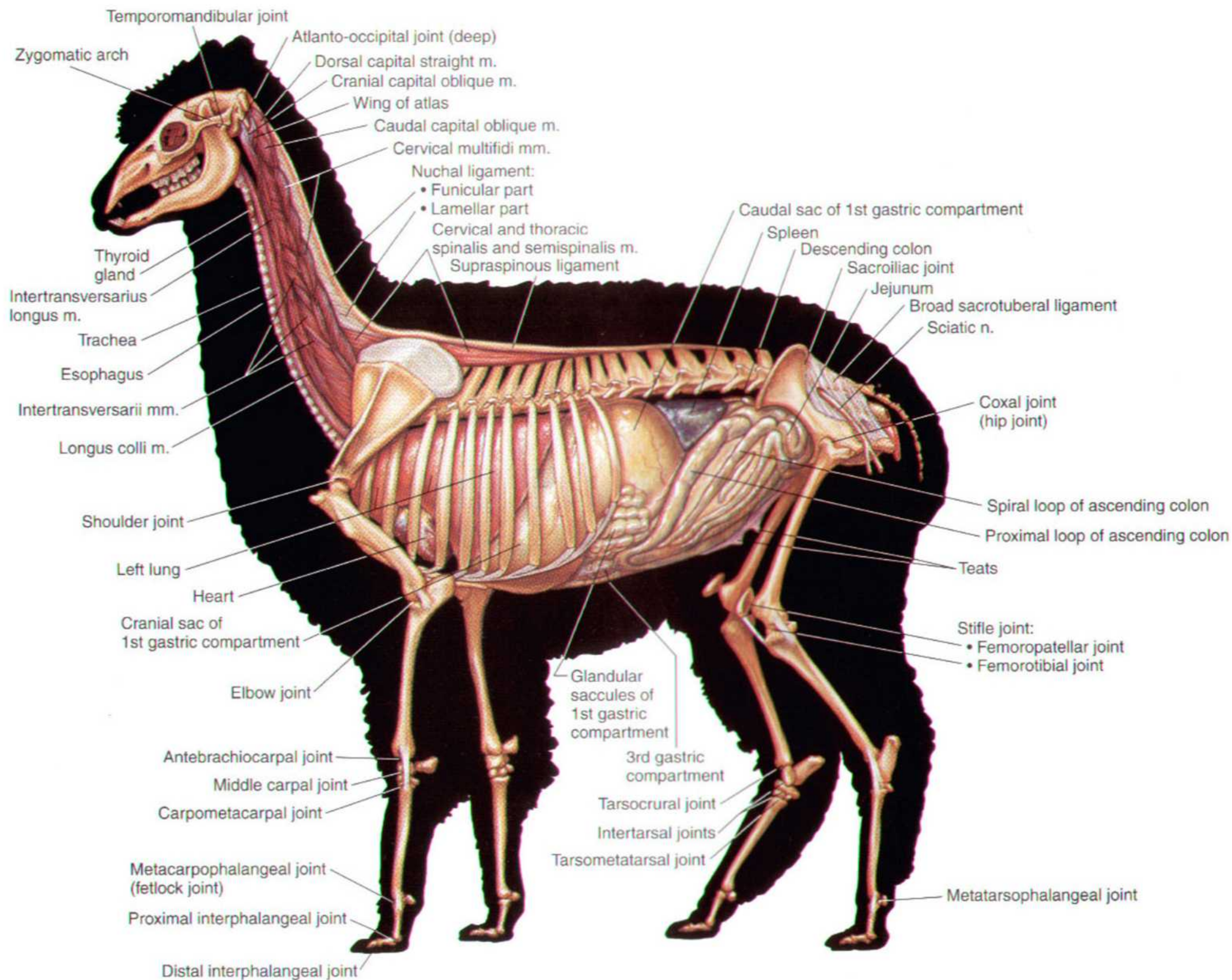
PLATE 5.5 Cutaneous muscles and major fasciae of the male llama.  
Right lateral view. m = muscle





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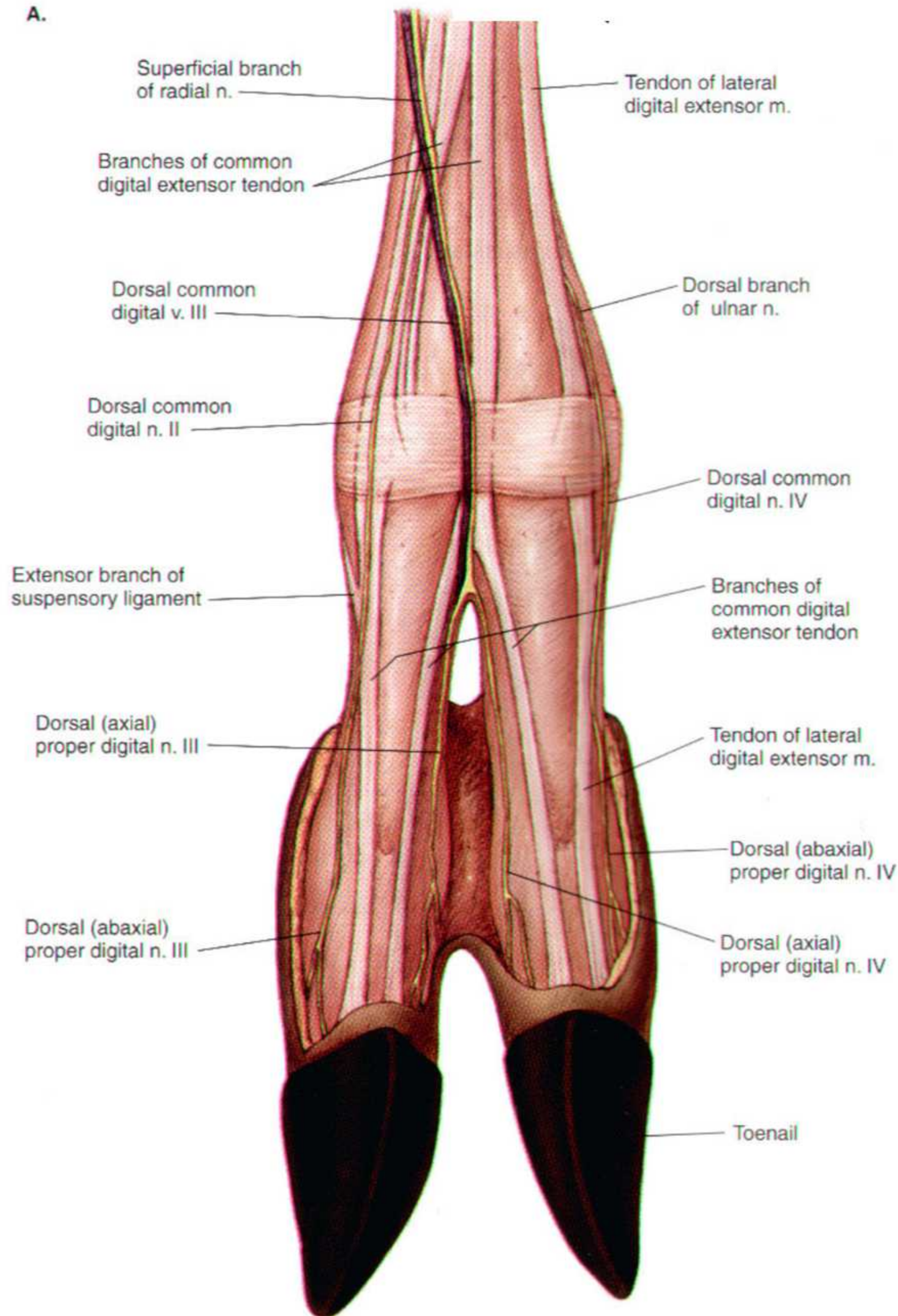




**PLATE 5.8** Deep cervical muscles, *in situ* viscera, and major joints of the female alpaca. The omentum is removed. Left lateral view. m = muscle



A.



B.

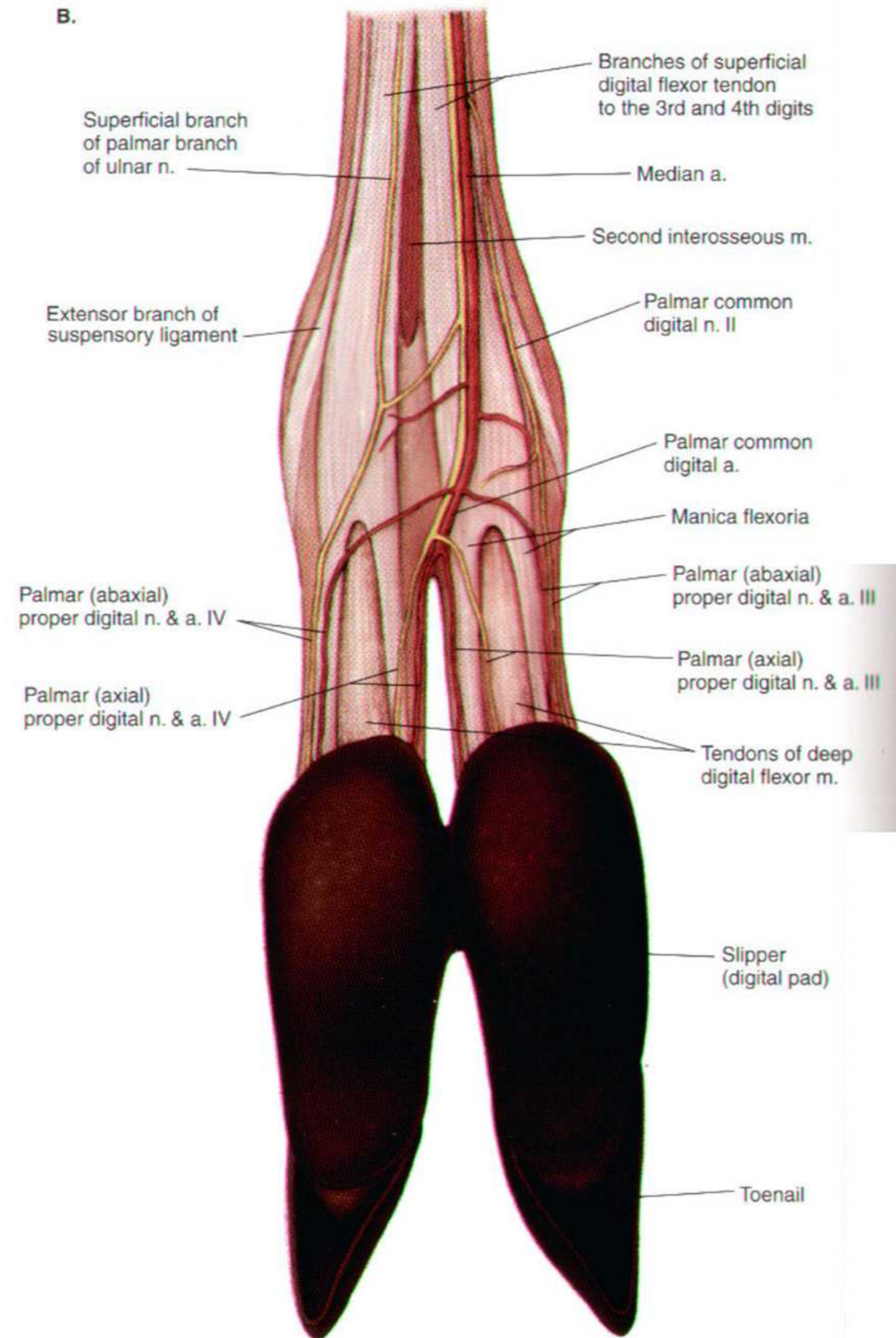
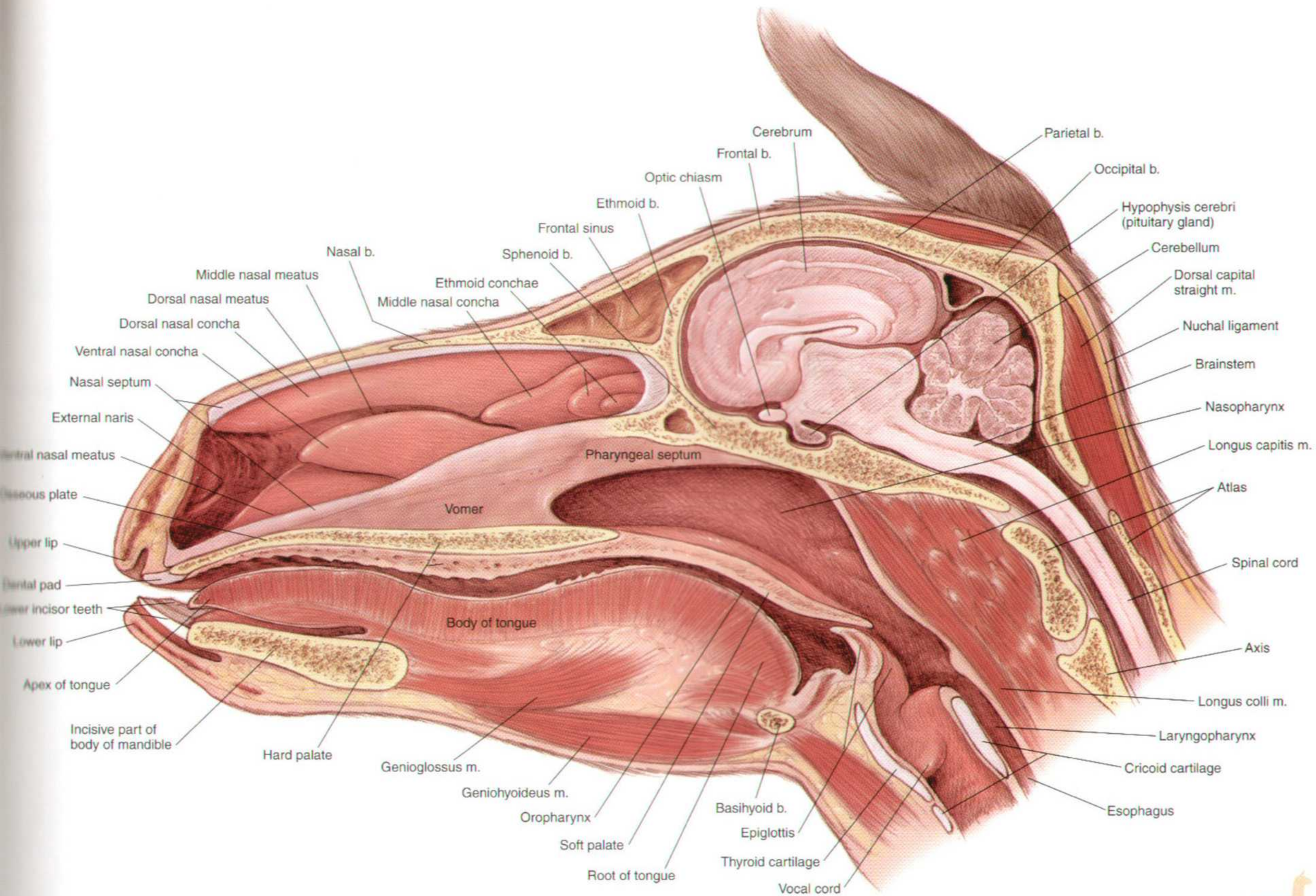


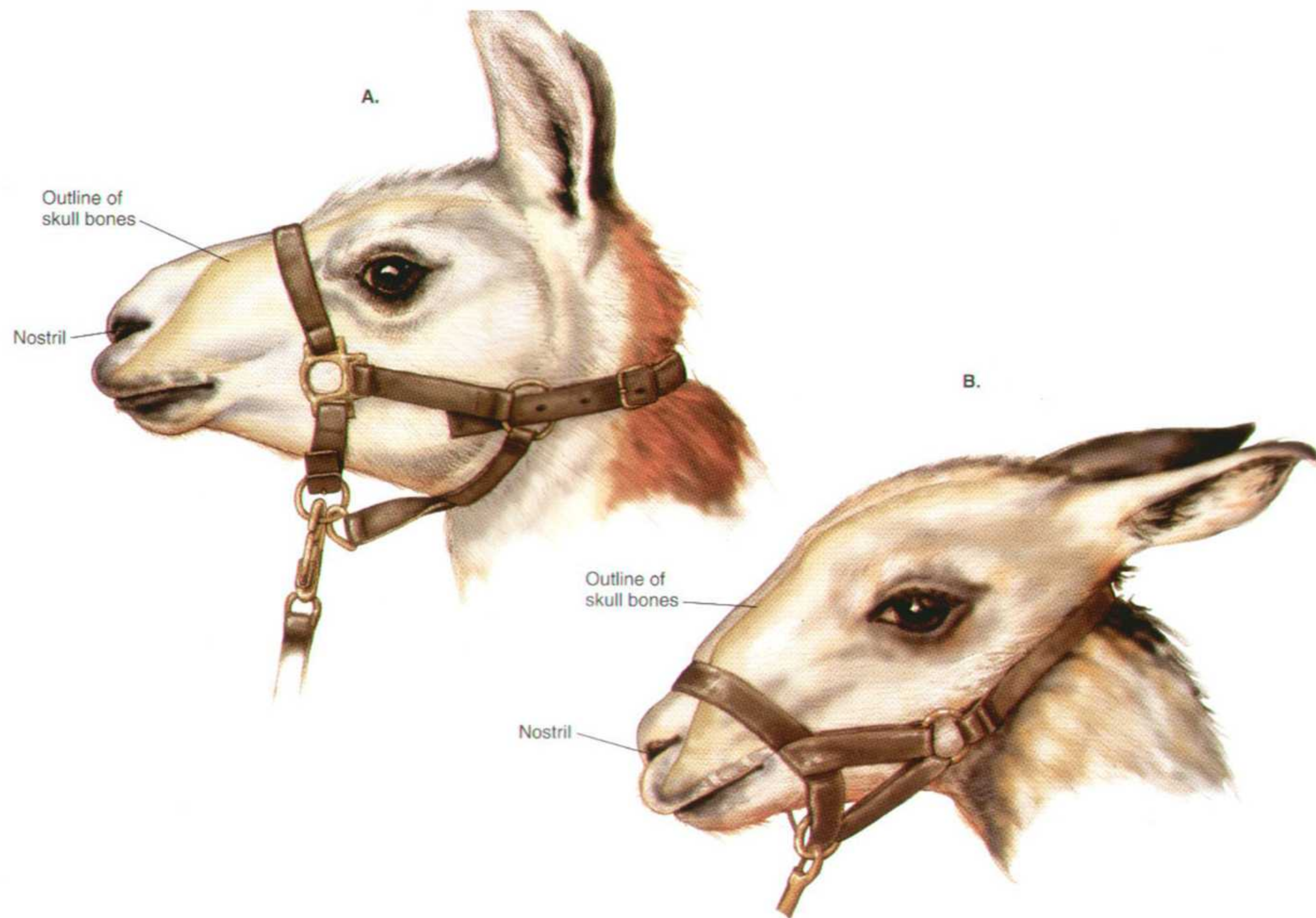
PLATE 5.9 Major structures of the lamoid left distal metacarpus and digits. A. Dorsal view. B. Palmar view. n = nerve, v = vein, m = muscle, a = artery





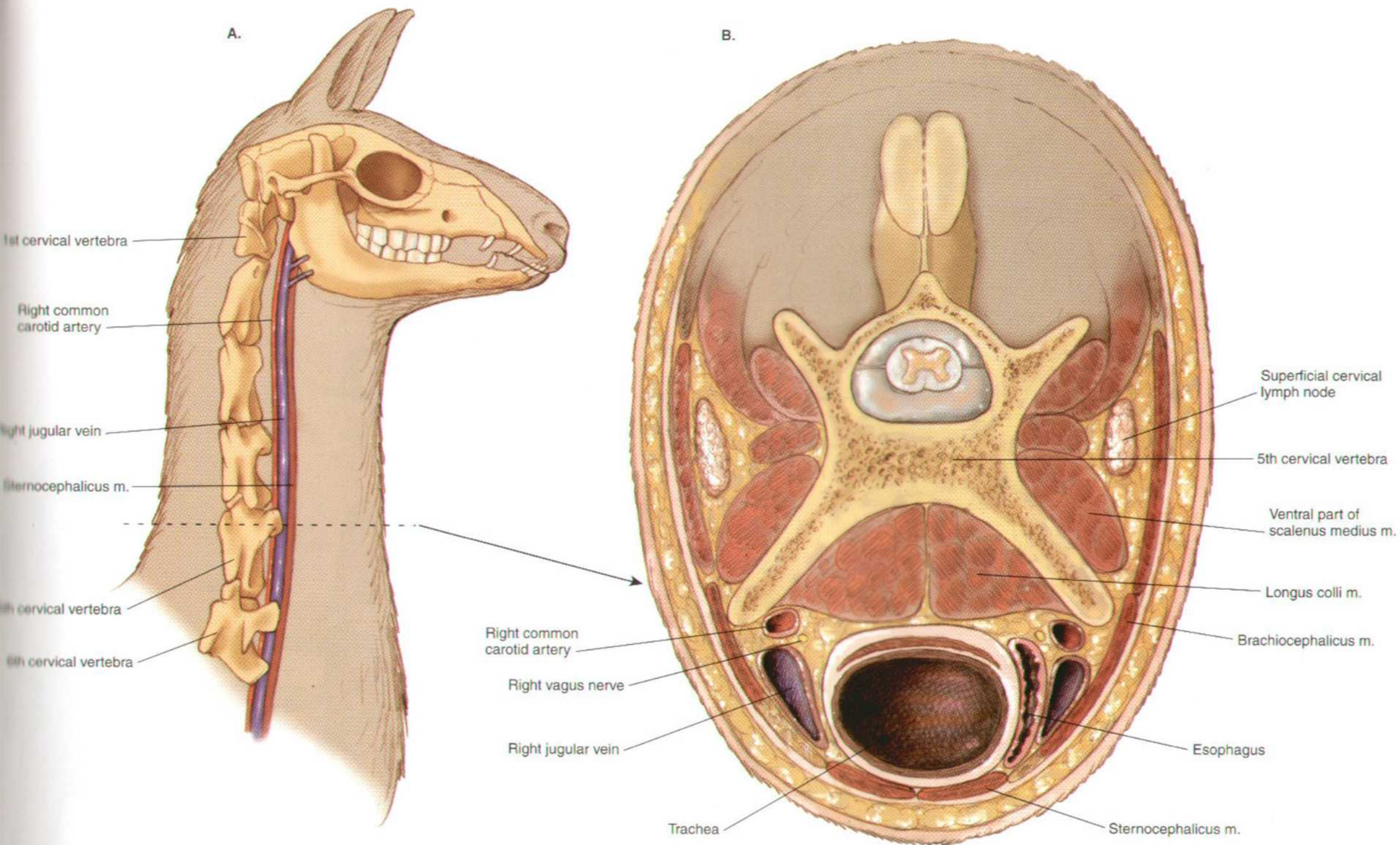
**PLATE 5.10** Median section of the llama's head. Most of the nasal septum is removed. b = bone, m = muscle





