

## **PELVIC GIRDLE**

In the adult animal, three bones unite to form the pelvic girdle. There are 2 symmetrical hip bones (Ossa coxae) which meet ventrally at the pelvic symphysis. They articulate firmly with the sacrum dorsally and together with the sacrum and first caudal vertebrae form the bony pelvis. It encompasses and protects the pelvic viscera including the reproductive organ which in turn exerts physiological influence during pregnancy and parturition. It also plays a role in posture and locomotion in that ensures an effective transmission of forces from the hind-limb to the trunk

### **HIP BONE (ossa coxae)**

Each of the hip bone is composed of 3 bones with separate ossification centres within a single cartilage plate. Though in young animals, strips of cartilage demarcate the borders to allow for growth, they disappear once growth is complete 3 components as ilium (OS), Pubis (Os Pubis), Ischium (Os Ischium).

The pubis and Ischium of each hip unite together ventrally in the cartilaginous pelvic symphysis (a firm but non-rigid joint) allowing the 2 involved to move apart under hormonal influence to enlarge the birth canal in preparation for parturition. The pelvic symphysis is made of 2 parts. The cranial pubic part (Symphysis pubica) **pubic symphysis** and the caudal Ischial part called Ischial Ischiadica.

### **ILIUM**

This is the largest of the 3 flat bones. It is located in the craniodorsal part of the hip bone and extends obliquely from the acetabulum to the sacrum it is irregularly triangular and presents two

surfaces, 3 borders and 3 angles. It is divided into 2 parts: the cranial expanded wing (ala ossis ilia) and the caudal columnar body or the shaft of the ilium (corpus body ossis ilium). The ilium has 2 surfaces: gluteal surface which faces dorso-laterally and backward in standing animal. It is wide and concave in front and narrow and convex caudally. The wide part is crossed by curved gluteal line which extend from the medial border towards the tuber coxae. This surface gives attachment to the gluteus medius and gluteus profundus. The pelvic surface faces the opposite direction, convex outline and made up of 2 distinct parts and they are

- ❖ The medial triangular part and the lateral quadrilateral part: The medial triangular part is roughened for ligamentous attachment and bears an irregular auricular surface. The lateral quadrilateral part is smooth in its course. It is crossed by ilio-pectineal lines that starts from the ventral part of the auricular surface and continues down to the shaft to join the pubis at its cranial border. The ilio-pectinal line is interrupted by furrows for the iliaco-femoral vessels and just below this bears the psoas tubercle which gives attachment from the psoas minor muscle **CRANIAL BORDER** (crest) is concave, relatively thick and rough **THE MEDIAL BORDER** is deeply concave and forms the greater Ischiatic notch and continues caudally with the ischiatic spine. The lateral border is also concave and is rough for its greater part. The nutrient foramen is usually located about the caudal end of this border. **THE LATERAL ANGLE** also called (**Tuber coxae**) serves as the land mark for the hip in a standing animal. It's a quadrilateral large mass and bears a pair of tuberosities for muscular attachment. The acetabular angle meets the other 2 bones (**Ischium and pubis**) at the acetabulum.
- ❖ **MEDIAL ANGLE** :( **tuber sacral**) curves upward and backward (dorso-caudally) opposite the first sacral spine and it forms the highest point of the pelvic-girdle. The

lateral surface of the shaft of the ilium is convex and rough providing attachment from the deep gluteal muscle.

## **PUBIS**

It is the smallest of the 3 pelvic bones. It forms the cranial part of the floor of the pelvic cavity. The pubis also enters in the formation of the acetabulum. The cranial part of the floor of the pelvic symphysis is formed by two symmetrical pubic bones. The pubis forms the cranial border of the obturator foramen and the cranial border of the pubic bone is rough and forms a prominence called pubic tubercle.

The pubic bone has 2 surfaces, 3 borders and 3 angles. The two surfaces are the pelvic and ventral surfaces. The former is concave in the young subject and convex in the mare and stallion. The ventral surface is rough for muscular attachment and crossed by a pubic groove near its cranial border. This groove leads to the acetabular notch. The cranial border is thin in its medial part forming the pectin-ossis-pubis and laterally it bears the ilio-pectineal eminence.

The medial border joins the opposite bone at the cranial portion of pelvic symphysis.

The caudal border forms the cranial margin of the obturator foramen.

It has three angles- The medial angle, acetabular angle and caudal angle.

The Medial angle meets with its other pairs at the cranial end of the symphysis; the acetabular angle joins the ilium and