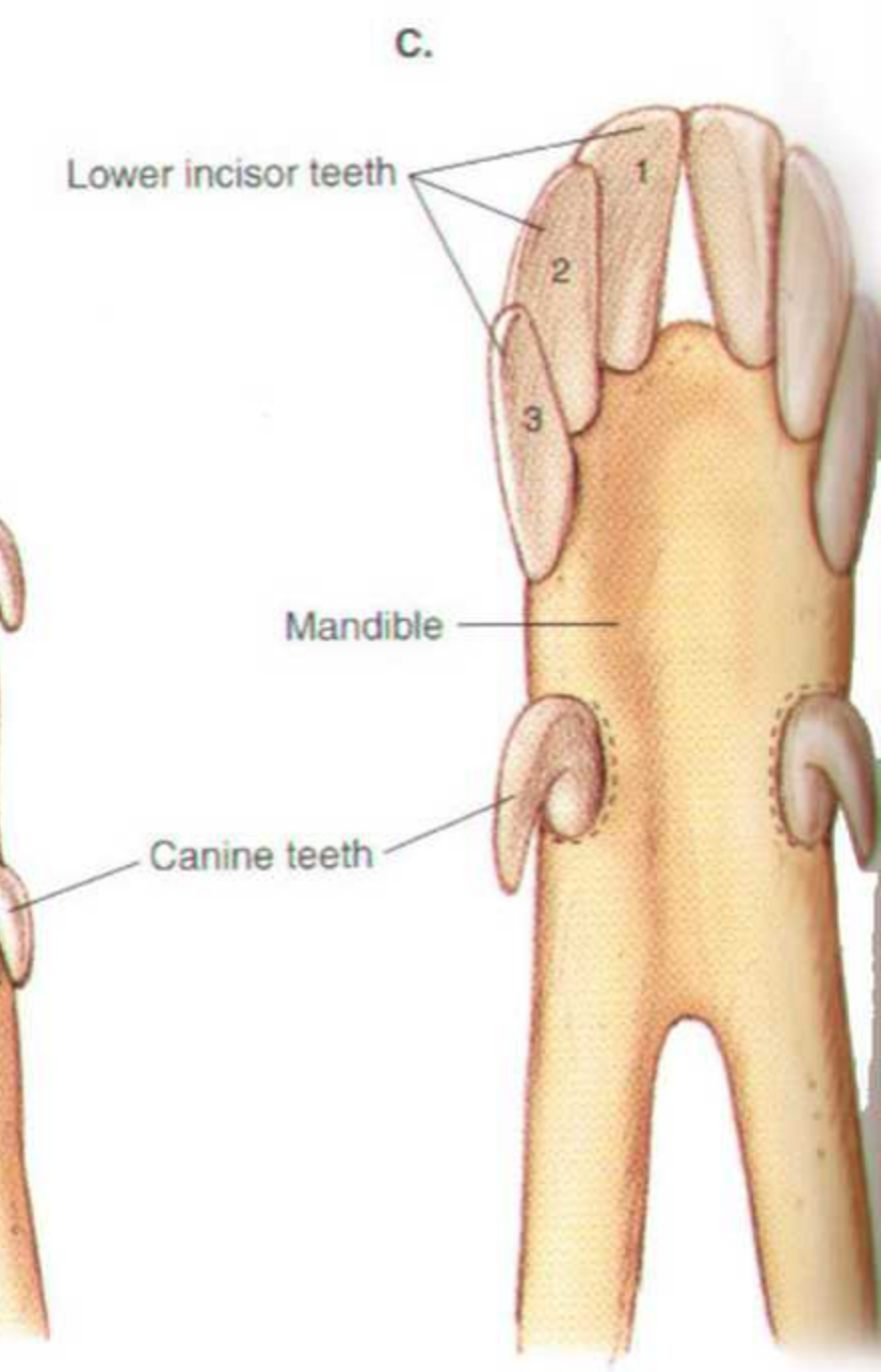
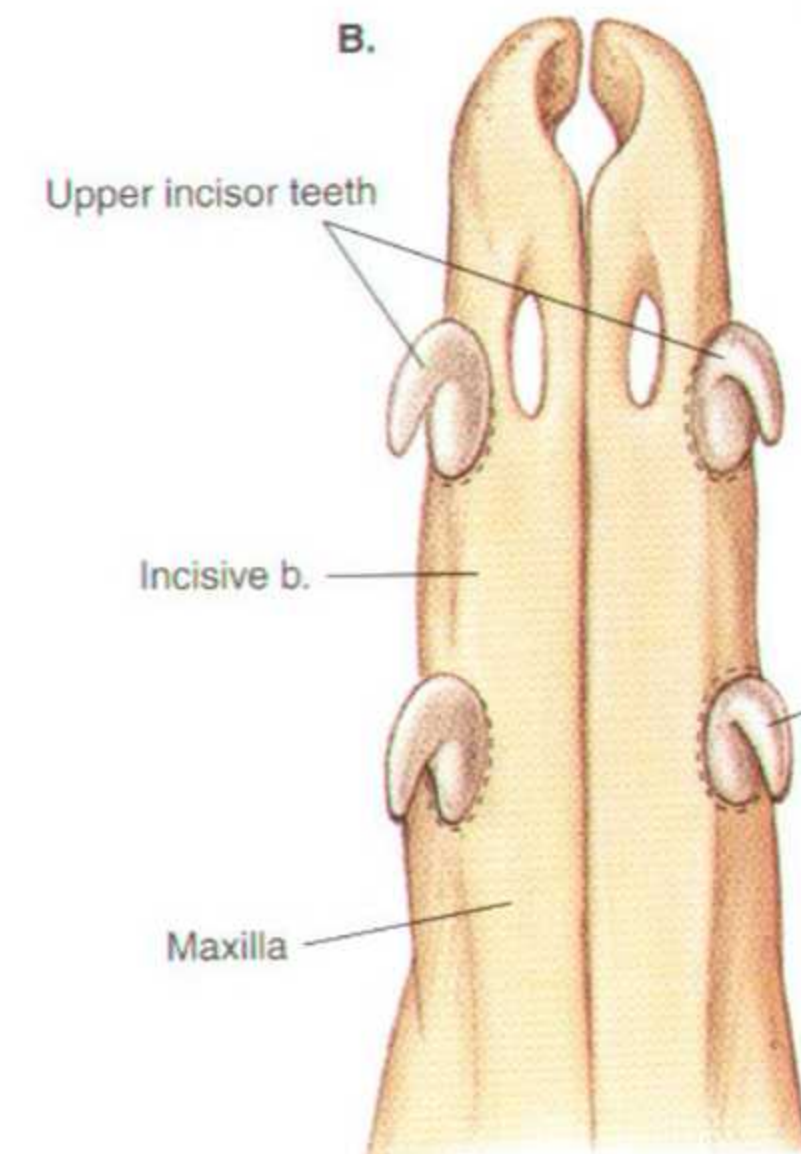
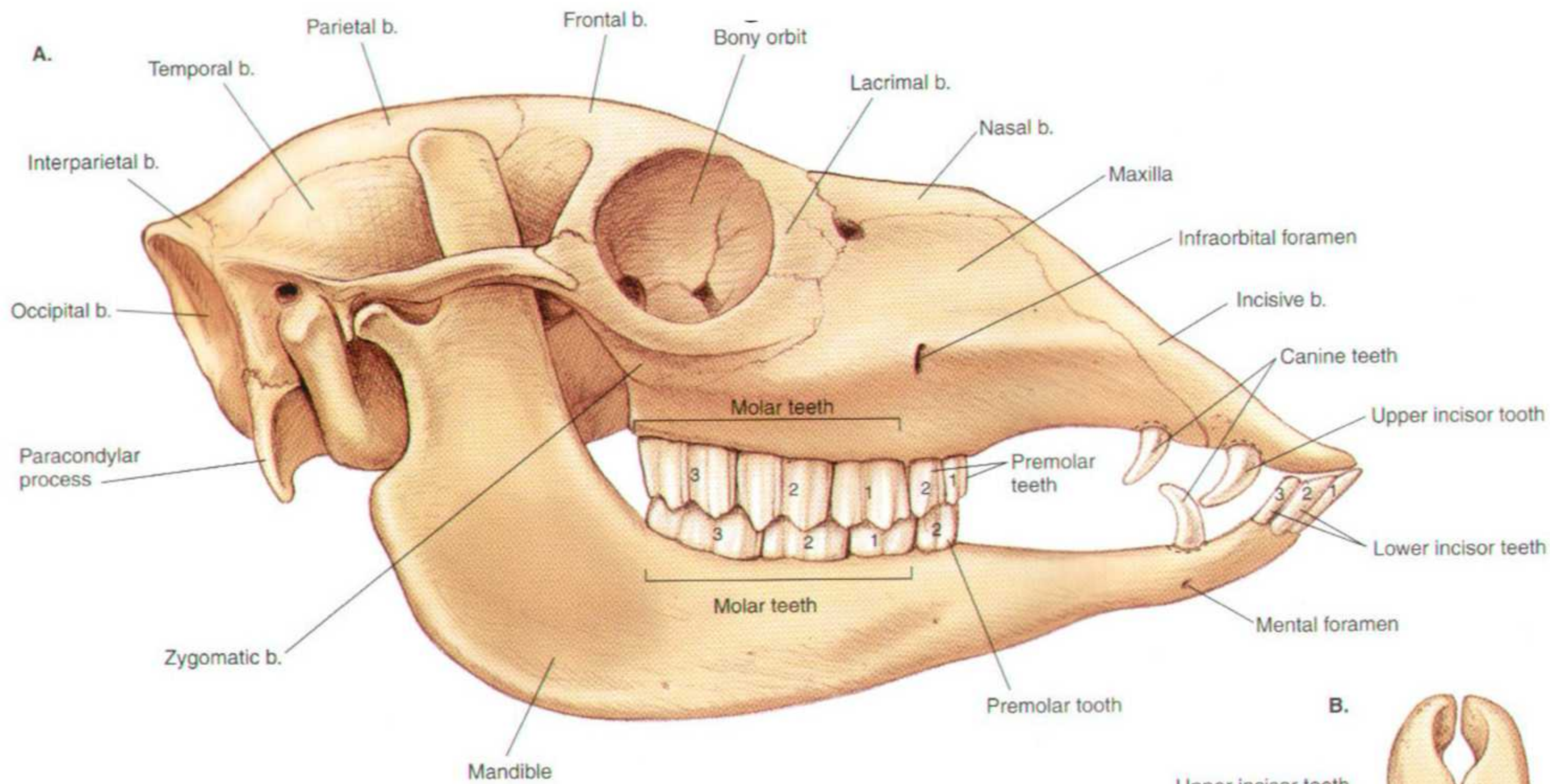
**PLATE 5.11** A. Proper placement of a halter on a llama's head. B. Improper placement of a halter. Pressure on the nostrils interferes with breathing.





**PLATE 5.12** Relations of the llama's common carotid artery and jugular vein. **A.** Right lateral view of the head and neck. **B.** Cross-section through the neck at the level of the 5th cervical vertebra. m = muscle





**PLATE 5.13** Dentition of the male llama. **A.** Right lateral view of the skull and crowns of permanent teeth *in situ*. **B.** Ventral view of the crowns of the upper incisor and canine teeth. **C.** Dorsal view of the crowns of the lower incisor and canine teeth. *Dashed lines* indicate the plane of sectioning (2–3 mm above the gum [gingival] line) for cutting off the crowns of deciduous or erupting permanent canine and upper incisor teeth. b = bone



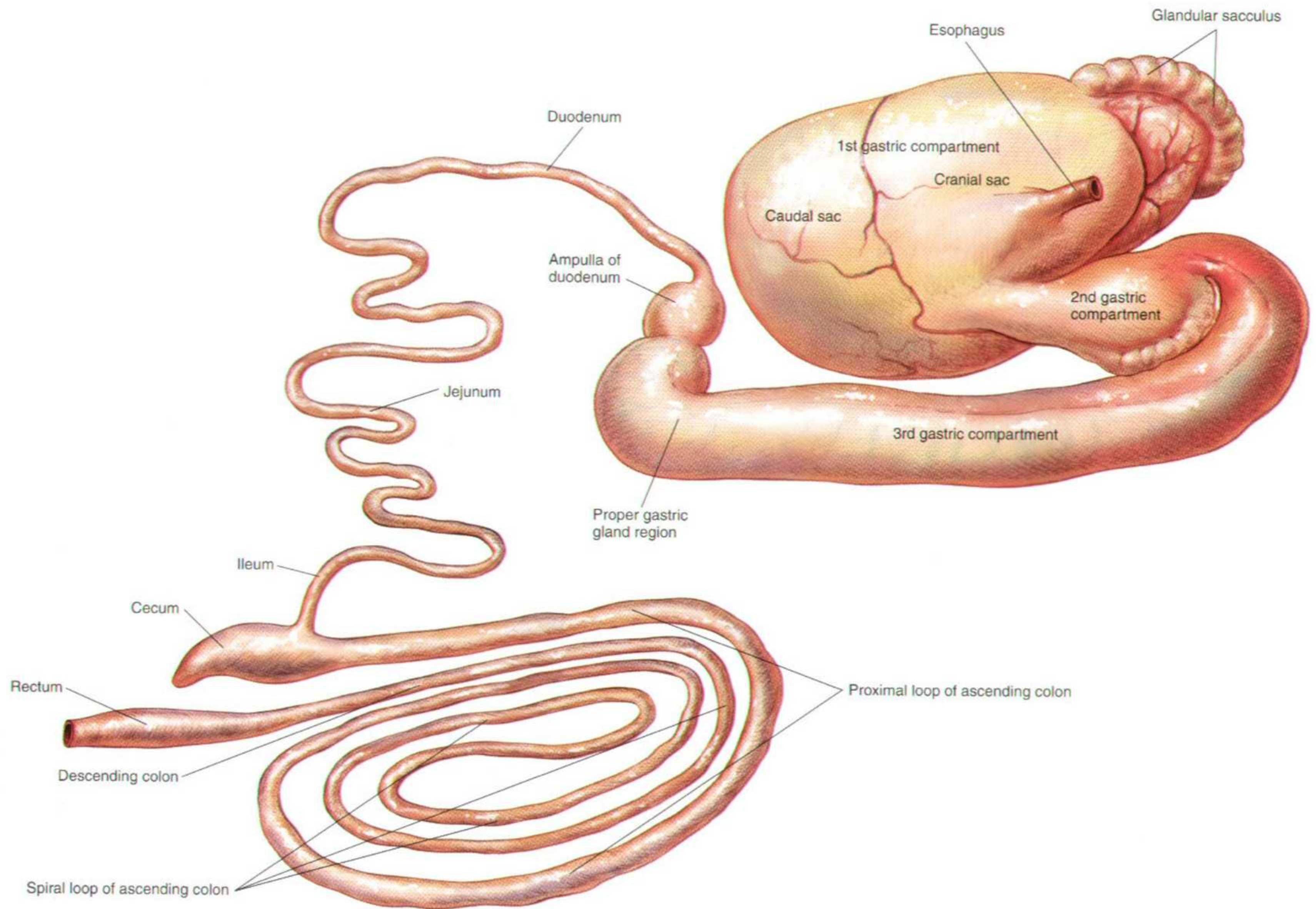
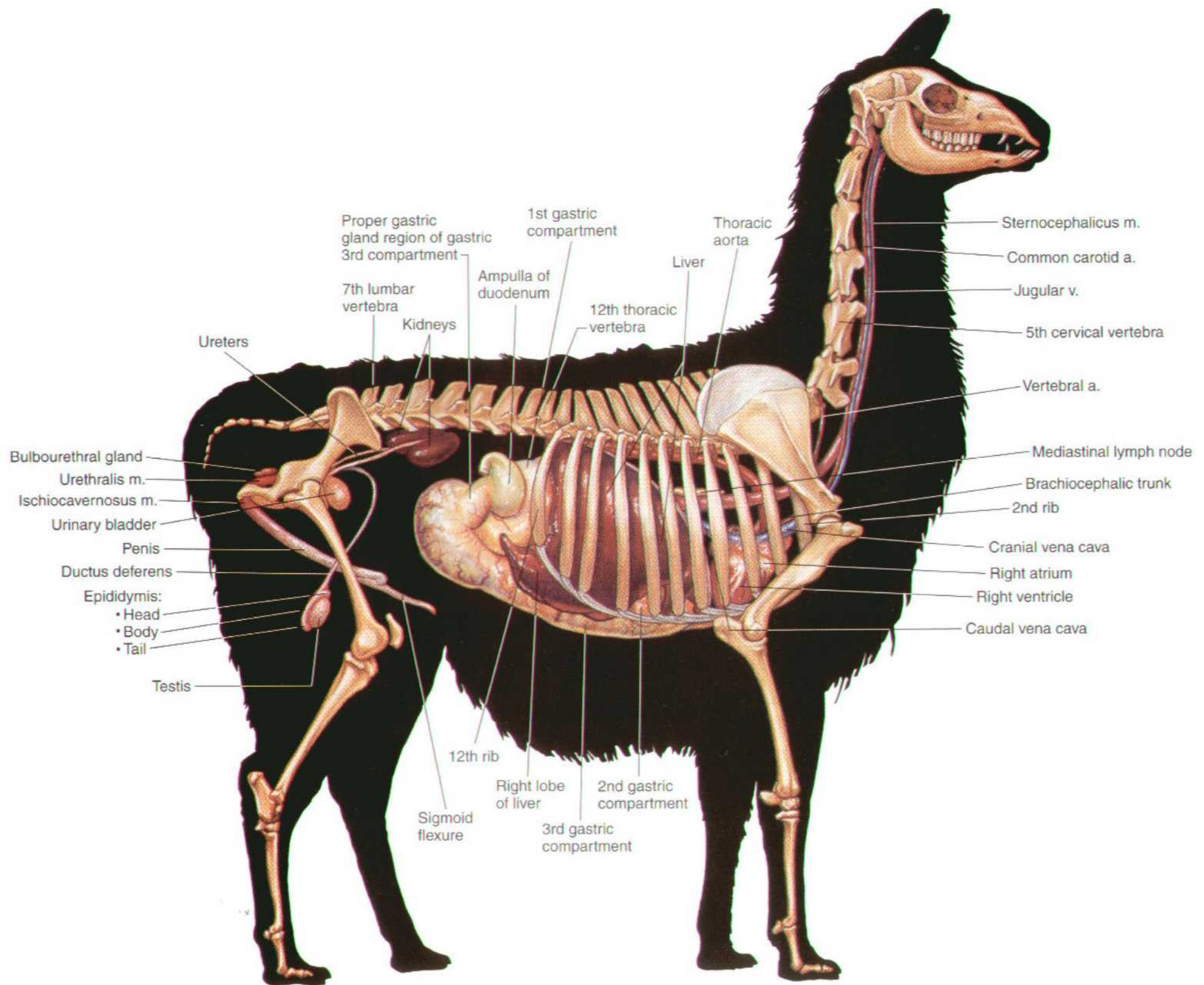


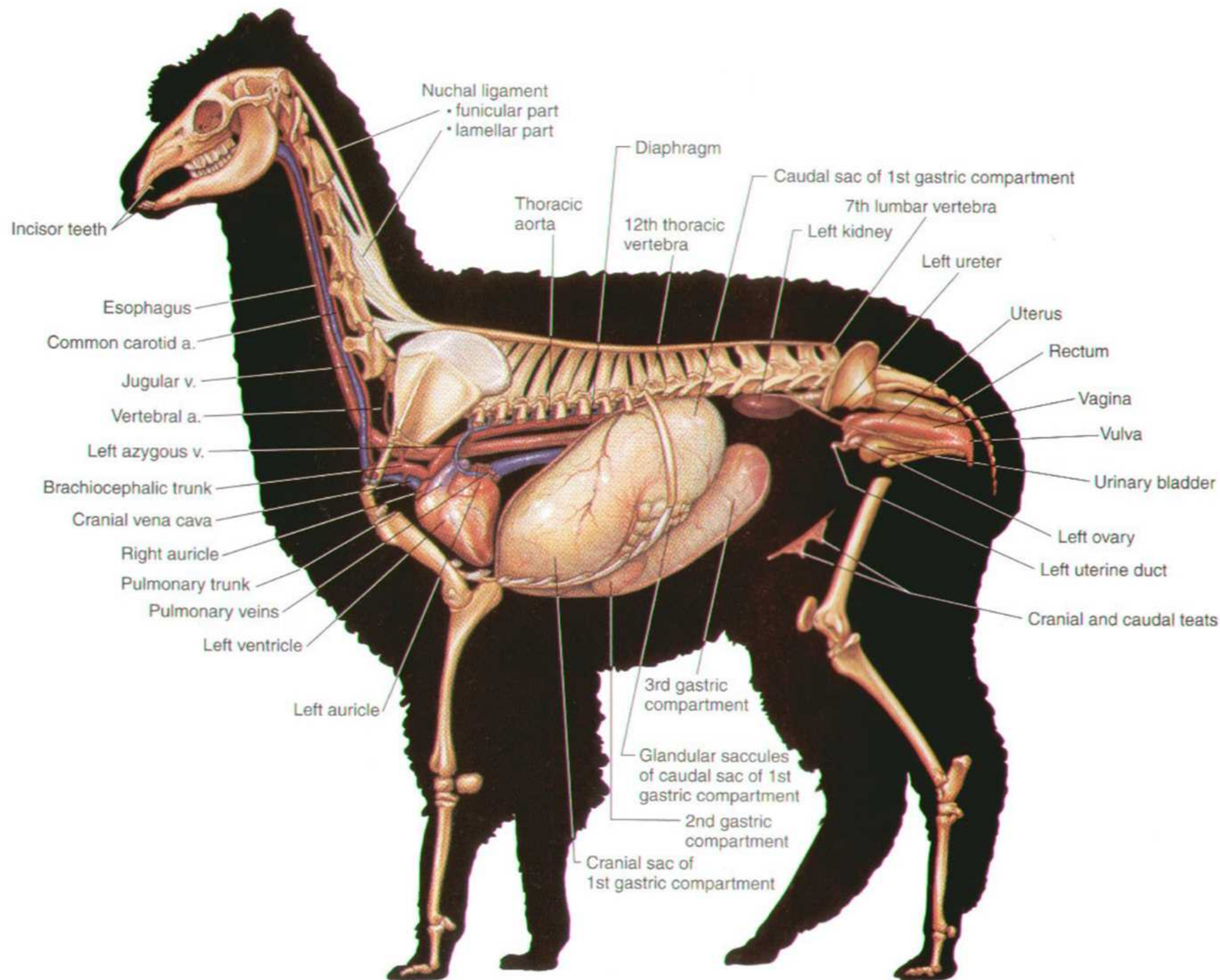
PLATE 5.14 Isolated stomach and intestines of the male llama. Jejunum is shortened.





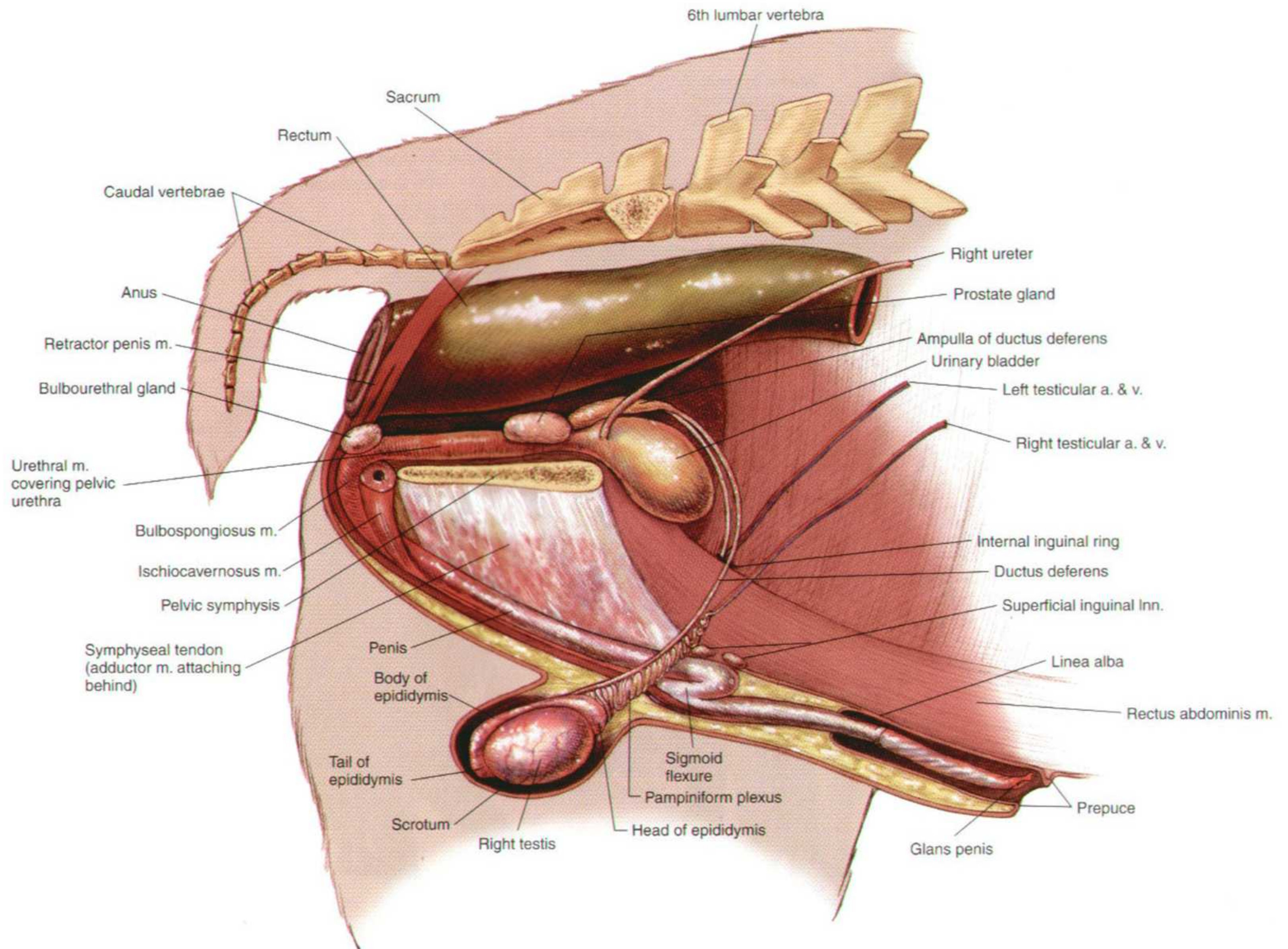
**PLATE 5.15** Reproductive and urinary organs, stomach, liver, heart, and adjacent major vessels related to the skeleton of the male llama. Lungs and intestines are removed.  
Right lateral view. v = vein, a = artery, m = muscle





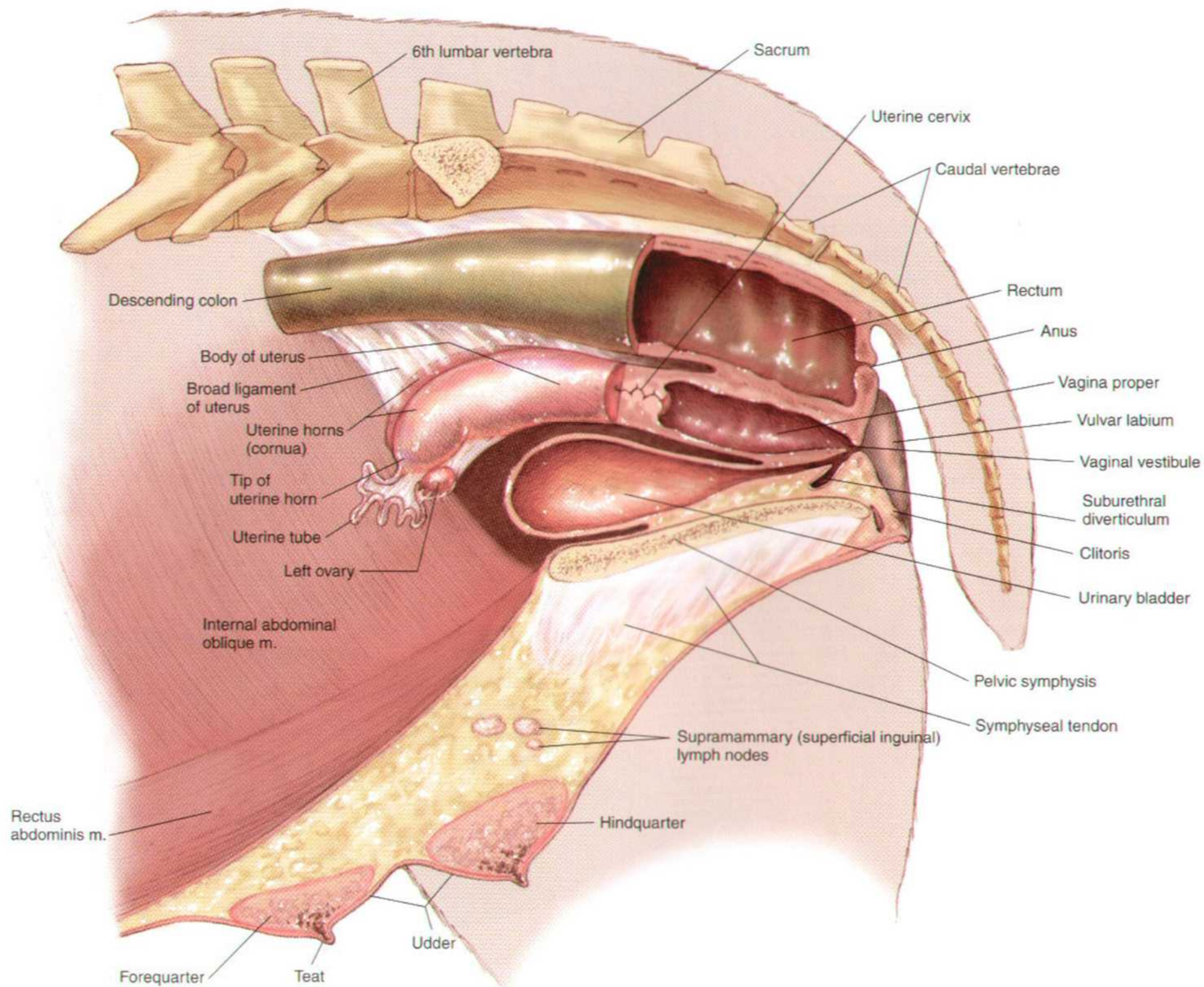
**PLATE 5.16** Reproductive and urinary organs, stomach, heart, and adjacent major vessels of the female alpaca. Lungs and intestines are removed. Left lateral view. a = artery, v = vein





**PLATE 5.17** Relations of the reproductive organs of the male llama. Right lateral view.  
m = muscle, Inn = lymph nodes, v = vein, a = artery





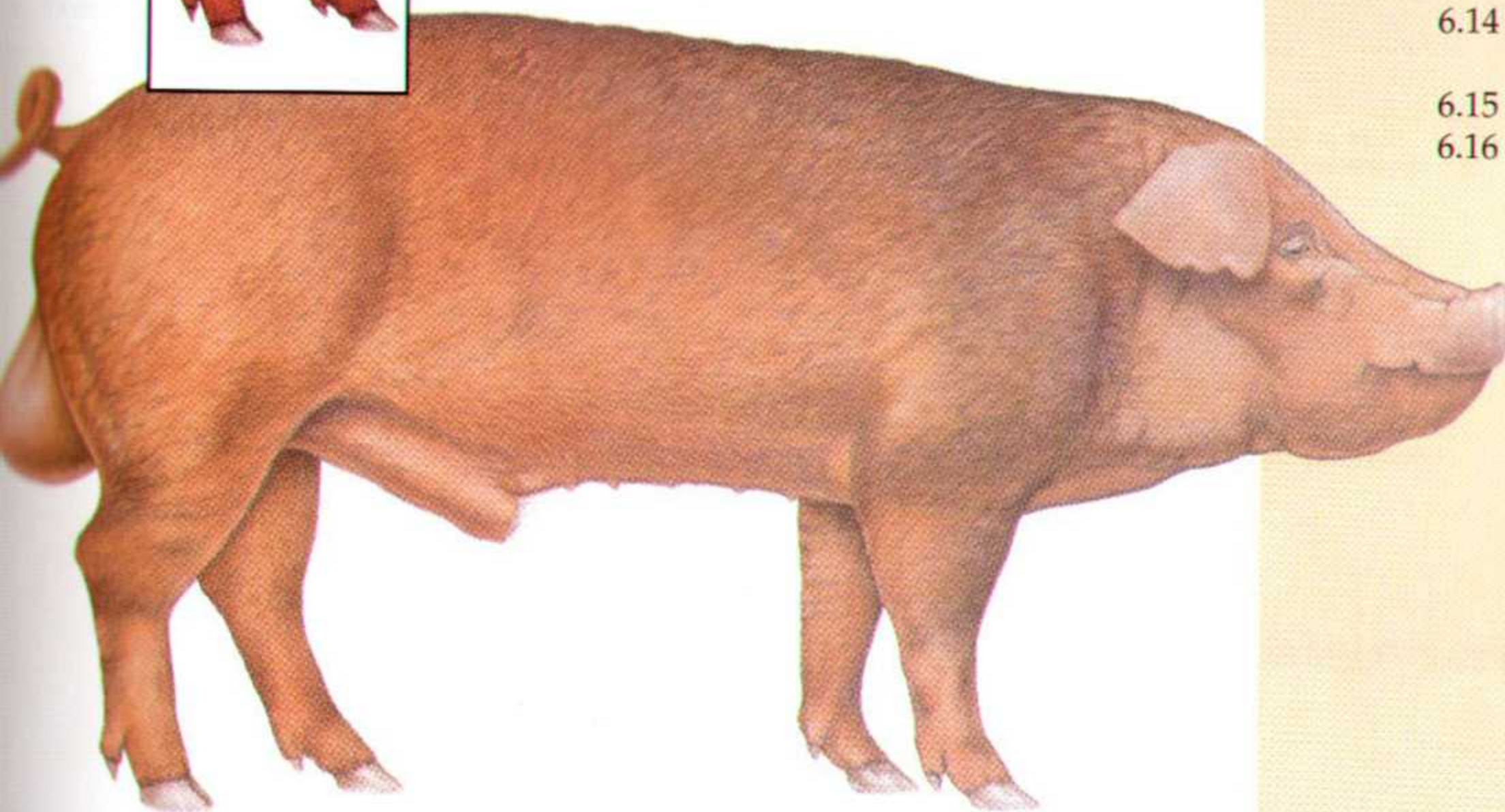
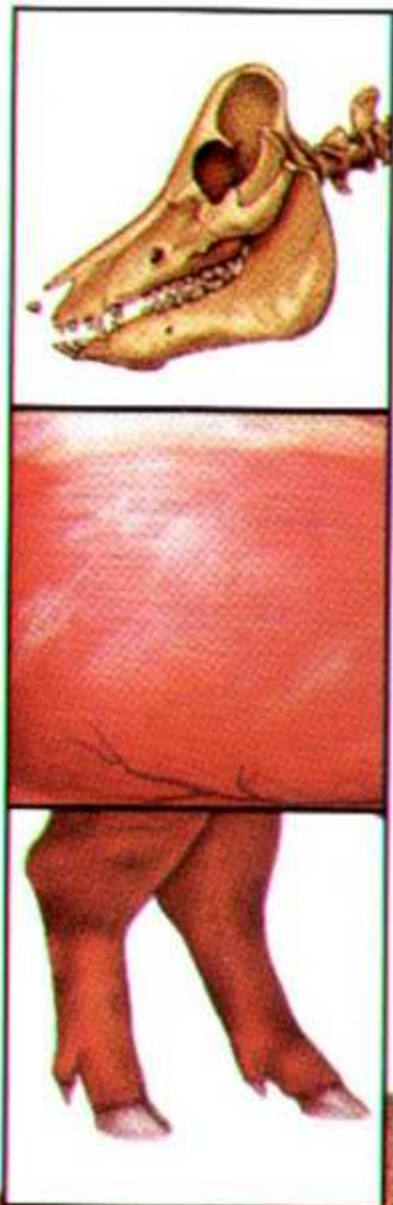
**PLATE 5.18** Relations of the reproductive organs of the female alpaca.  
Partial median section. Left lateral view. m = muscle



# SECTION 6 THE SWINE (*Sus scrofa domesticus*)

## P L A T E S

- 6.1 Right lateral view of a boar.
- 6.2 Left lateral view of a sow.
- 6.3 Carcass cuts of the hog.
- 6.4 Skeleton of the swine.
- 6.5 Cutaneous and superficial muscles of the boar.
- 6.6 Superficial muscles of the sow.
- 6.7 Deep muscles and *in situ* viscera of the boar.
- 6.8 Deep cervical muscles, major joints, and *in situ* viscera of the sow.
- 6.9 Median section of the porcine head.
- 6.10 A. Permanent dentition of the boar.  
B. Cutting the deciduous incisor and canine teeth of a piglet.
- 6.11 Isolated stomach and intestines of the swine.
- 6.12 Lymph nodes and vessels of the sow.
- 6.13 Reproductive and urinary organs, stomach, liver, heart, and adjacent major vessels related to the skeleton of the boar.
- 6.14 Reproductive and urinary organs, abdominal viscera, spleen, heart, and adjacent major vessels of the sow.
- 6.15 Relations of the reproductive organs of the boar.
- 6.16 Relations of the reproductive organs of the sow.





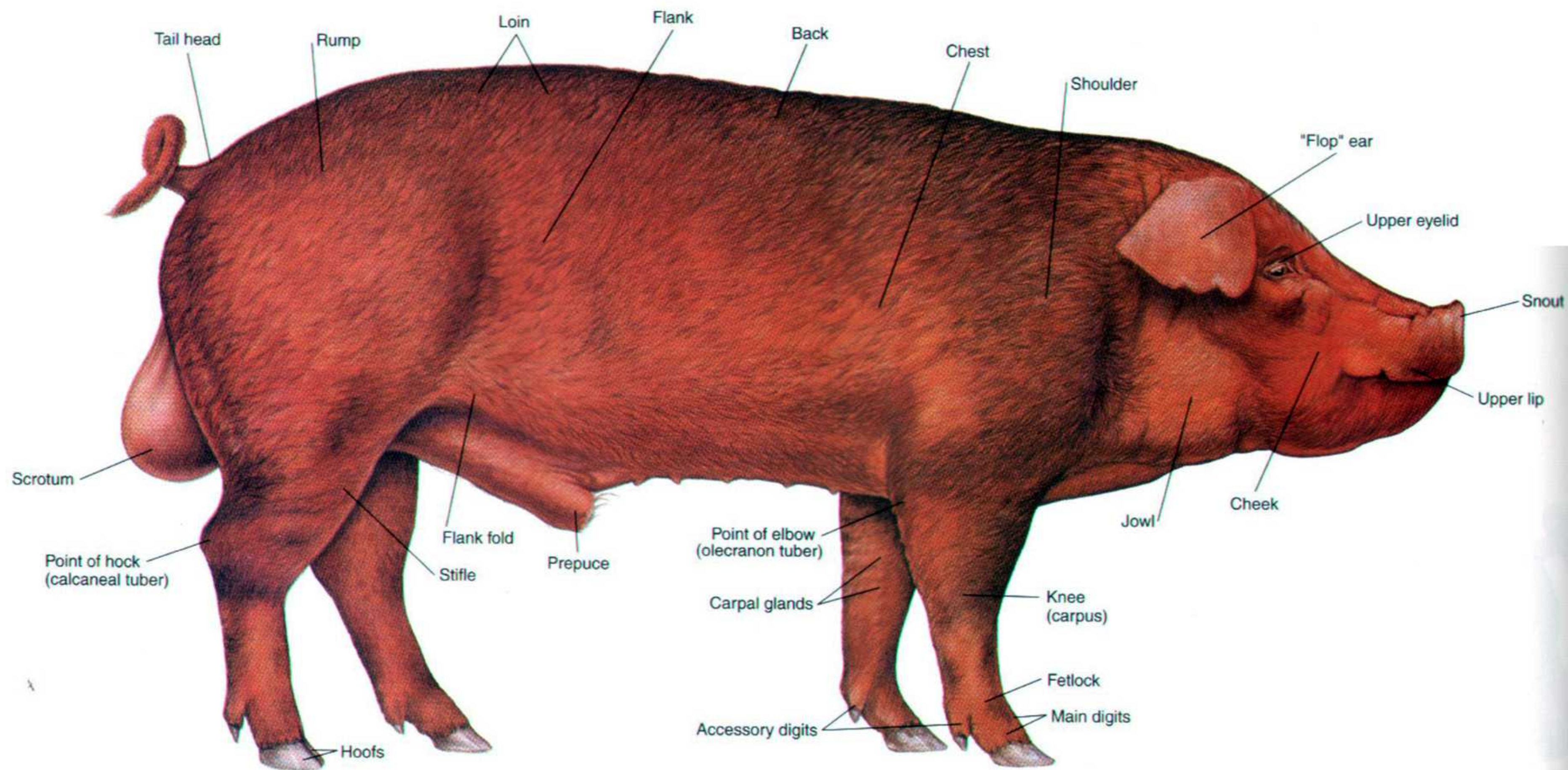


PLATE 6.1 Right lateral view of a boar.



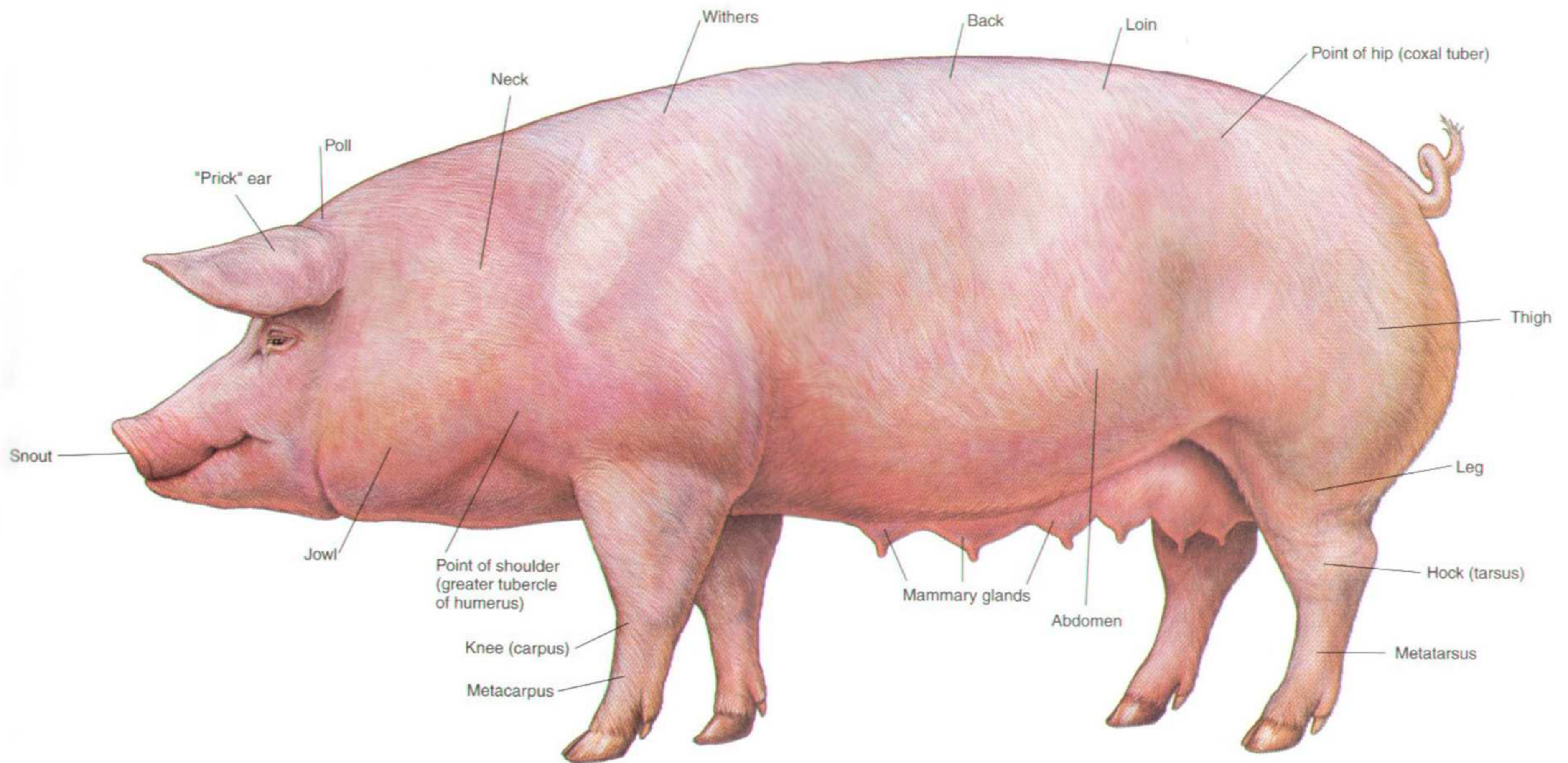


PLATE 6.2 Left lateral view of a sow.



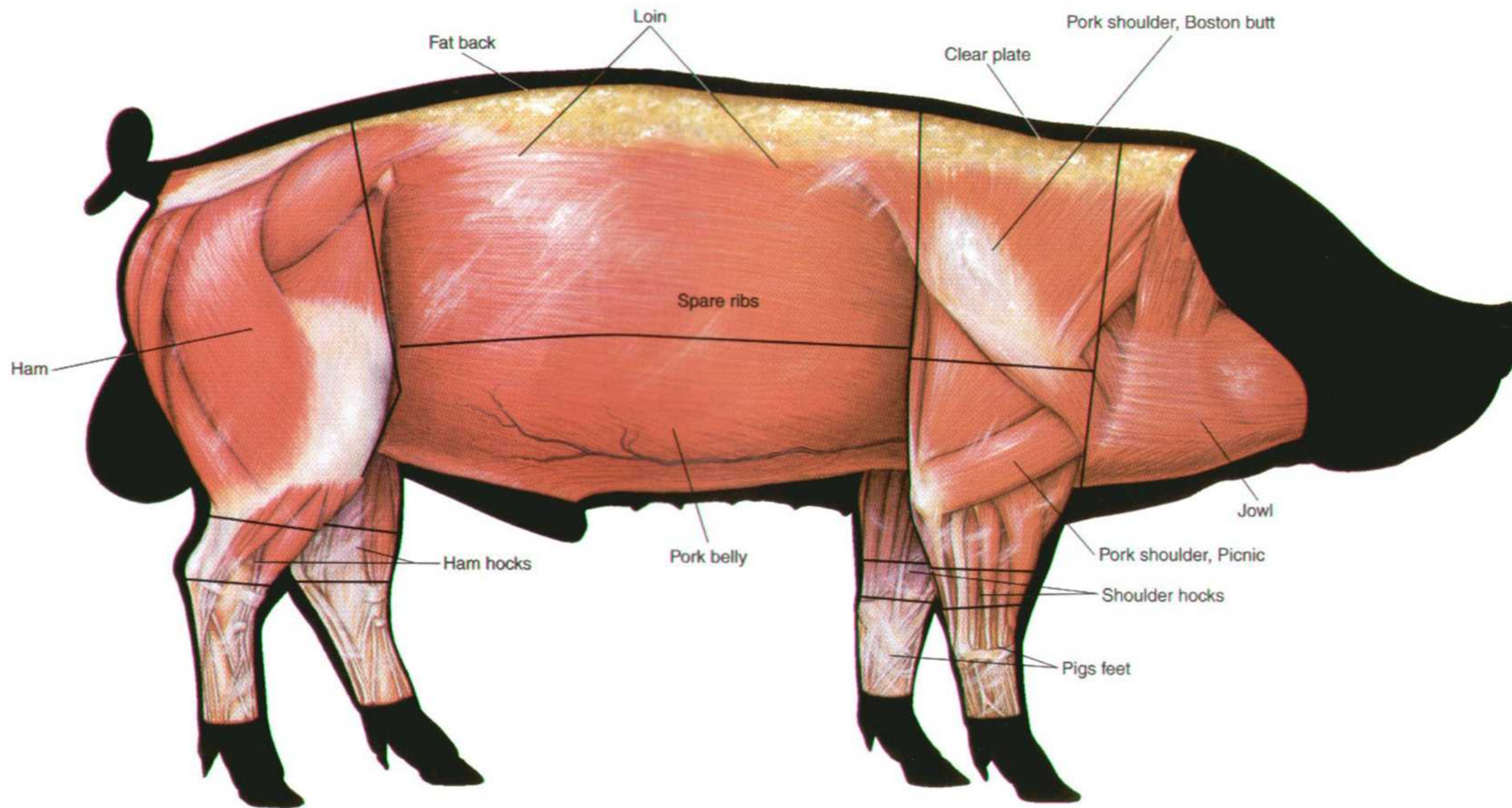


PLATE 6.3 Carcass cuts of the hog.



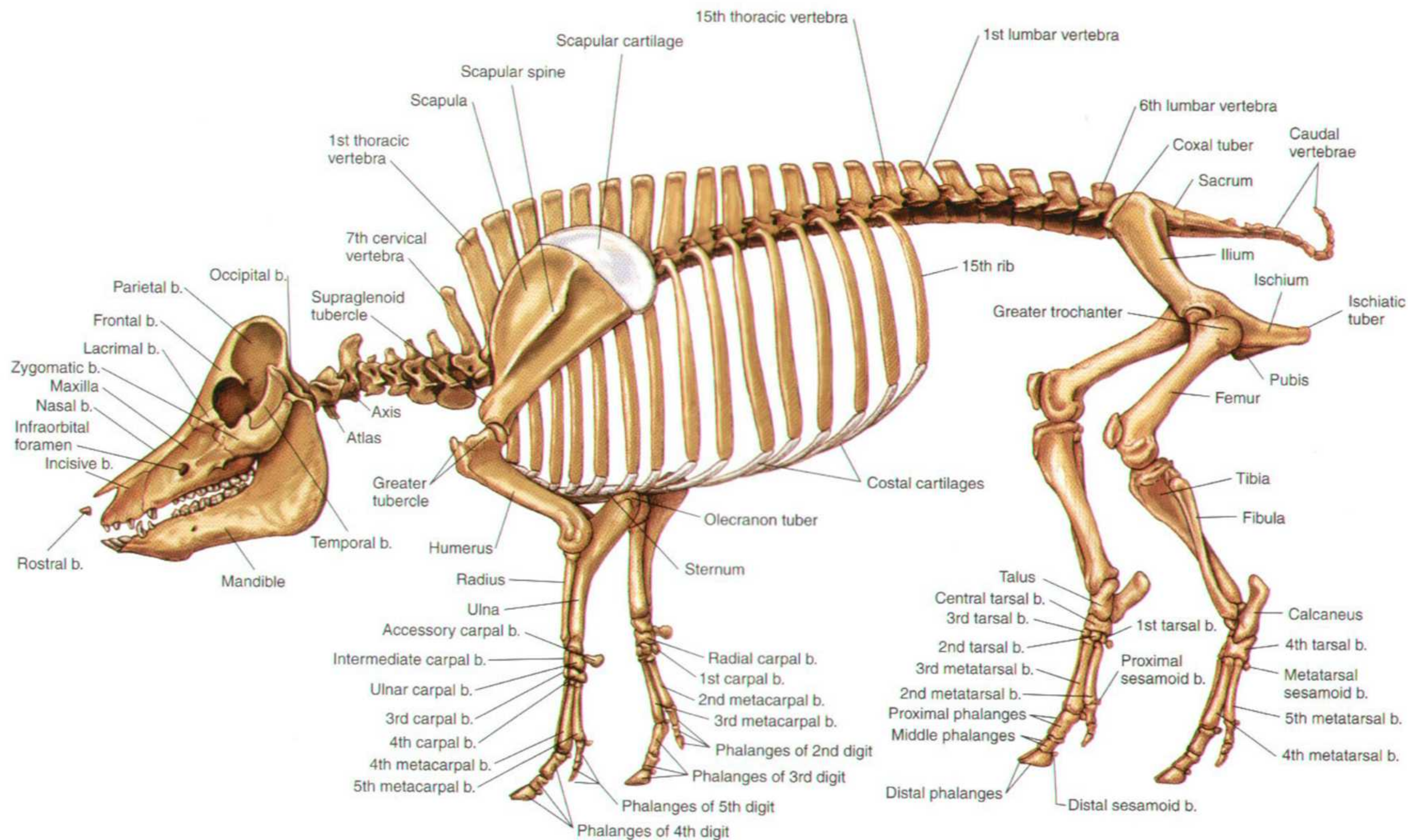


PLATE 6.4 Skeleton of the swine. b = bone



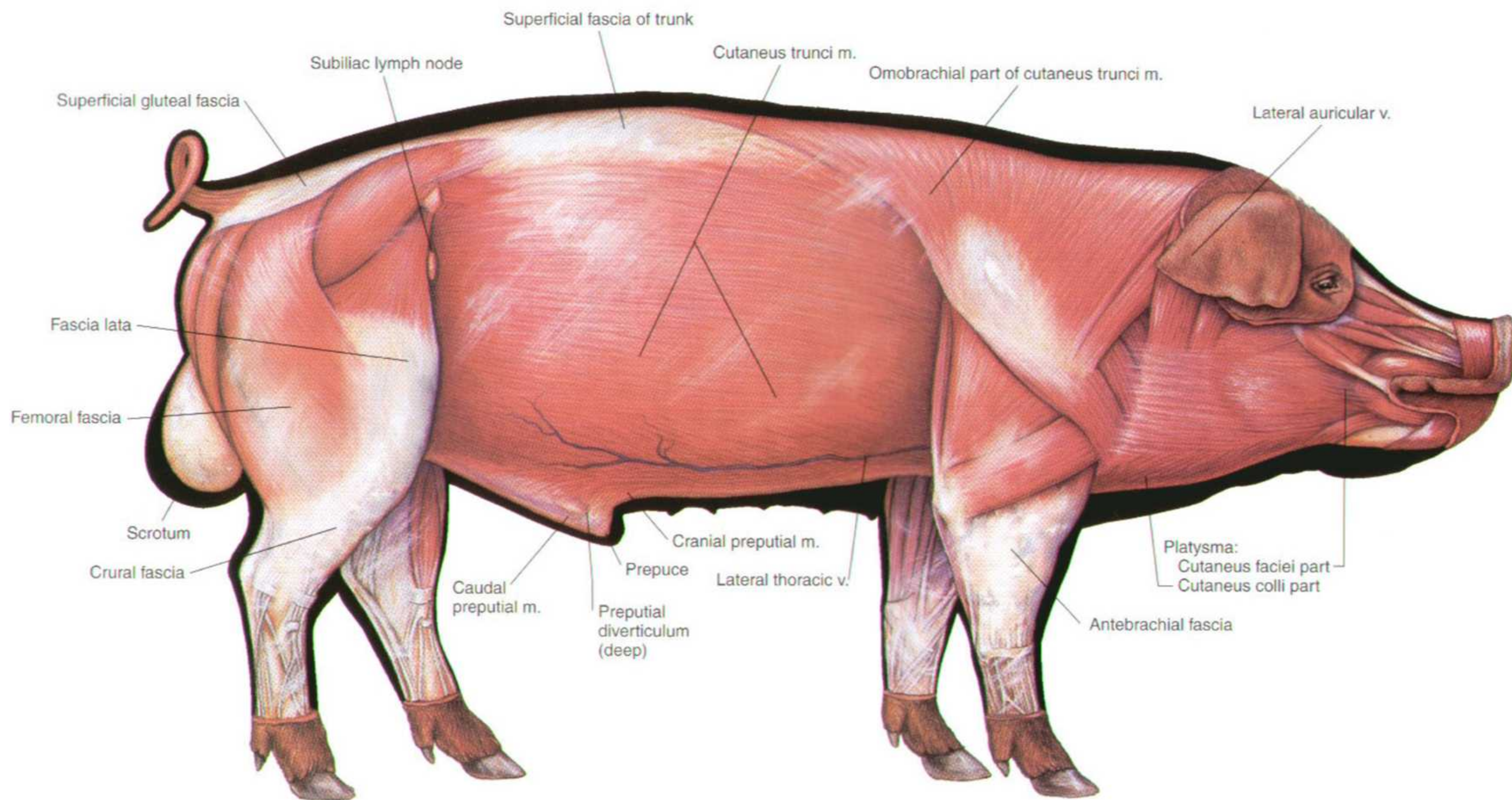


PLATE 6.5 Cutaneous and superficial muscles of the boar. Panniculus adiposus (fat layer) removed. Right lateral view. v = vein, m = muscle



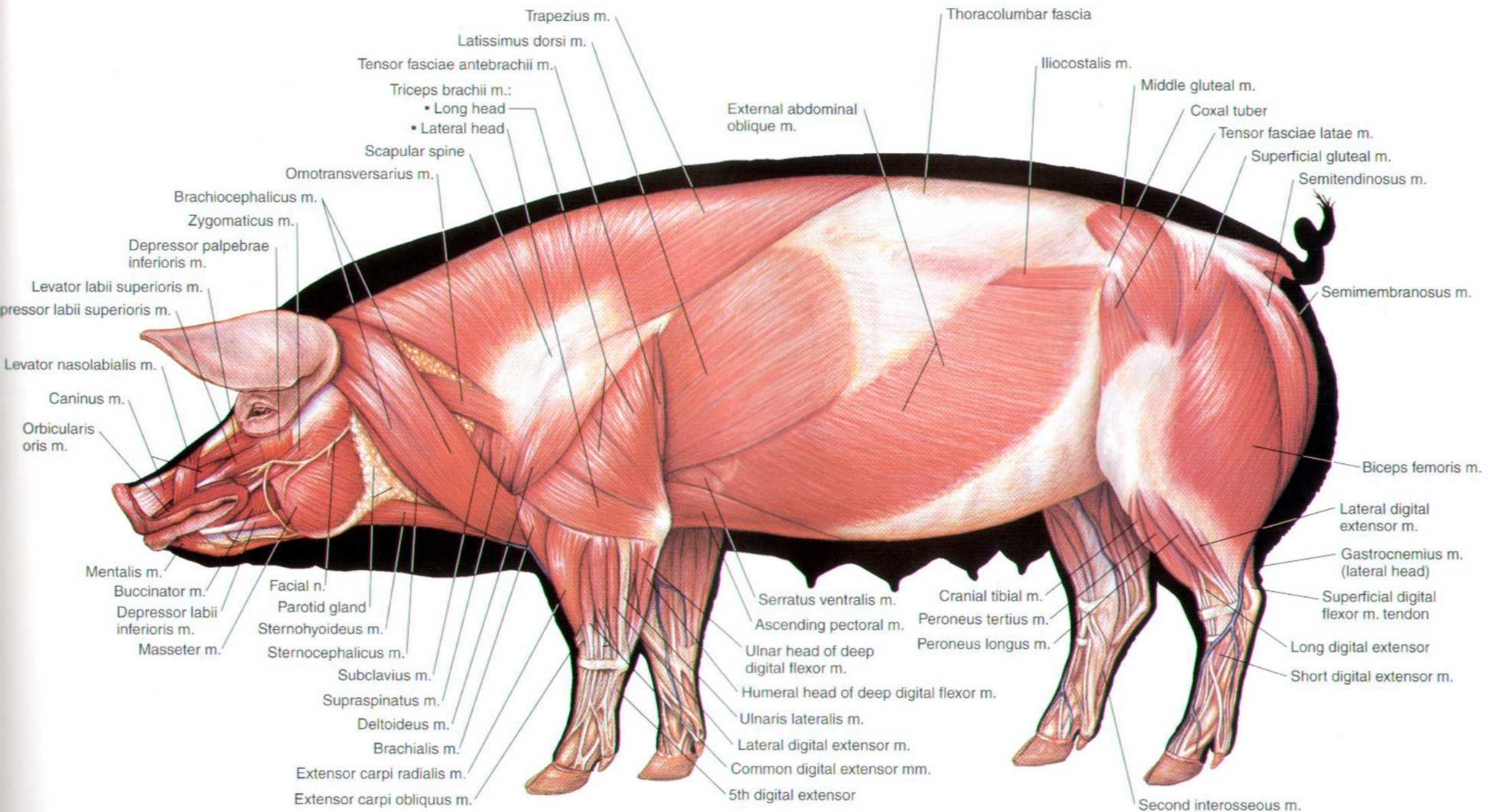


PLATE 6.6 Superficial muscles of the sow. Left lateral view. m = muscle, n = nerve



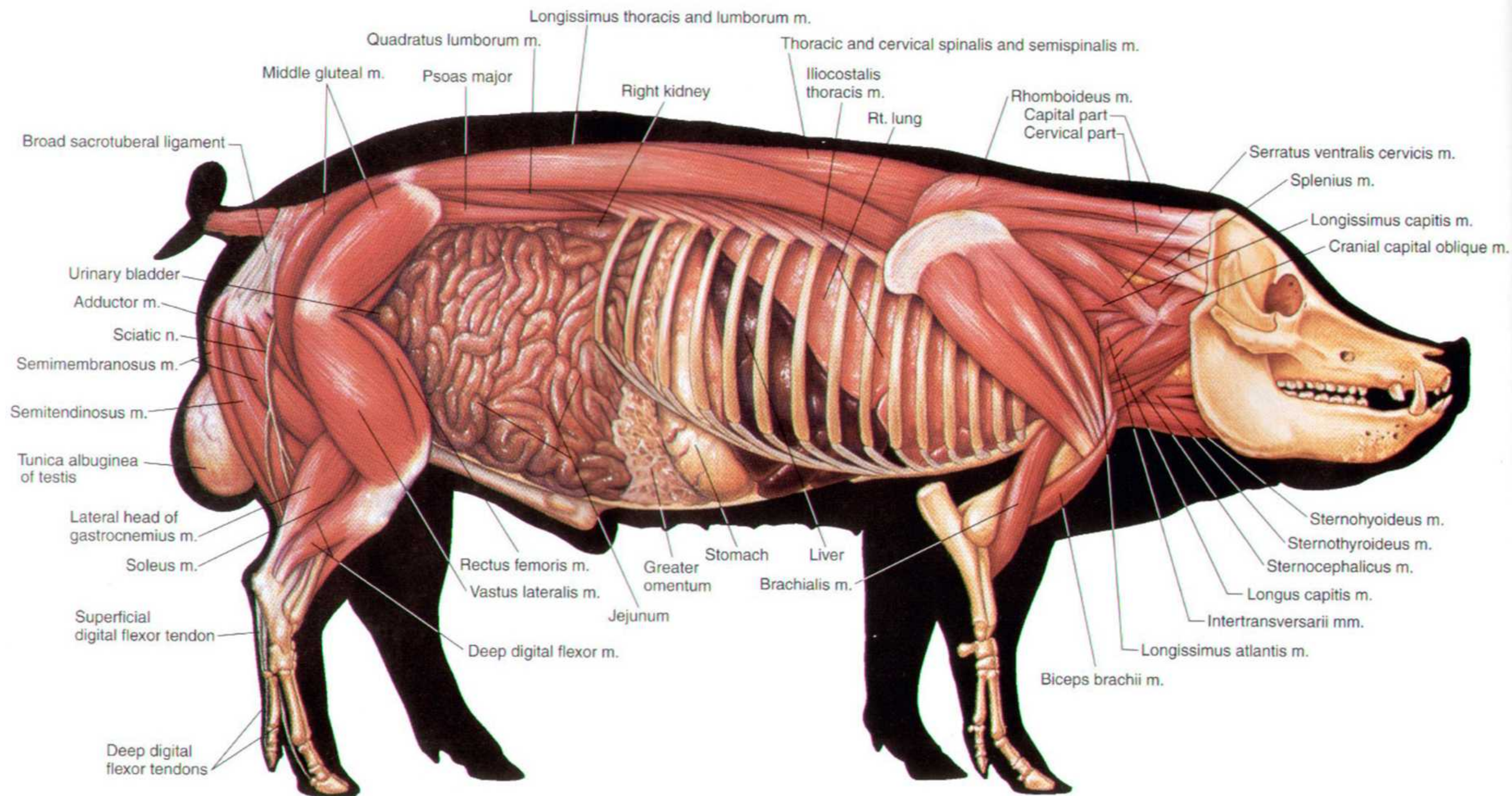
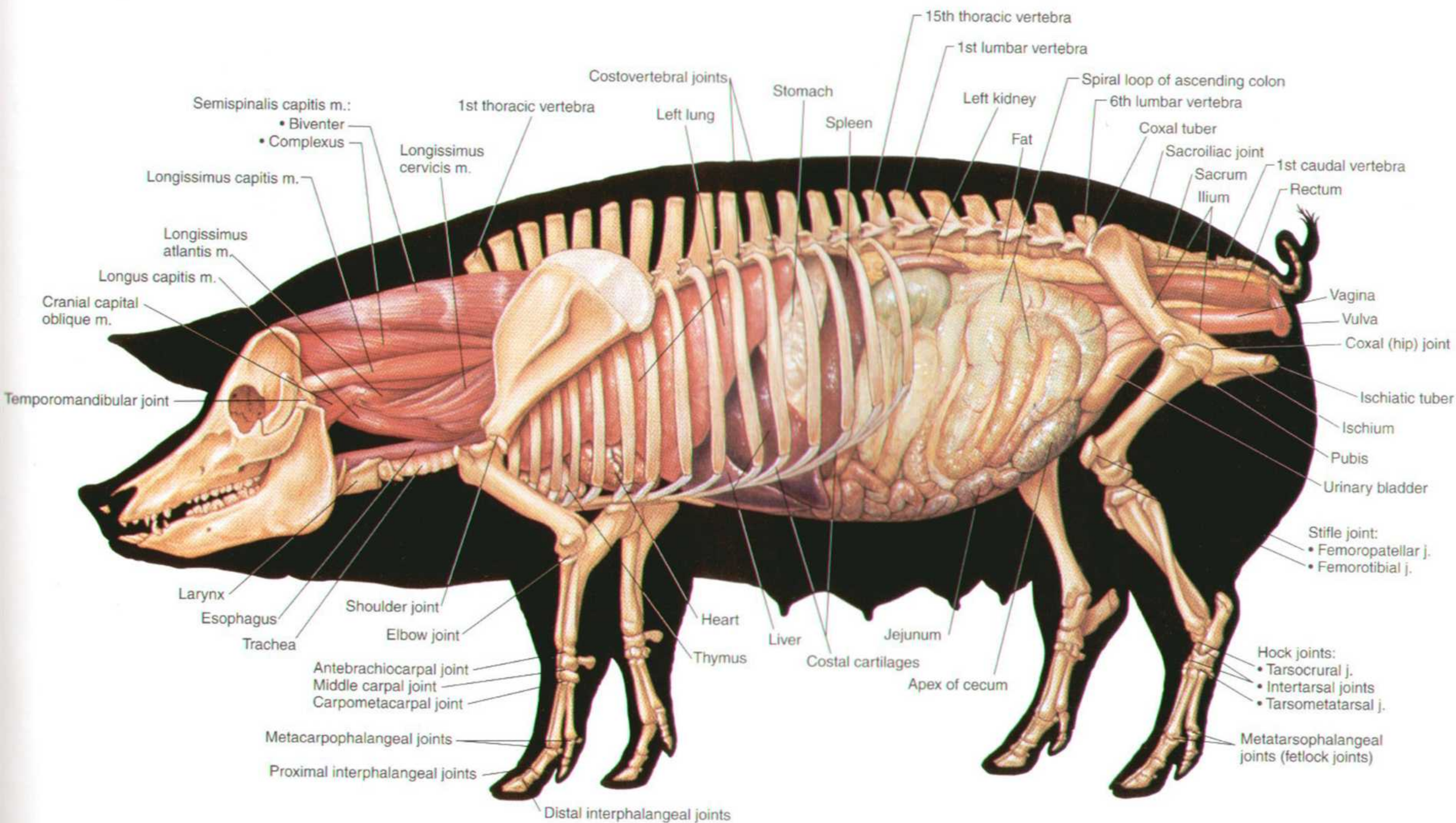


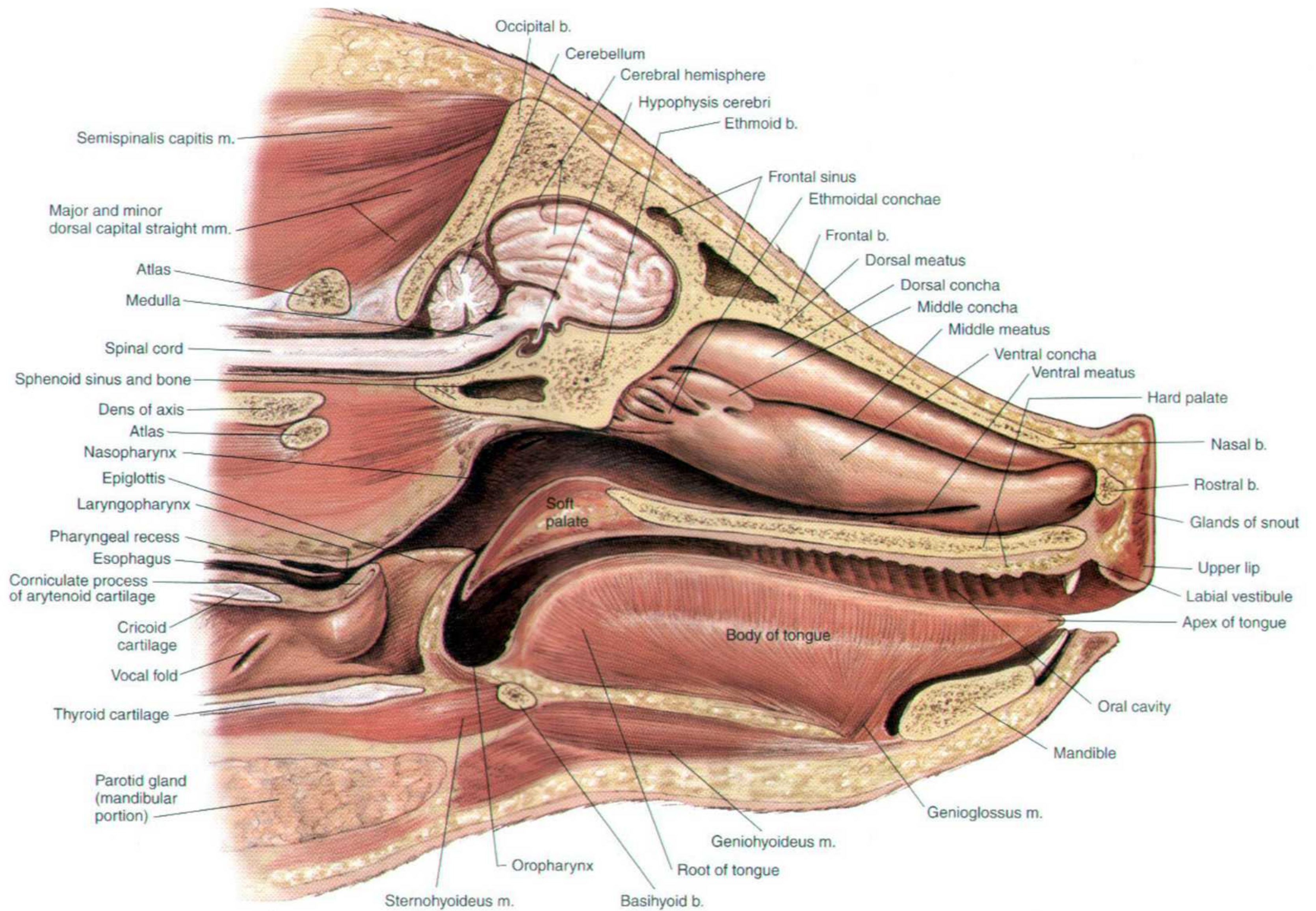
PLATE 6.7 Deep muscles and *in situ* viscera of the boar.  
Right lateral view. m = muscle, n = nerve





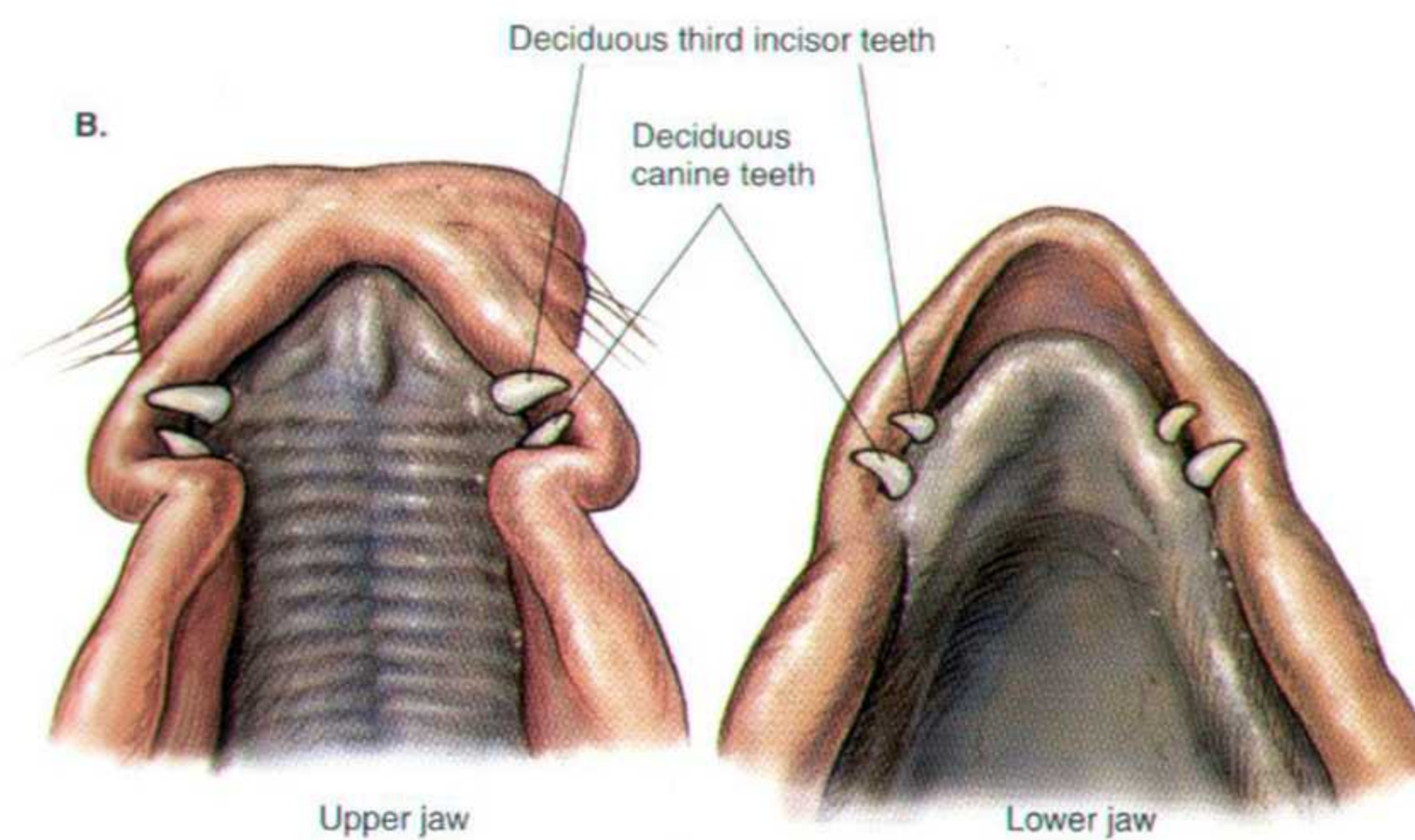
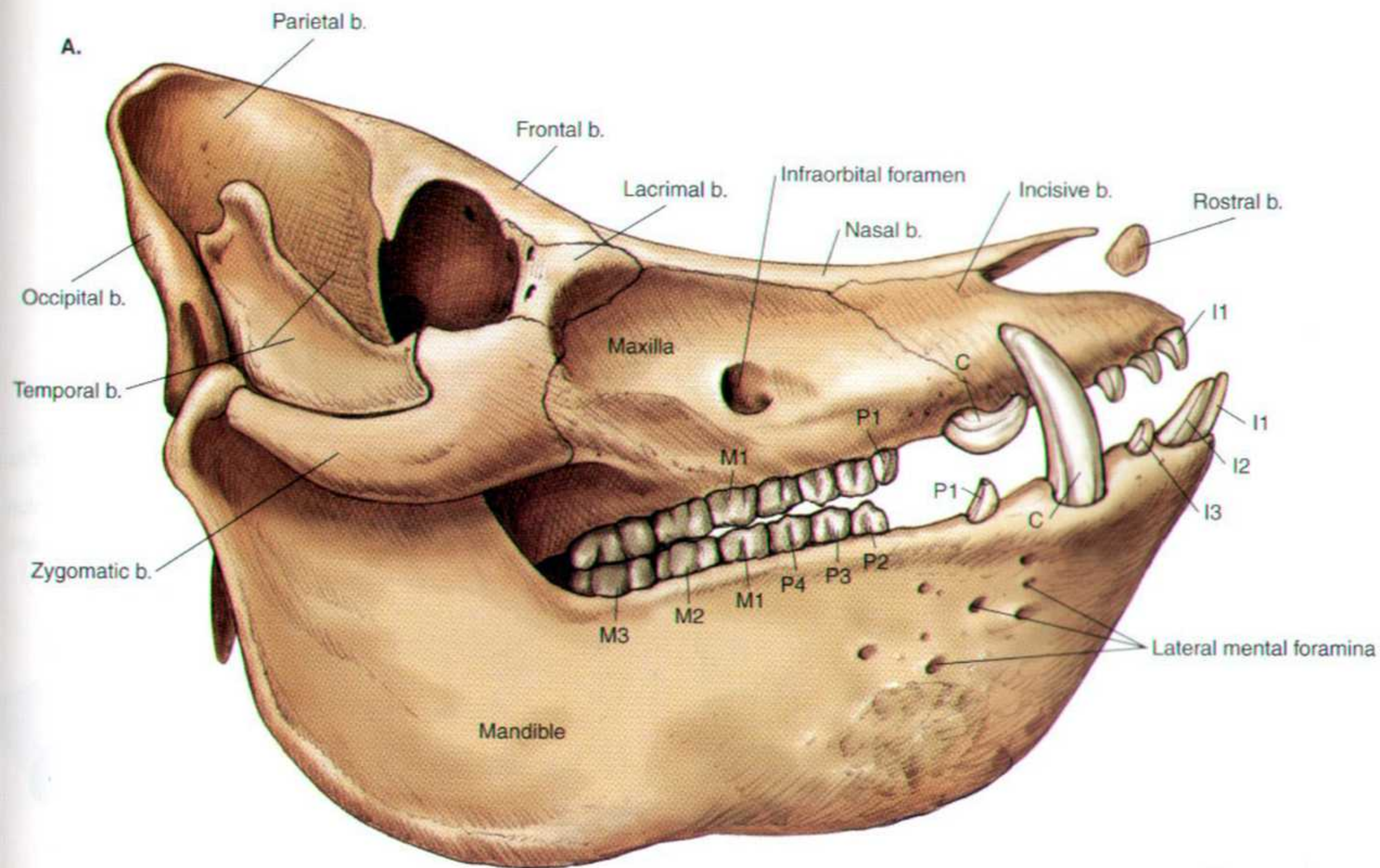
**PLATE 6.8** Deep cervical muscles, major joints, and *in situ* viscera of the sow. Left lateral view. m = muscle, j = joint





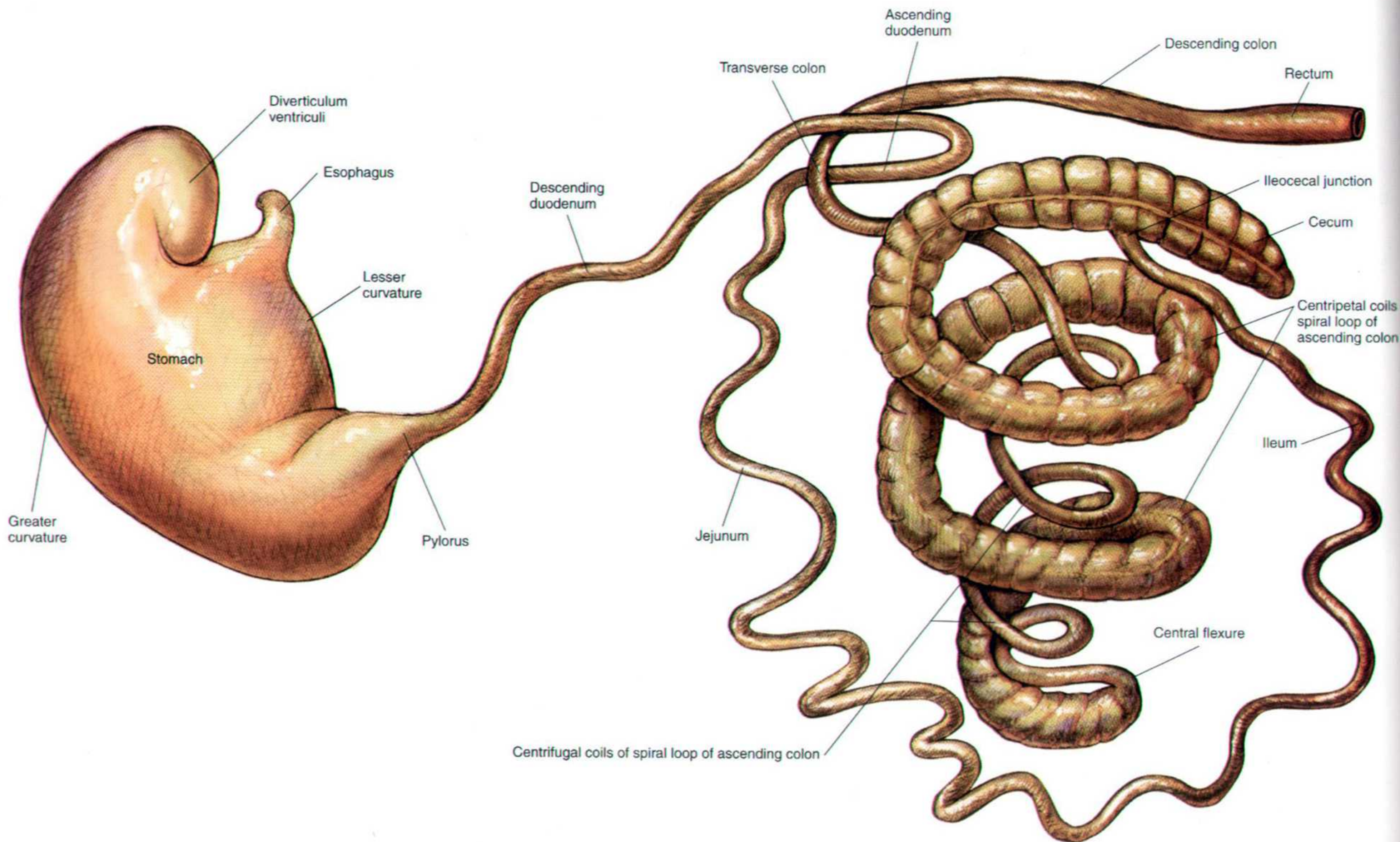
**PLATE 6.9** Median section of the porcine head. The nasal septum has been removed.  
Right lateral view. m = muscle, b = bone





**PLATE 6.10** **A.** Permanent dentition of the boar. b = bone, I = incisor tooth, C = canine tooth, P = premolar tooth, M = molar tooth **B.** Cutting the deciduous incisor and canine teeth of a piglet. They are routinely cut off to prevent damage to sow's teats.





**PLATE 6.11** Isolated stomach and intestines of the swine. The jejunum is shortened and uncoiled, and the loops of the ascending colon are pulled apart.



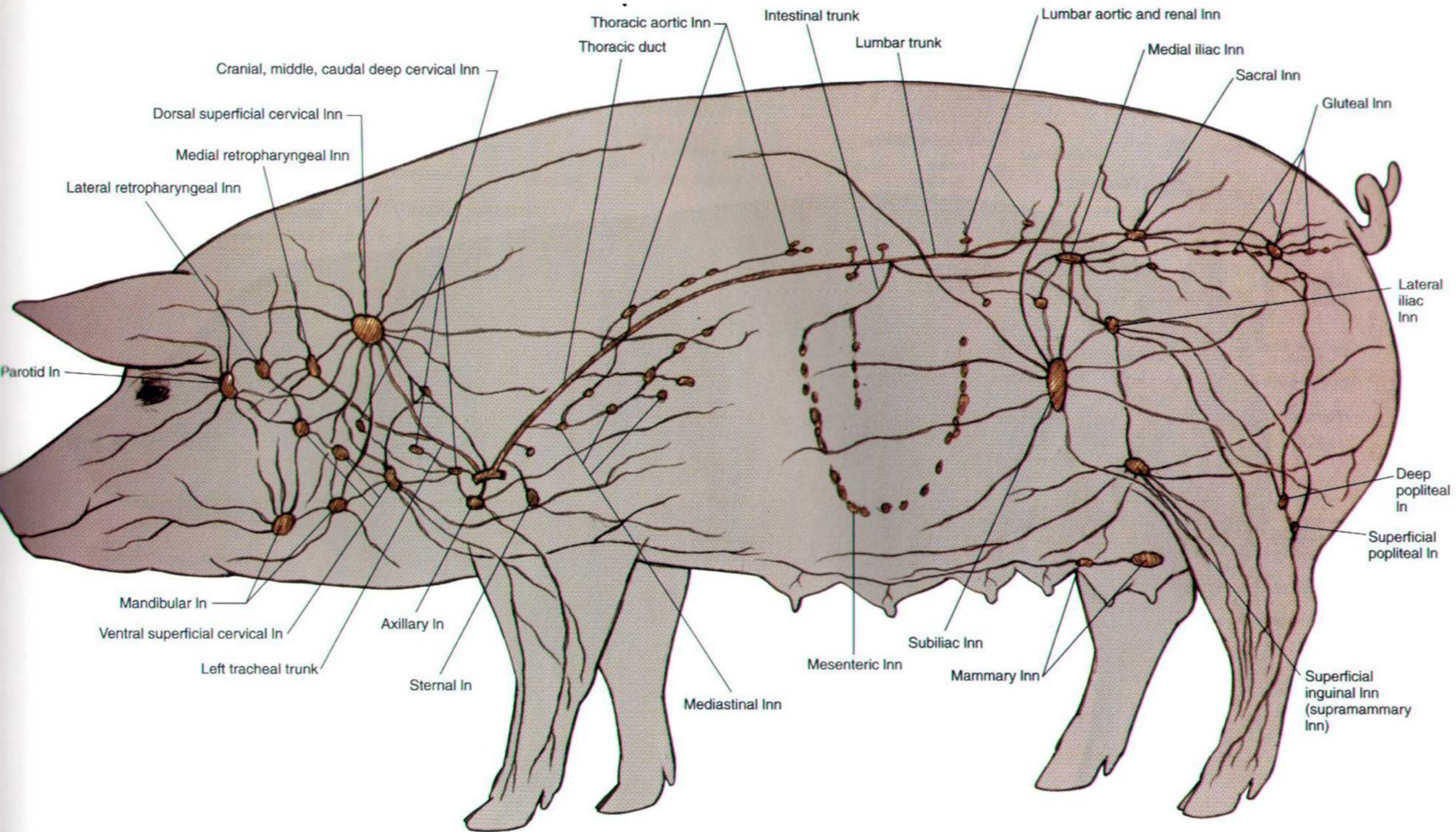
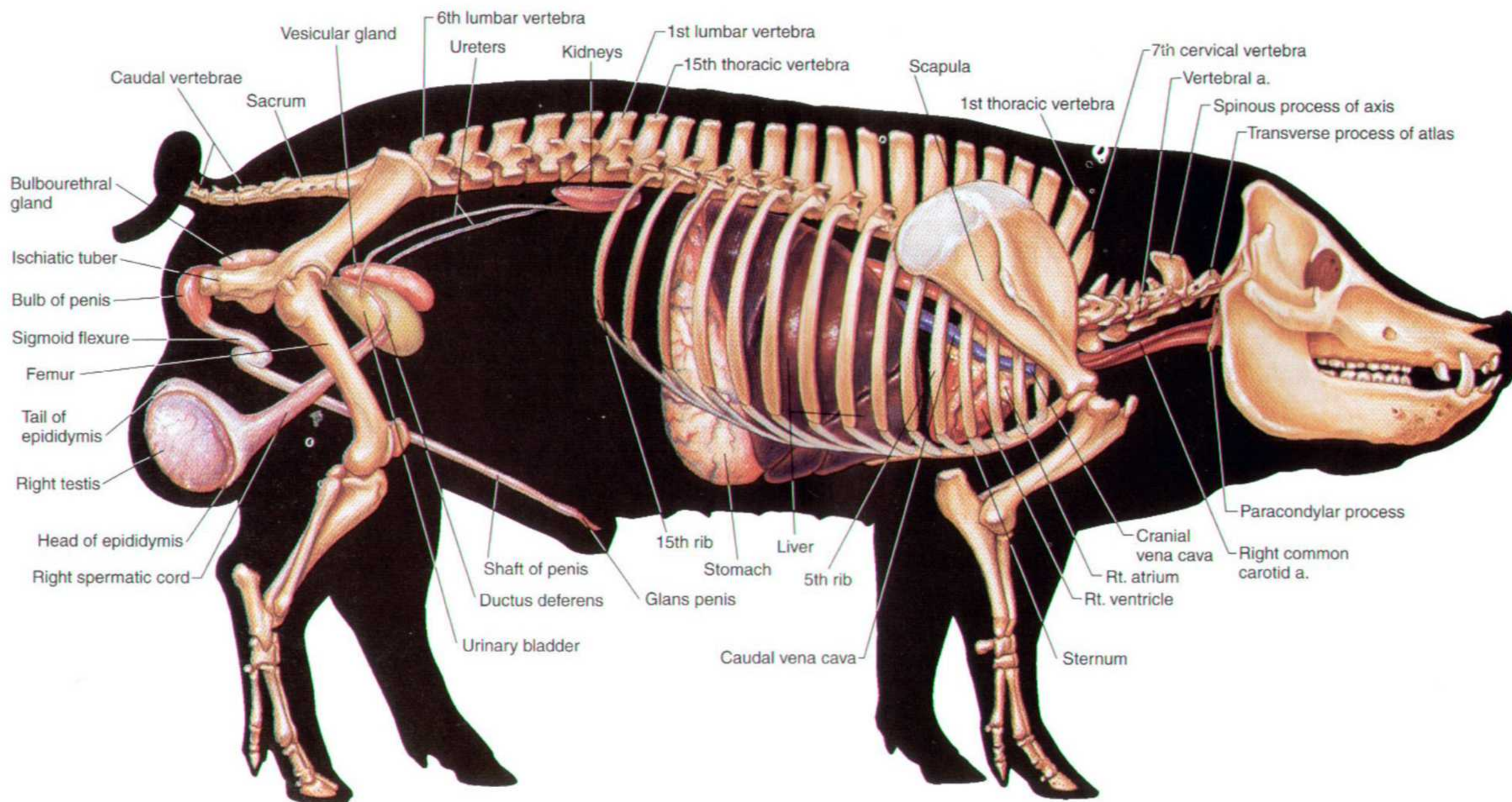


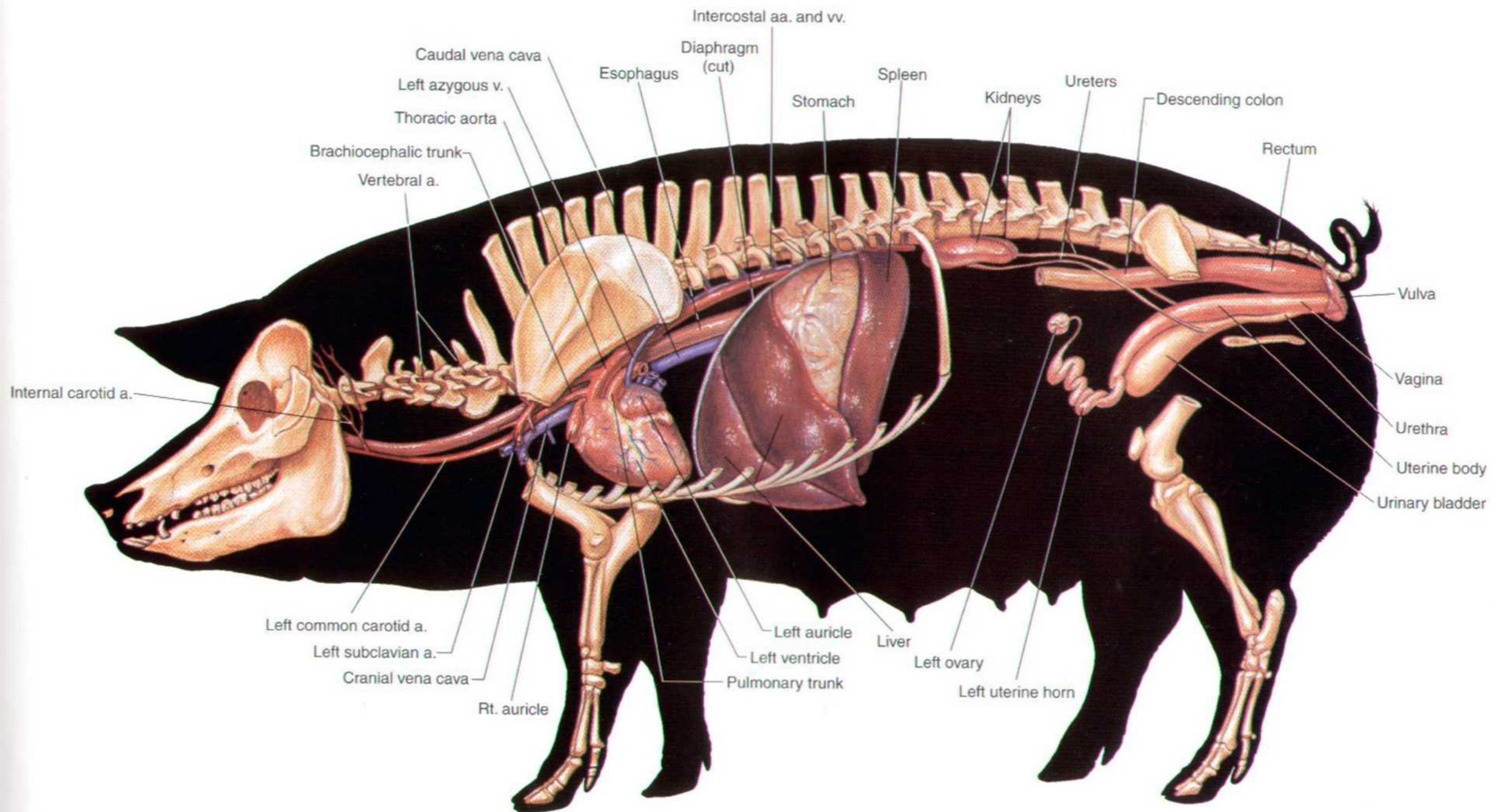
PLATE 6.12 Lymph nodes and vessels of the sow. In = lymph node





**PLATE 6.13** Reproductive and urinary organs, stomach, liver, heart, and adjacent major vessels related to the skeleton of the boar. Lungs and intestines are removed. Right lateral view. a = artery





**PLATE 6.14** Reproductive and urinary organs, abdominal viscera, spleen, heart, and adjacent major vessels of the sow. Lungs and intestines are removed.  
Left lateral view. v = vein, a = artery



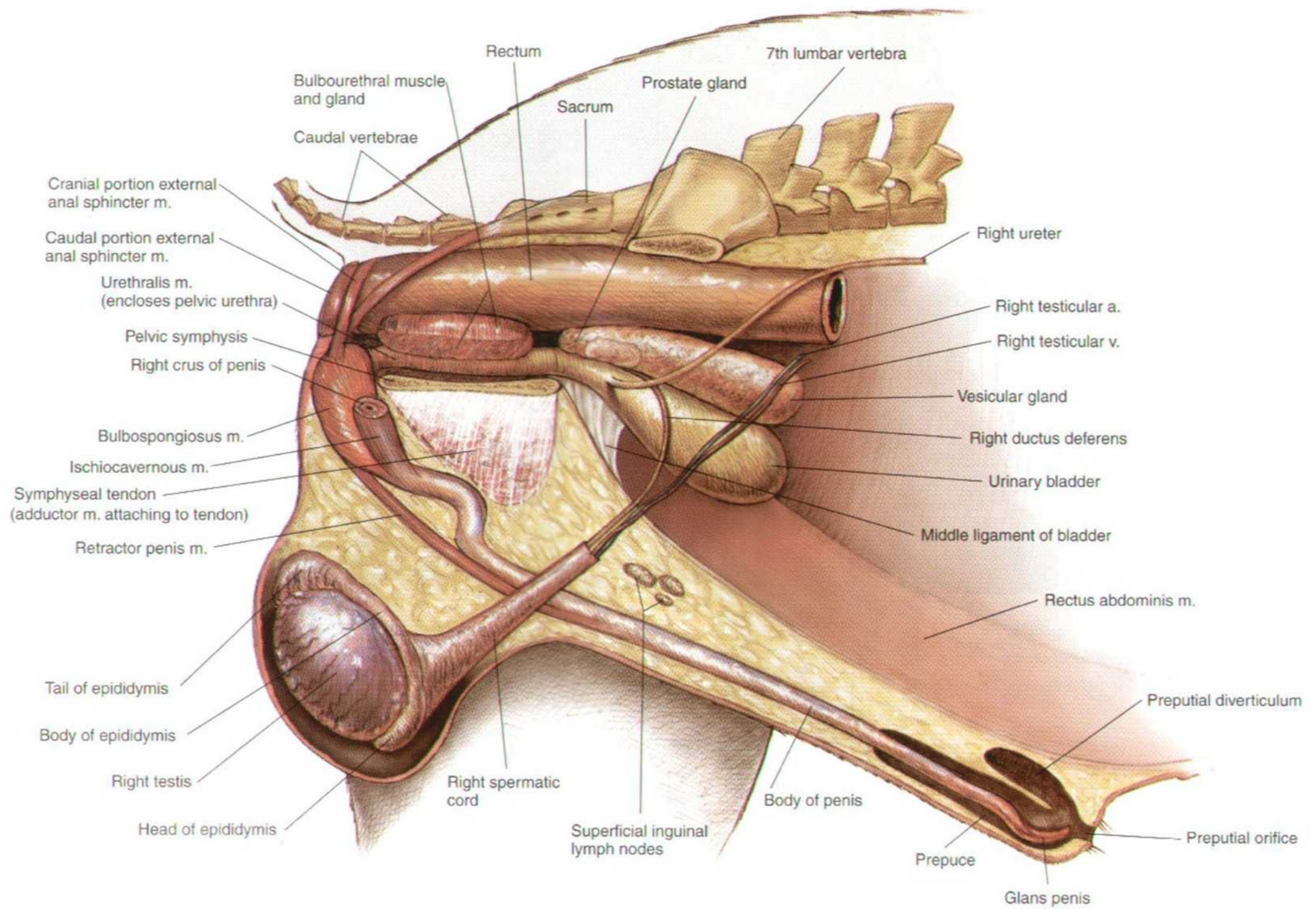


PLATE 6.15 Relations of the reproductive organs of the boar. m = muscle, v = vein, a = artery



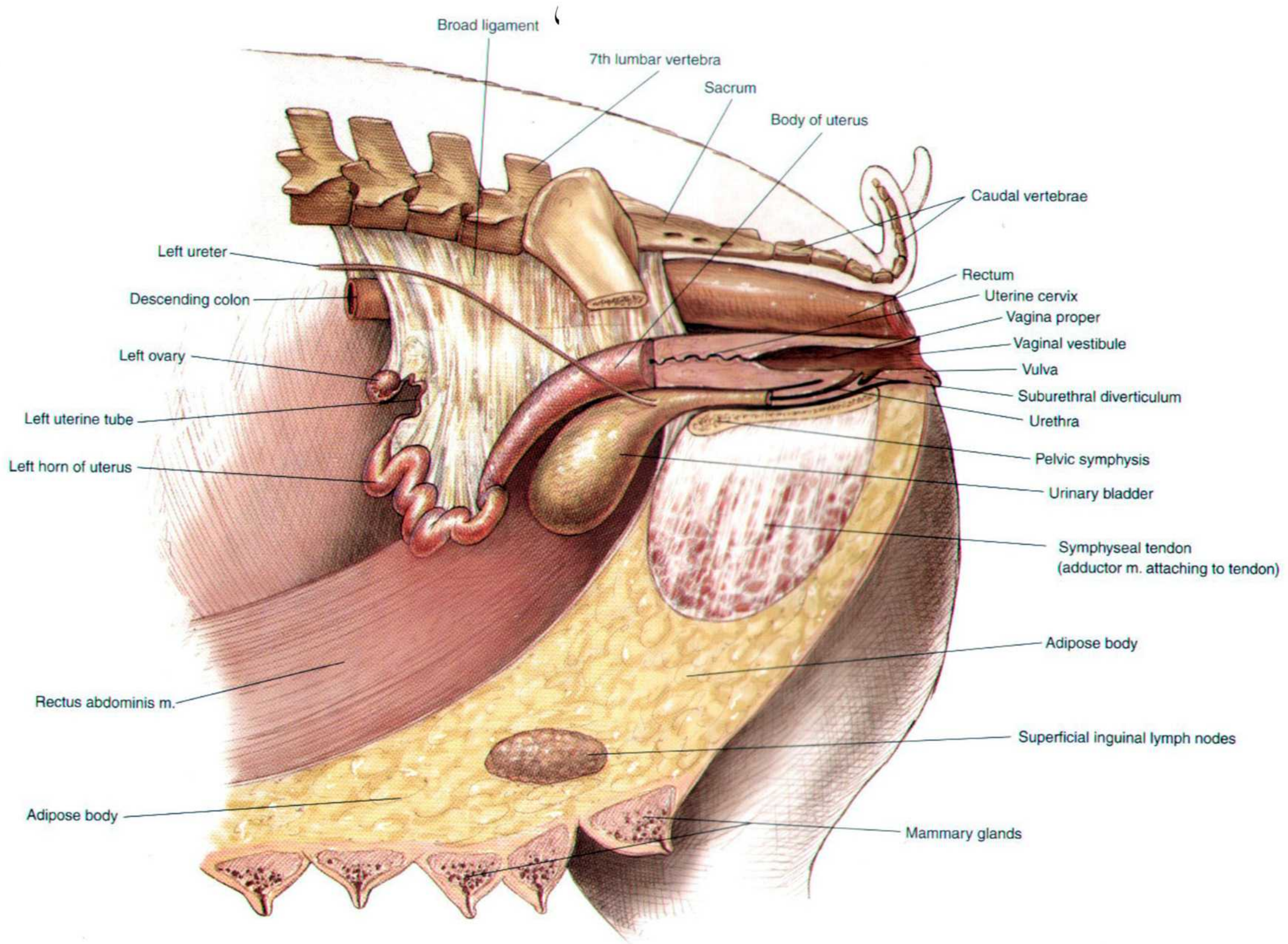
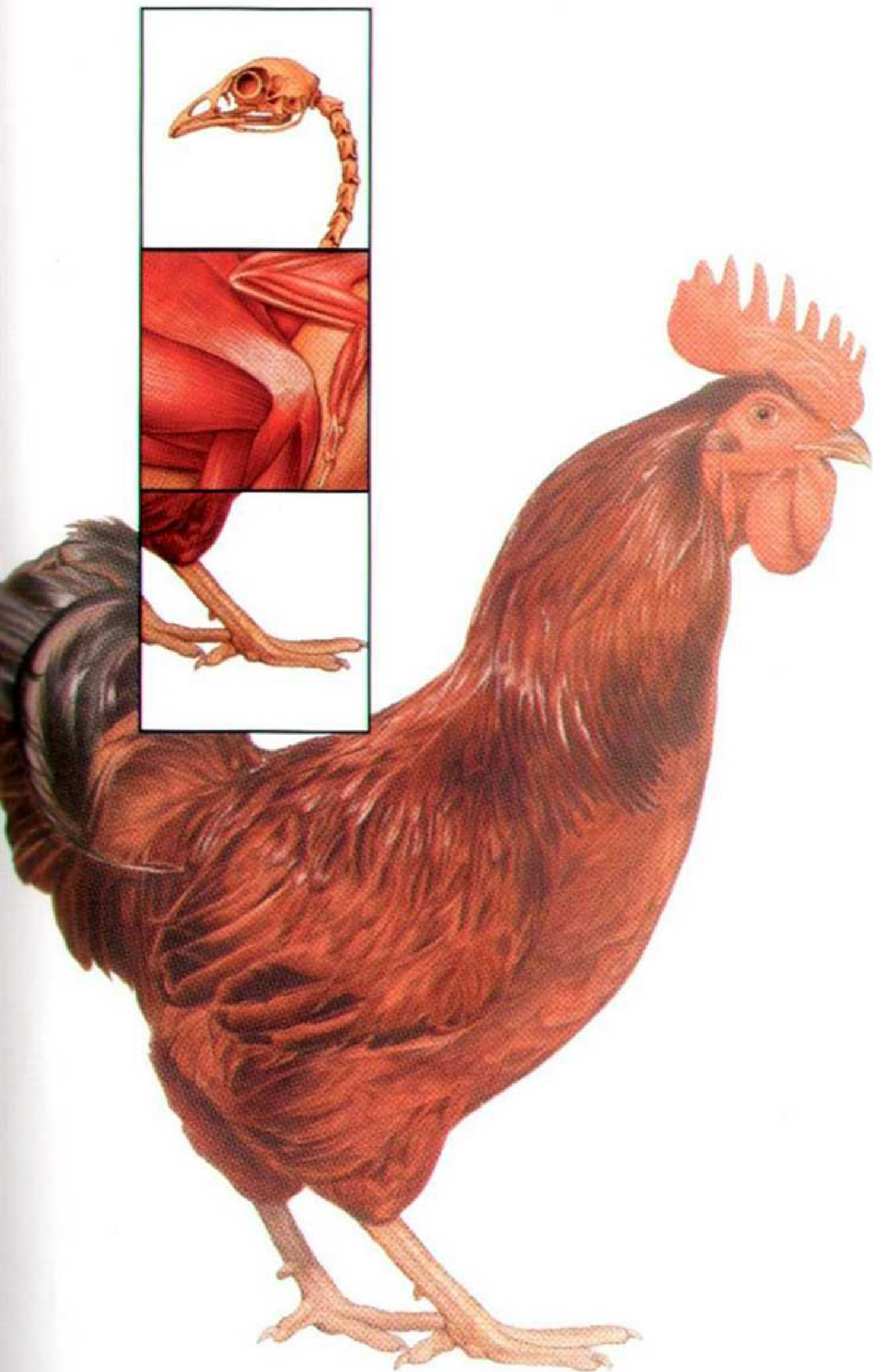


PLATE 6.16 Relations of the reproductive organs of the sow.



# SECTION 7 THE CHICKEN

(*Gallus gallus domesticus*)



## PLATES

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- 7.2 Left lateral view of a hen.
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- 7.13 Reproductive and urinary organs of the rooster.
- 7.14 Reproductive organs of the hen.



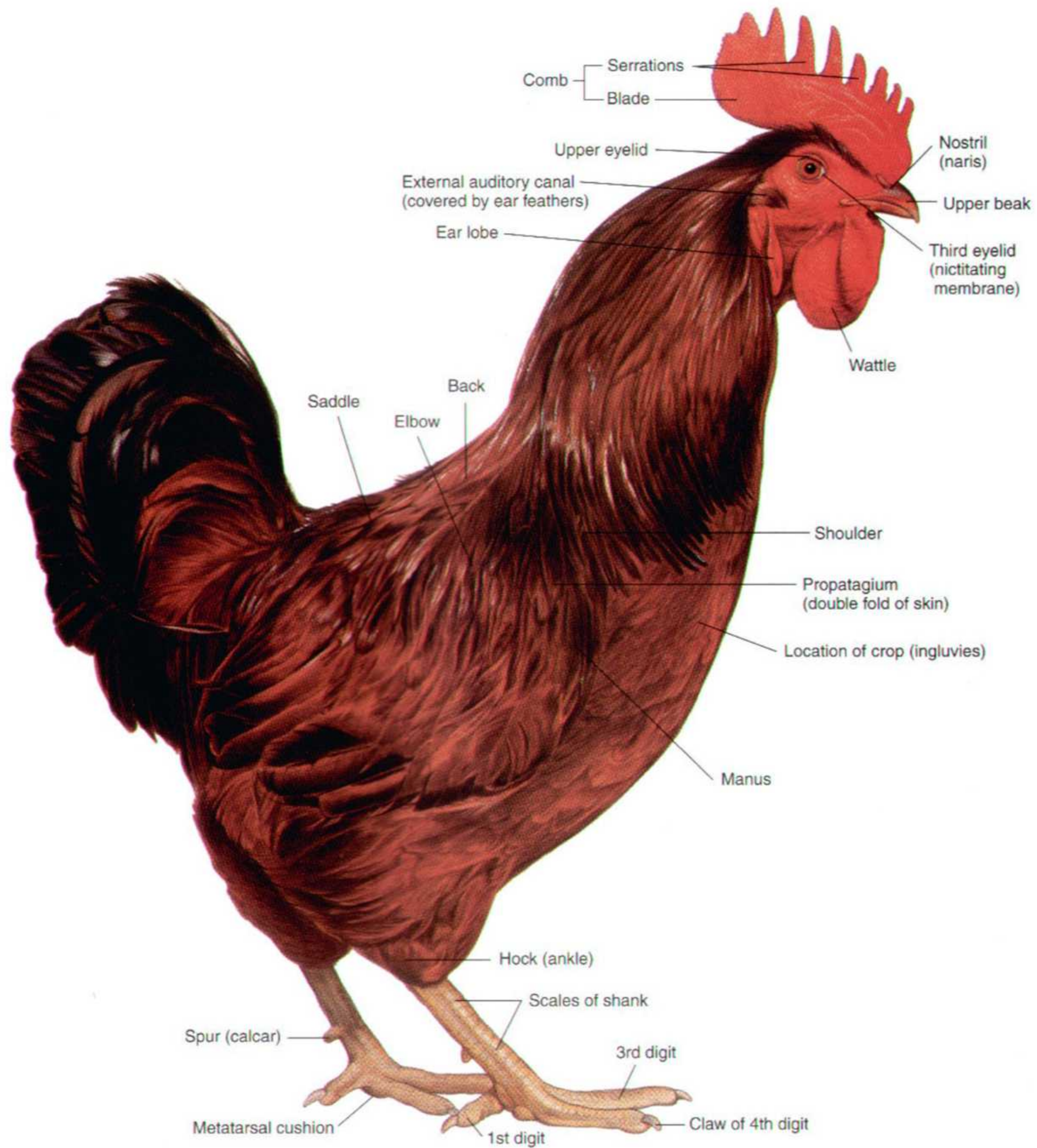
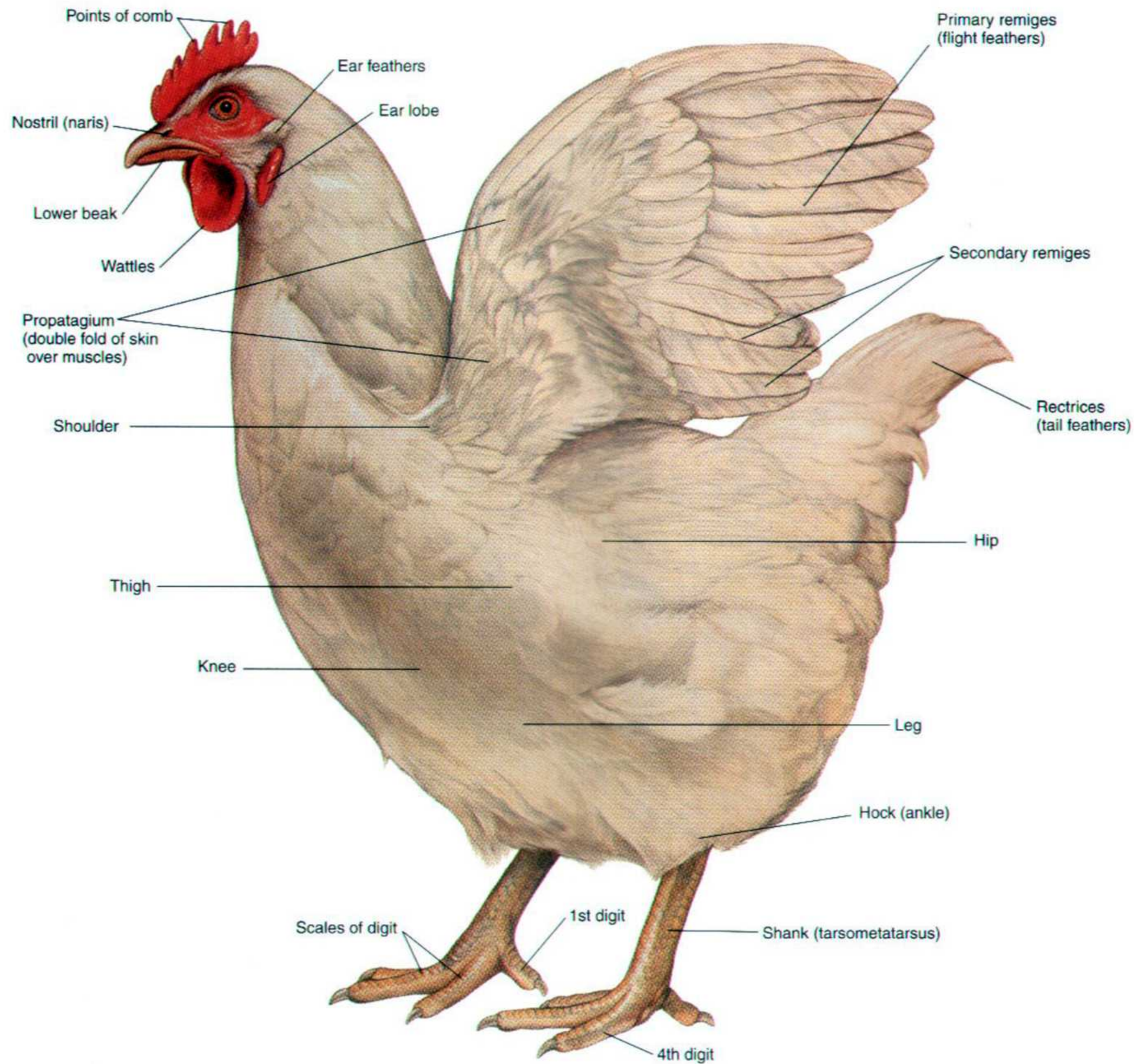


PLATE 7.1 Right lateral view of a rooster (cock).







**PLATE 7.2** Left lateral view of a hen. Patagiotomy (wing clipping), excision of part of the propatagium (wing membrane), is performed on one wing to prevent flight.



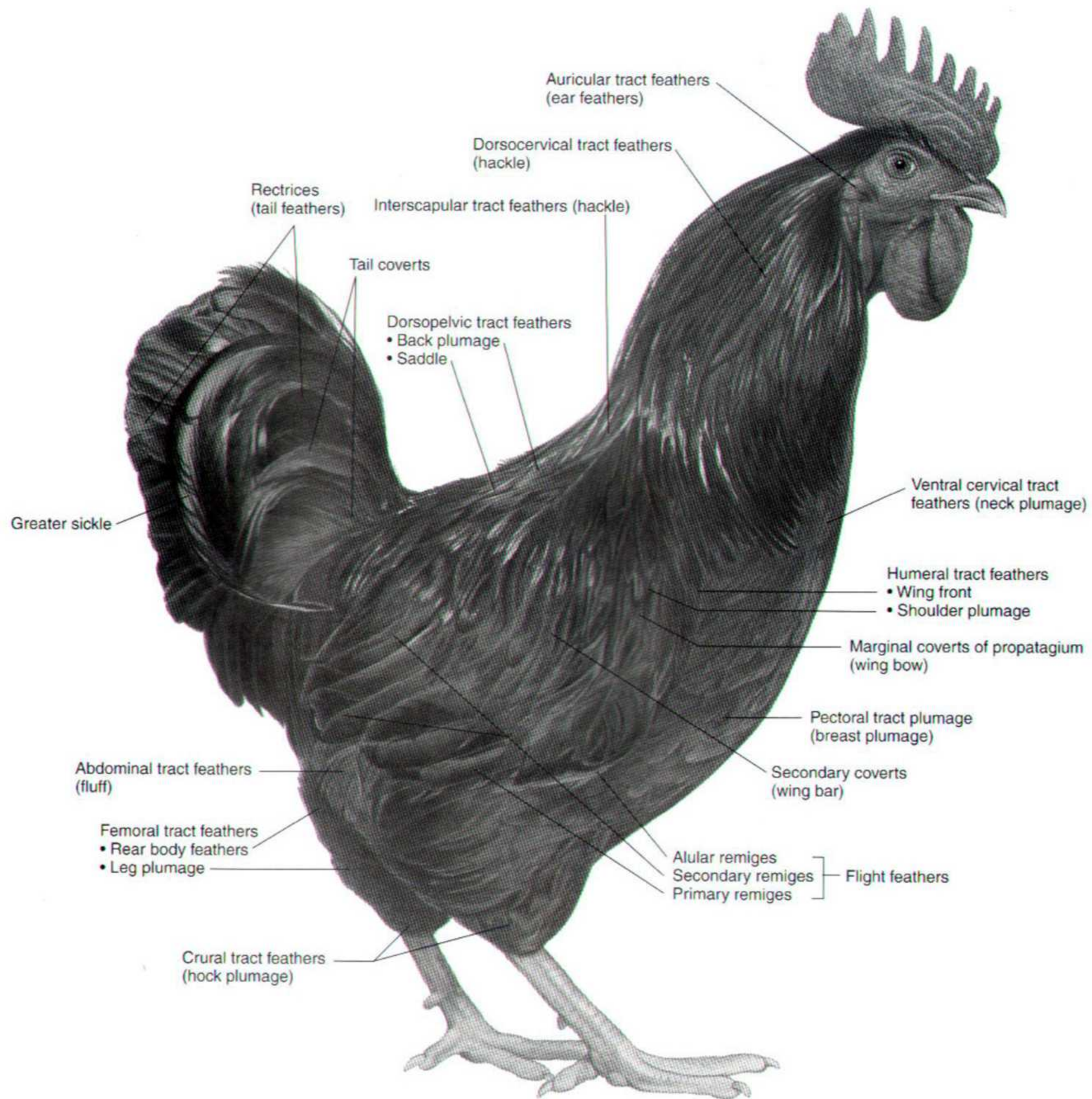


PLATE 7.3 Feather coat of the rooster.



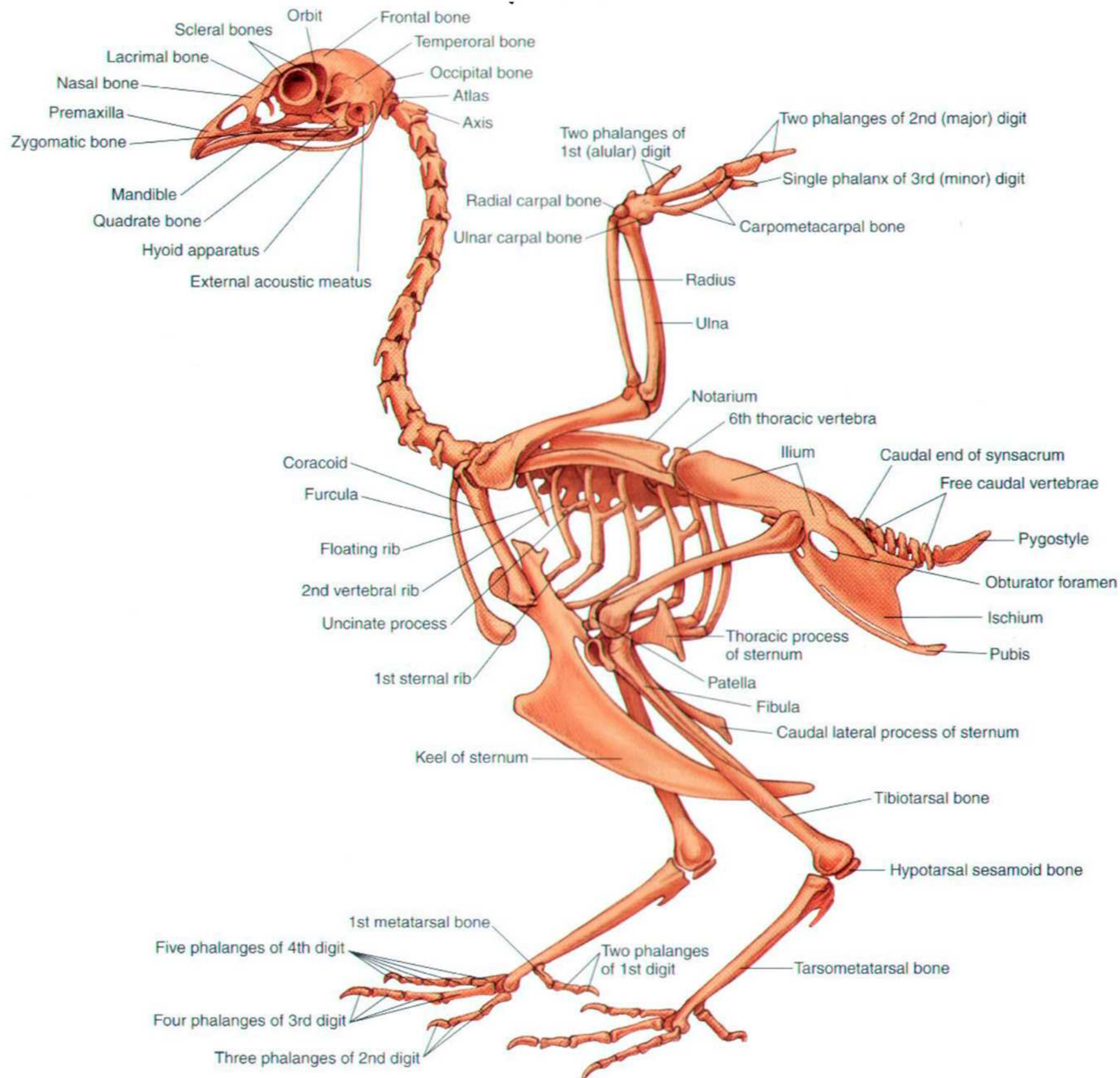


PLATE 7.4 Skeleton of the chicken. Left lateral view.



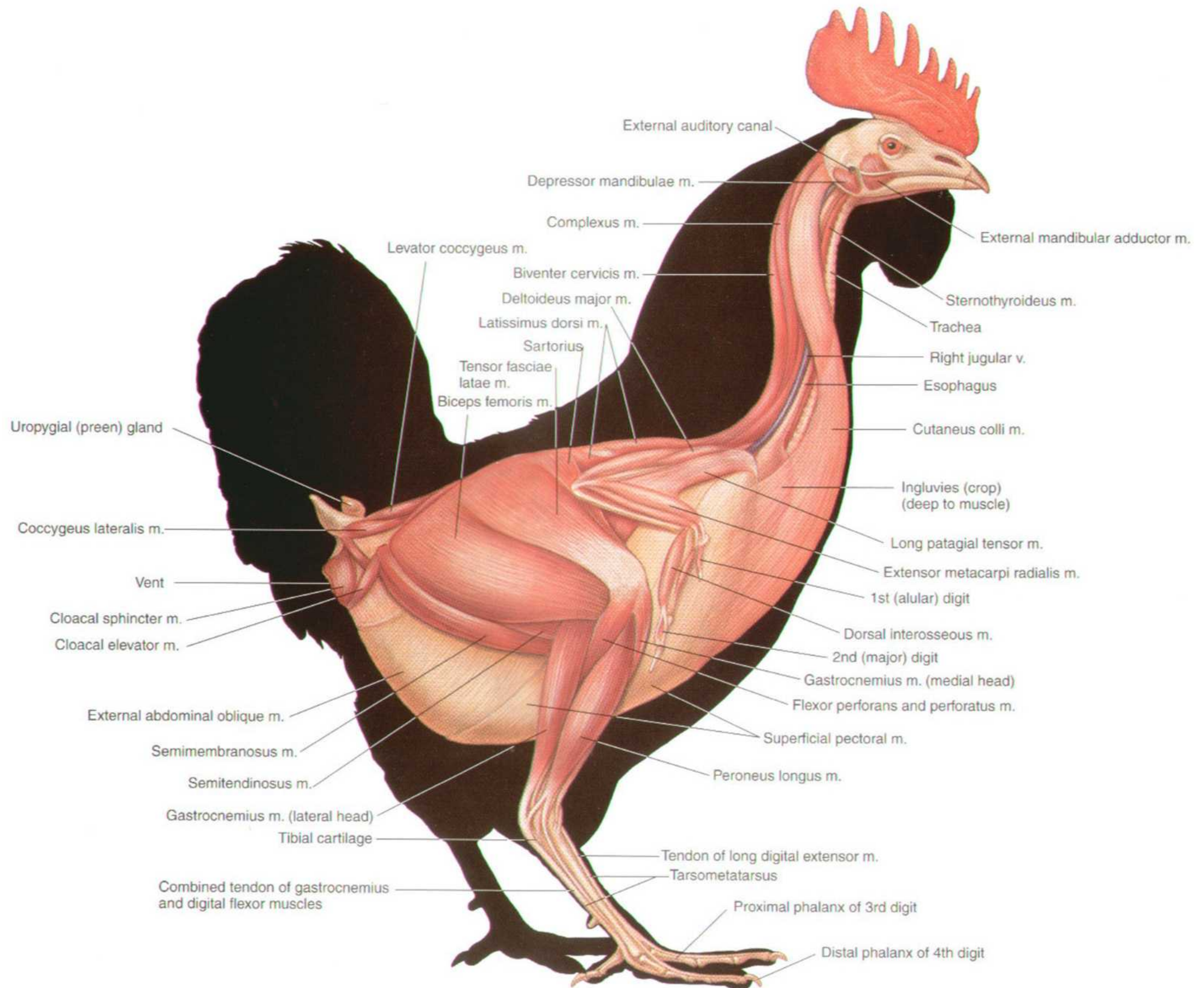


PLATE 7.5 Superficial muscles of the rooster. Right lateral view. m = muscle, v = vein



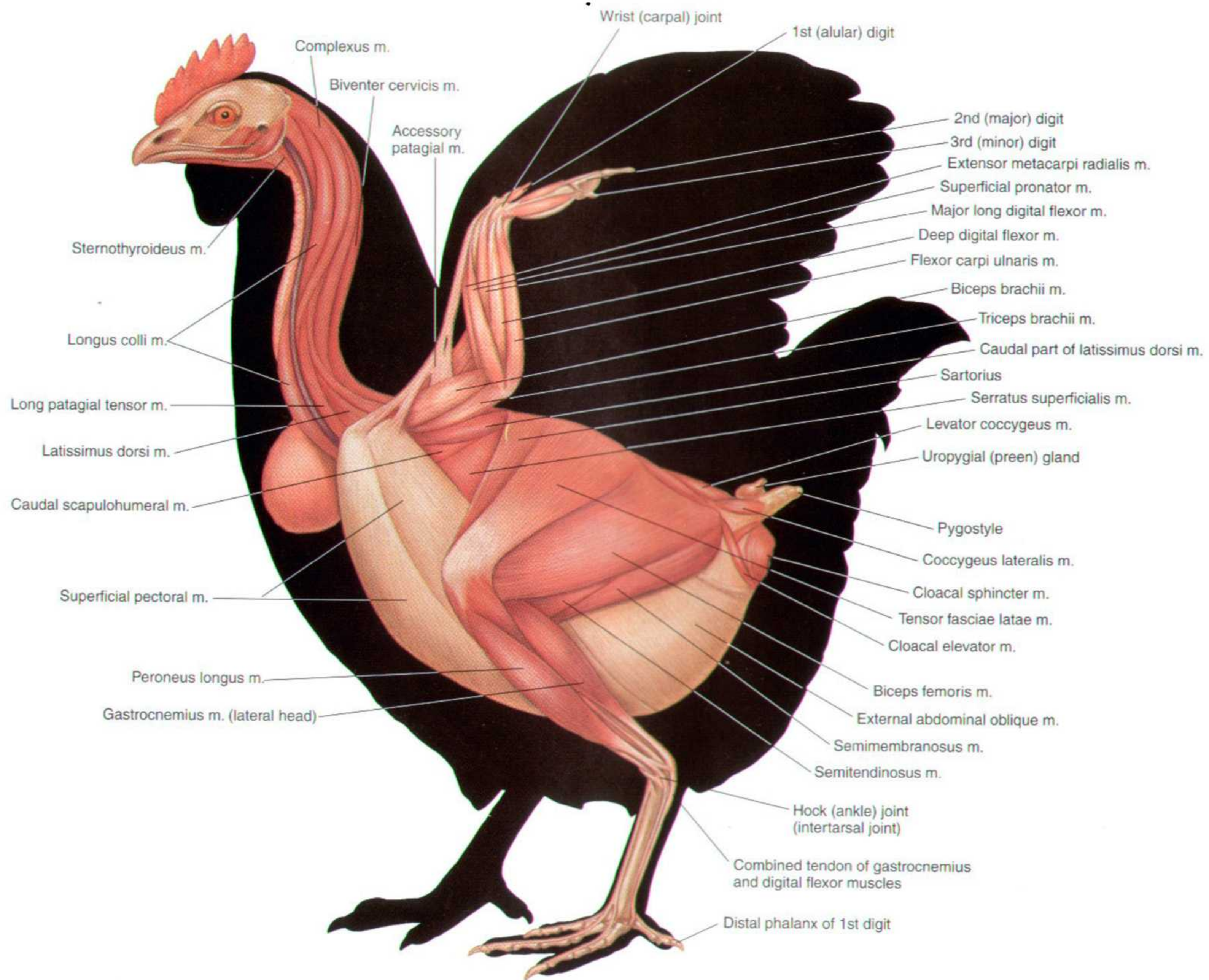


PLATE 7.6 Superficial muscles of the hen. Left lateral view. m = muscle



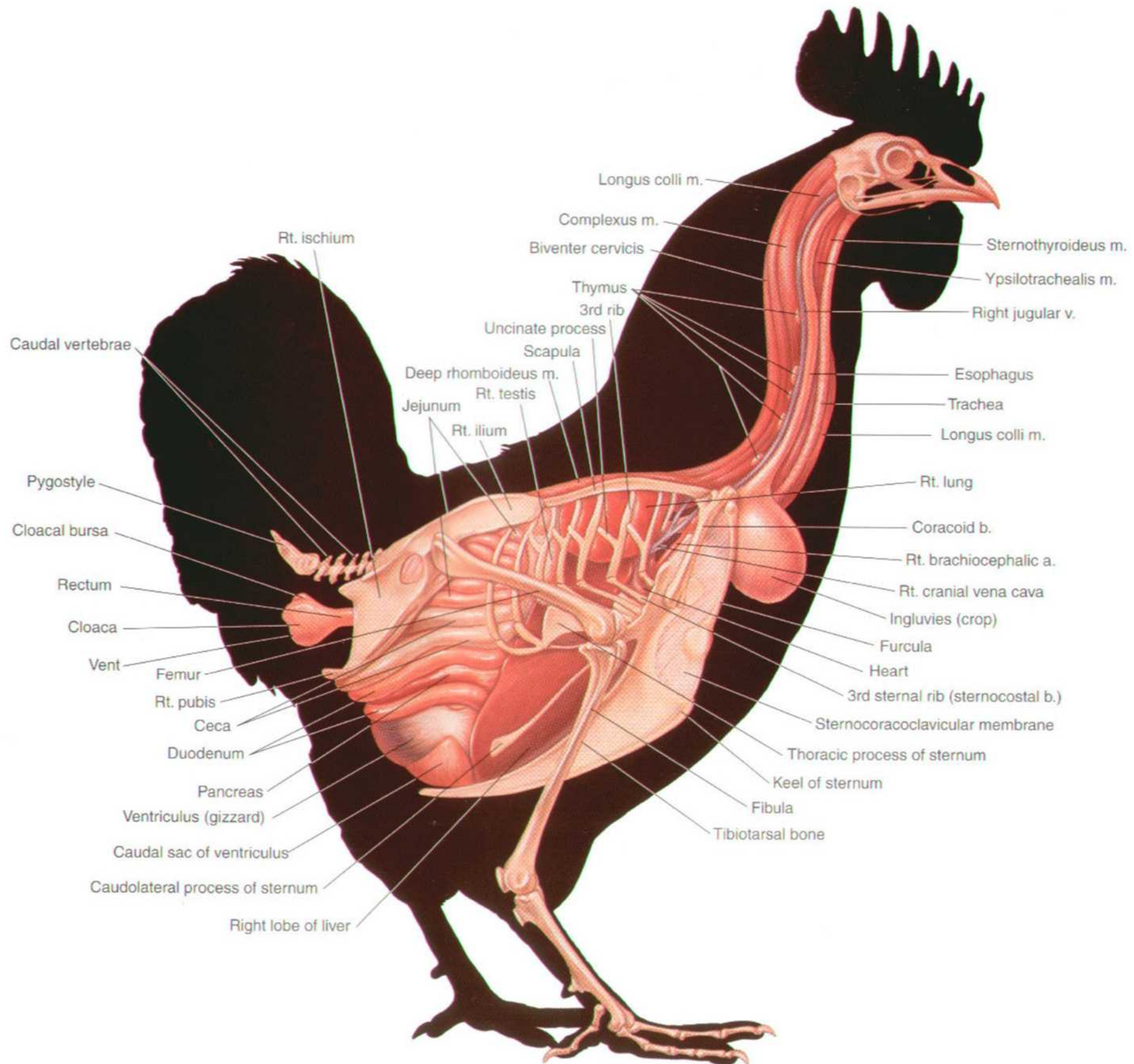
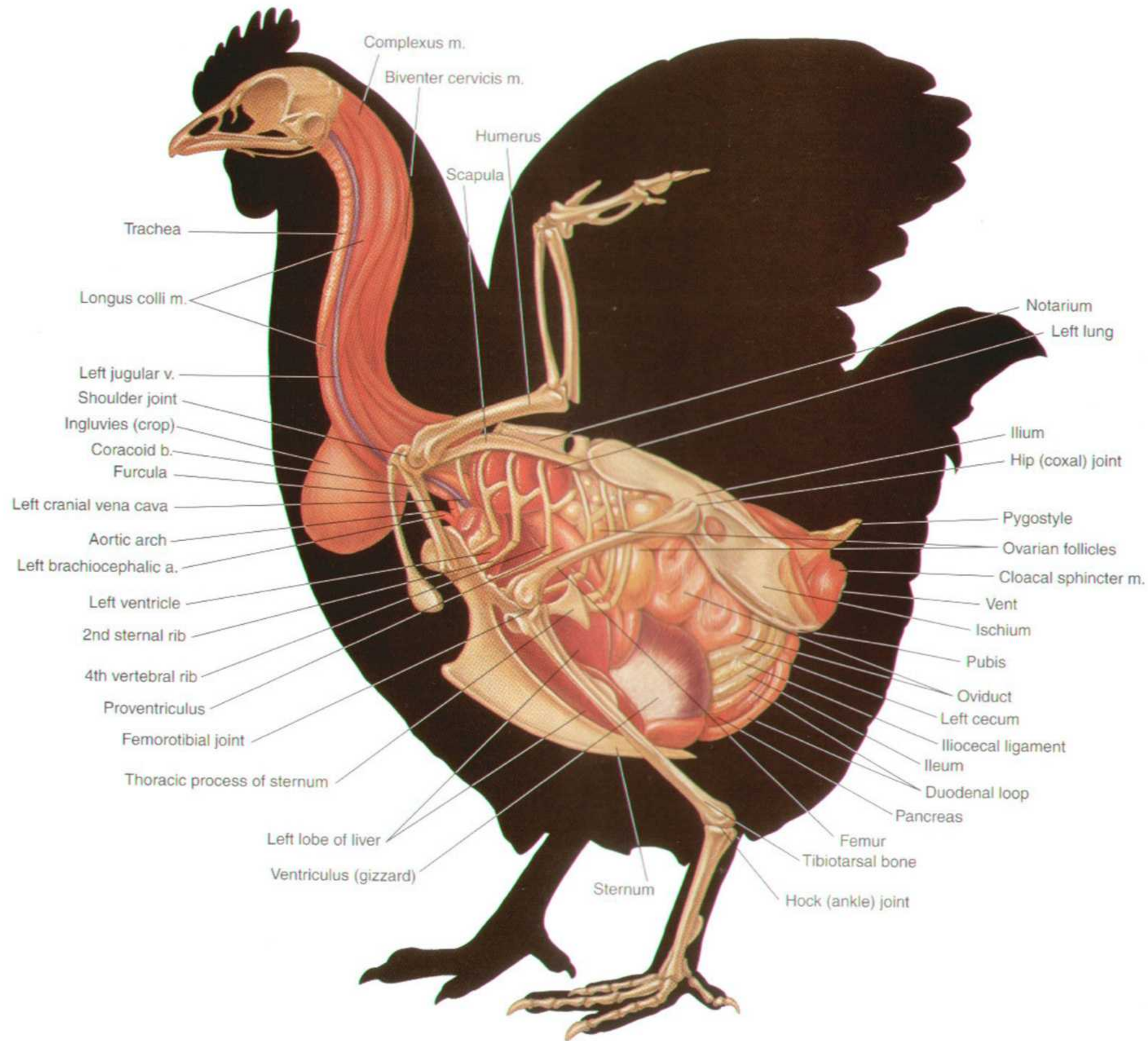


PLATE 7.7 Relations of *in situ* viscera to the skeleton and cervical muscles of the rooster.  
Right lateral view. m = muscle, b = bone, a = artery, v = vein





**PLATE 7.8** Relations of *in situ* viscera and blood vessels to the skeleton and cervical muscles of the hen. Left lateral view. m = muscle, v = vein, b = bone, a = artery



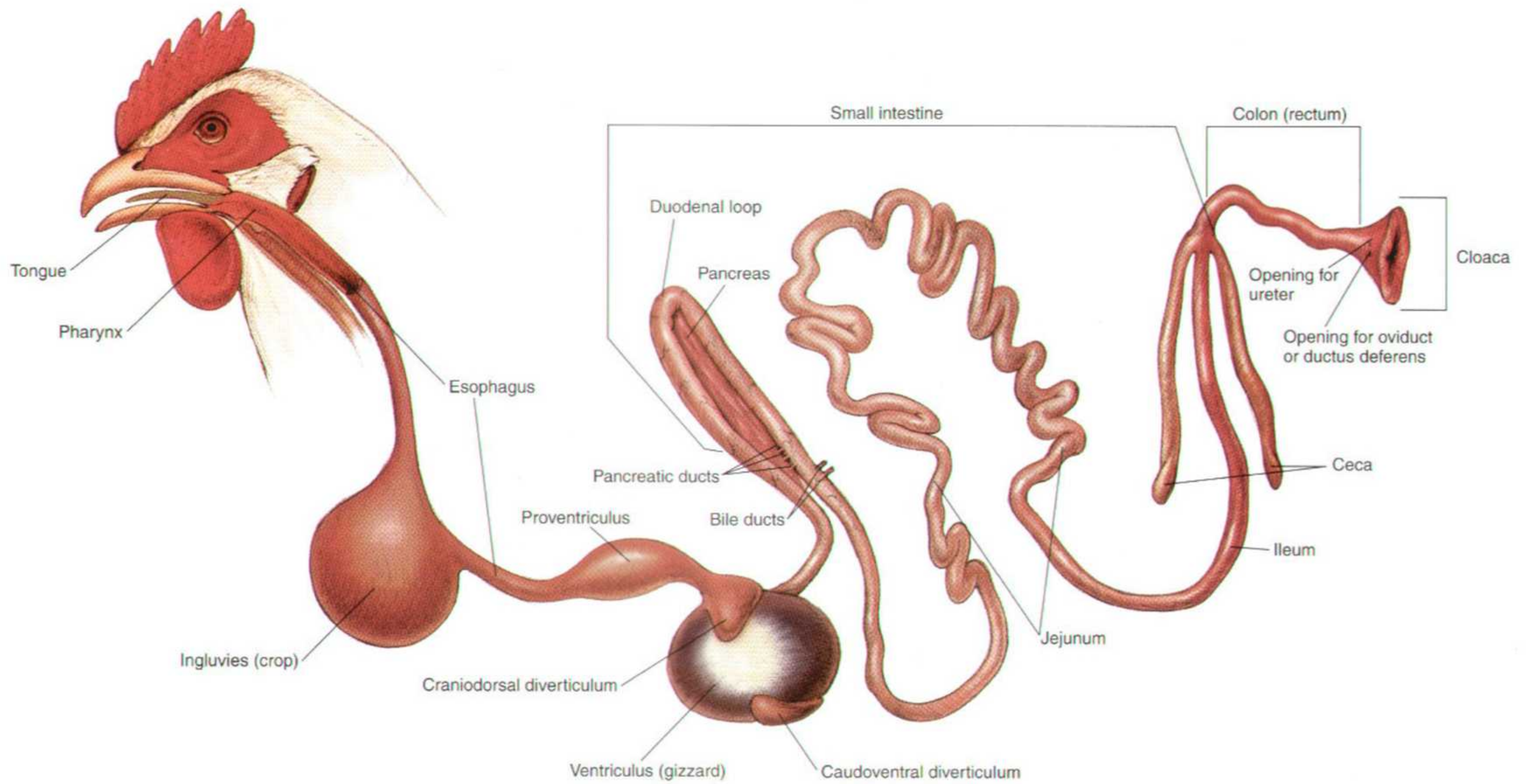
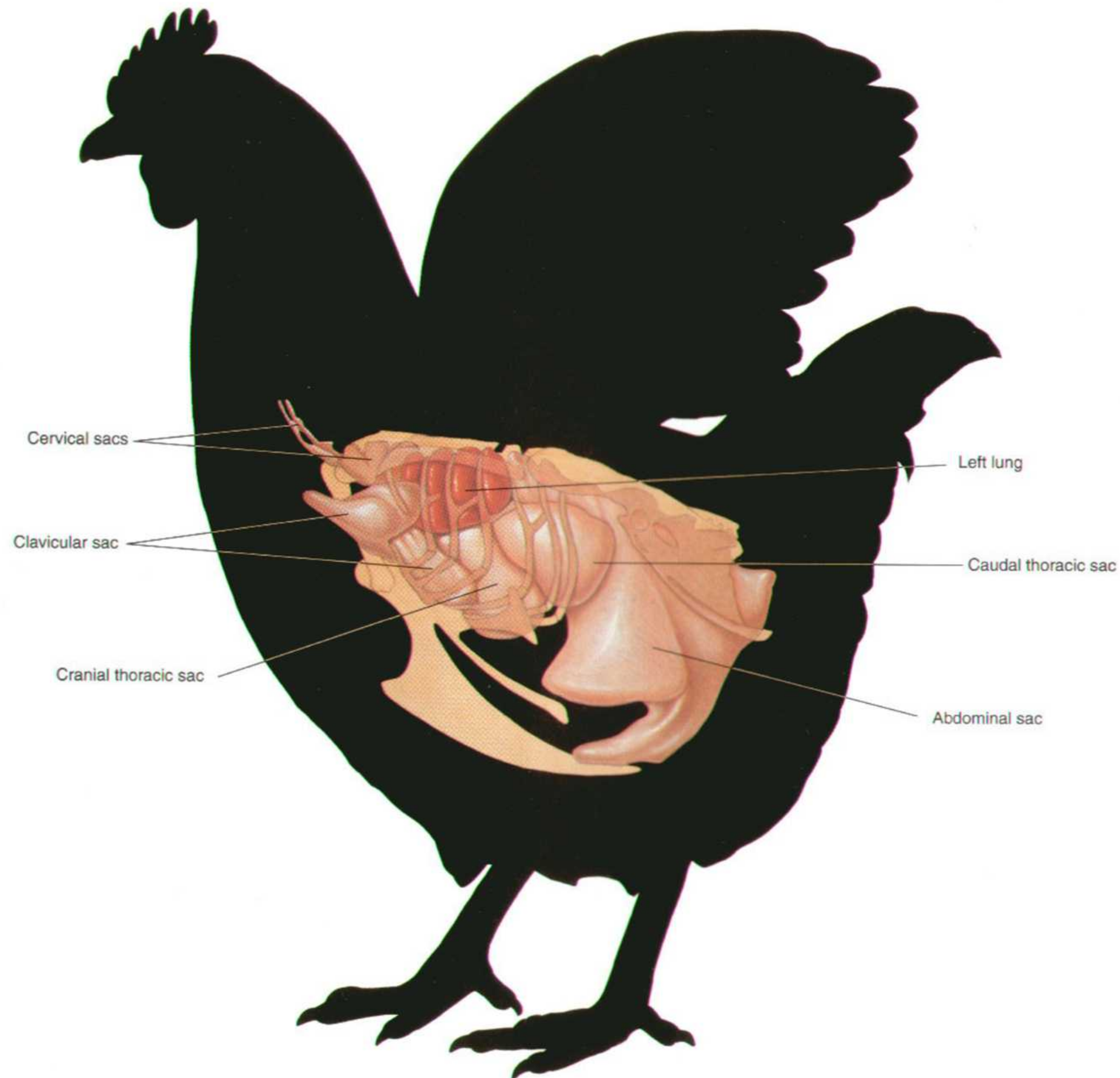


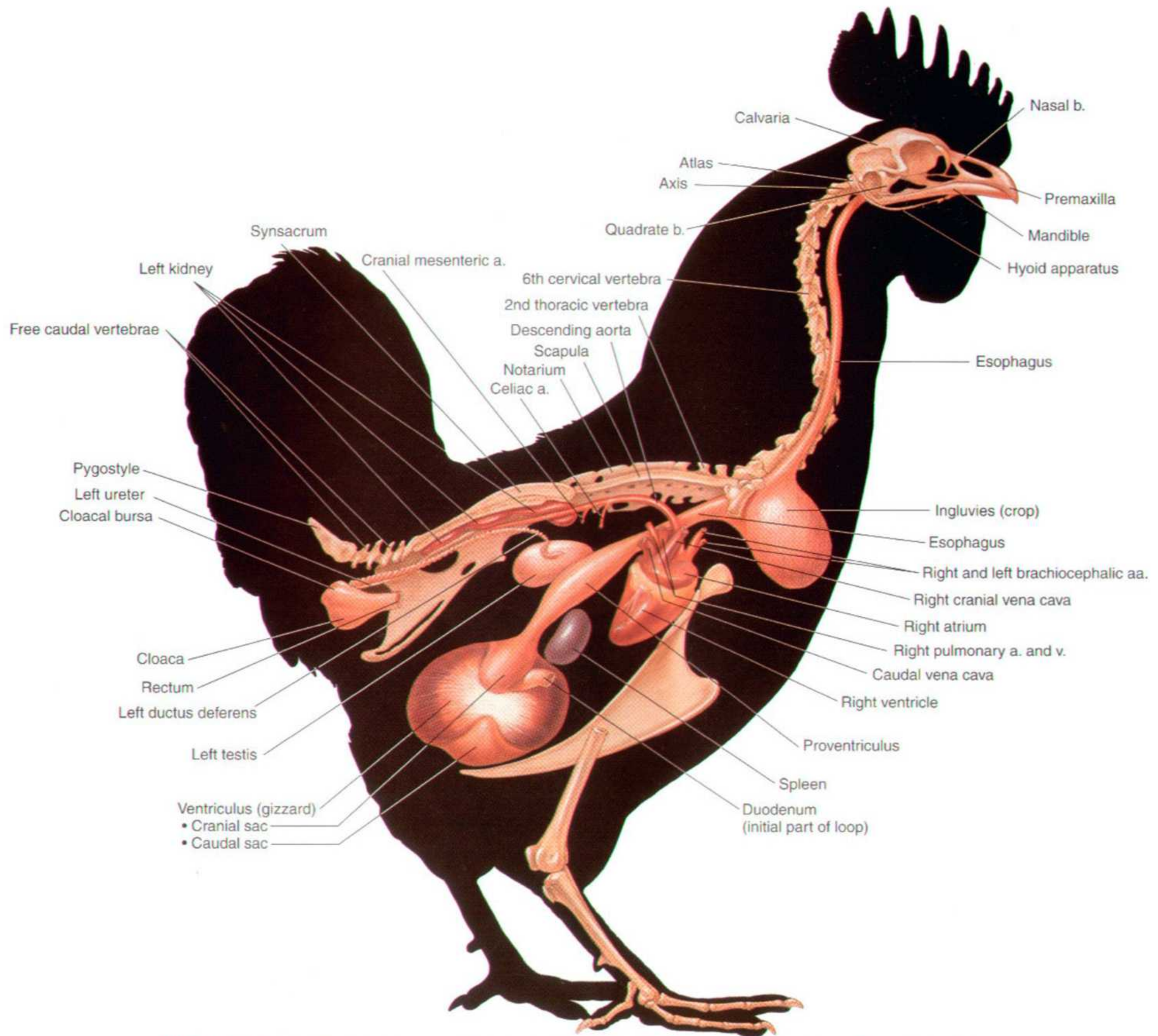
PLATE 7.9 Isolated gastrointestinal tract of the chicken.





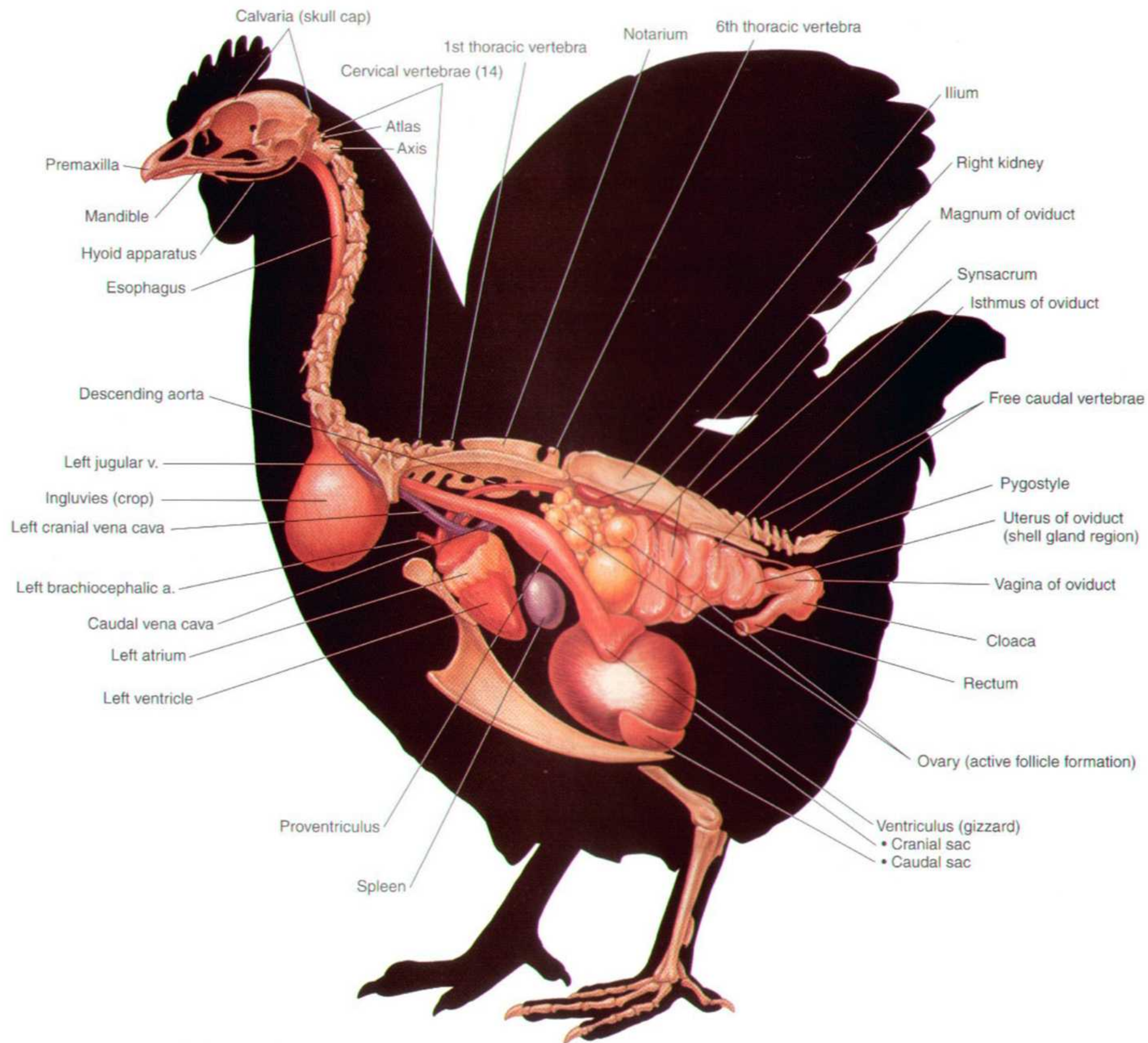
**PLATE 7.10** Air sacs and lungs of the chicken. Left lateral view. There is a total of eleven air sacs named according to location: abdominal, caudal thoracic, cranial thoracic, axillary, clavicular, and cervical. All are paired except the single clavicular sac. With the exception of the thoracic sacs, all provide communication between a bronchus and the interior of some of the pneumatic (air-containing) bones.





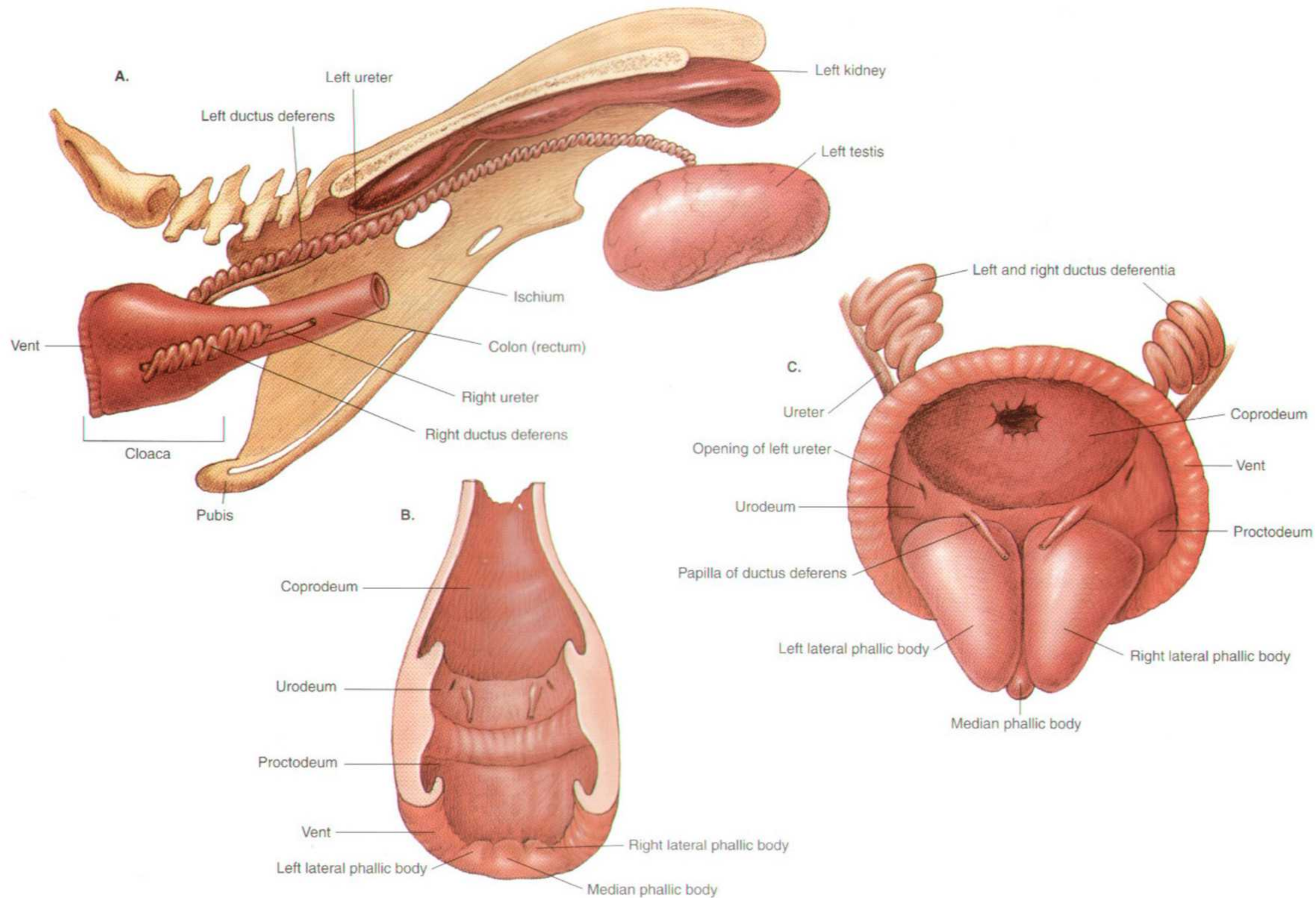
**PLATE 7.11** *In situ* viscera, major blood vessels, and axial skeleton of the rooster. Intestines, liver, and lungs are removed. Right lateral view. b = bone, a = artery, v = vein





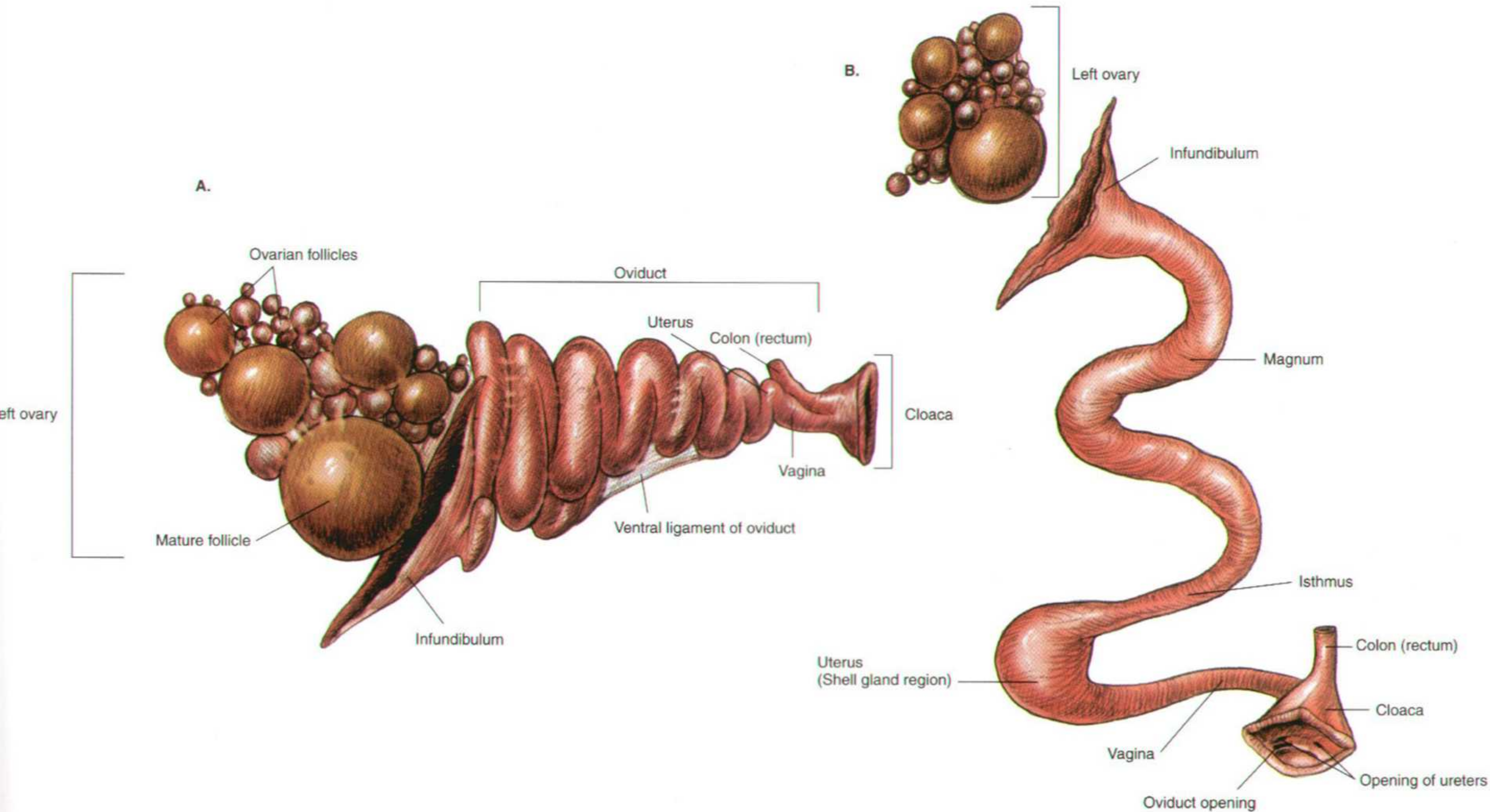
**PLATE 7.12** *In situ* viscera, major blood vessels, and axial skeleton of the hen. Intestines, liver, and lungs are removed. Left lateral view. v = vein, a = artery





**PLATE 7. 13** A. Reproductive and urinary organs of the rooster. Right lateral view. B. Cloaca of the rooster. Dorsal view. C. Erect copulatory apparatus. Caudodorsal view.





**PLATE 7.14** A. Isolated reproductive organs of the hen. Left lateral view.  
 B. Diagrammatic representation of the reproductive organs of the hen.



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# INDEX

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## C

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     cervical, **H** 6; **L** 94  
     crural, **H** 6; **O** 36; **S** 58; **G** 76; **L** 94; **Sw** 114  
     fascia lata, **H** 6, 7; **O** 36; **S** 58; **G** 76; **L** 94; **Sw** 114  
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alar, **H** 14; **O** 40; **G** 83  
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flank, **H** 22; **O** 32, 33; **S** 54; **G** 72, 73; **Sw** 110  
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Foot, **H** 1, 2; **S** 54; **L** 90

**Foramen (foramina)**

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Forearm, **H** 2; **O** 33; **G** 72; **L** 90

Forecannon, **H** 2

Forehead, **H** 2

Forelock, **H** 3

Foresaddle, **S** 56

Foreshank, **O** 32, 33; **S** 54, 56; **G** 72; **L** 90

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**G**

Gallbladder, **O** 38, 43, 44; **S** 60; **G** 80, 84

Gambrel cord, **S** 56

Ganglia. *See* Autonomic nervous system

Gaskin, **H** 2

Girth, **H** 3; **O** 32

Gizzard. *See* Ventriculus

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infraorbital, **S** 54, 55

inguinal, **S** 55

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mandibular, **S** 62

metatarsal scent gland complex, **L** 90, 91

of snout, **Sw** 118

parotid, **H** 7; **O** 37; **S** 59, 62; **G** 77; **L** 95; **Sw** 115, 118

prostate, **H** 22; **O** 46; **L** 106; **Sw** 124

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vesicular, **O** 46, **S** 66; **G** 86; **Sw** 122, 124

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**H**

Heart, **H** 12, 13, 20, 21; **O** 39, 38, 44, 45; **S** 61, 65; **G** 80, 81, 84; **L** 96, 97; **Sw** 117; **C** 134

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left auricle, **H** 21; **O** 45; **S** 65; **Sw** 123

left ventricle, **H** 20, 21; **S** 65; **G** 85; **L** 105; **Sw** 123; **C** 135, 139

right atrium, **O** 44, 45; **G** 84; **L** 104; **Sw** 122; **C** 138

right auricle, **H** 21; **O** 45; **S** 65; **G** 85; **L** 105; **Sw** 123

right ventricle, **H** 21, 22; **S** 64; **G** 84; **L** 104; **Sw** 122; **C** 138

Hindcannon, **H** 2

Hindsaddle, **S** 56

Hindshank, **O** 38; **S** 54, 56; **G** 72; **L** 90

Hip, **C** 129

point of, **H** 3. *See also* Hook

Hock, **H** 2, 11; **O** 32; **S** 54; **G** 72; **L** 90; **Sw** 111; **C** 128, 129

Hoof(s), **H** 3, 8, 9, 24; **O** 32; **S** 55; **G** 72, 73, 79; **Sw** 111

Hook, **O** 32; **G** 73

Horn, **O** 32; **S** 54; **G** 72

Hyoid apparatus, **H** 13. *See also* Bone(s)

Hypophysis cerebri. *See* Brain

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**I**

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Ileum, **H** 16; **L** 103; **Sw** 120; **C** 135, 136

Ingluvies, **C** 128, 132, 133, 134, 135, 136, 138, 139

Inguinal canal, **H** 22



Interdigital cleft, **G** 72  
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     Jejunum, Rectum  
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## J

Jaw, **H** 3; **O** 33  
 Jejunum, **H** 13, 16; **O** 38, 39, 41, 42; **S** 60, 61; **G** 80, 81; **L**  
     96, 97, 103; **Sw** 116, 117, 120; **C** 136  
 Joint(s)  
     ankle, **H** 2; **C** 135  
     antebrachiocarpal, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw**  
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     atlantoaxial, **H** 5  
     atlanto-occipital, **H** 5; **S** 64; **G** 81; **L** 97  
     break joint, **S** 56  
     carpometacarpal, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117  
     coffin, **H** 8, 13; **O** 39; **S** 61; **G** 81  
     costovertebral, **H** 5, 13; **O** 39; **Sw** 117  
     coxal, **H** 13; **O** 39; **G** 81; **L** 97; **Sw** 117; **C** 135  
     cubital, **O** 39; **L** 97  
     distal interphalangeal, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97;  
         **Sw** 117  
     elbow, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117  
     femoropatellar, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117  
     femorotibial, **H** 11, 13; **O** 39; **S** 61, 64; **G** 81; **L** 97; **Sw**  
         117; **C** 135  
         fetlock, **H** 8, 13; **O** 39; **S** 61; **G** 81; **L** 97  
     hip, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117; **C** 135  
     humero-radial, **H** 13  
     humero-ulnar, **H** 13  
     intertarsal, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117  
     metacarpophalangeal, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97;  
         **Sw** 117  
     metatarsophalangeal, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97;  
         **Sw** 117  
     middle carpal, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117  
     pastern, **H** 8, 13; **O** 39; **S** 61; **G** 81  
     proximal interphalangeal, **H** 8, 13; **O** 39; **S** 61; **G** 81;  
         **L** 97; **Sw** 117

sacroiliac, **H** 13; **S** 61; **G** 81; **L** 97; **Sw** 117  
 scapulohumeral, **H** 13  
 shoulder, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117; **C** 135  
 sternocostal, **H** 13  
 stifle, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117  
 tarsocrural, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117  
 tarsometatarsal, **H** 13; **O** 39; **S** 61; **G** 81; **L** 97; **Sw** 117  
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     fetlock, **H** 8  
     pastern, **H** 8  
 Jowl, **H** 3; **O** 33; **Sw** 110, 111, 112  
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## K

Kidneys, **H** 19, 20, 21; **O** 38, 44; **S** 60, 64, 65; **G** 80; **L** 96,  
     104, 105; **Sw** 116, 117, 122, 123; **C** 138, 139, 140  
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## L

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     laryngeal ventricle, **H** 14  
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     accessory l. of superficial digital flexor m., **H** 10  
     broad l. of uterus, **S** 67, 69; **L** 107; **Sw** 125  
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         97; **Sw** 116  
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     collateral sesamoidean, **H** 8  
     digital anular, **G** 78  
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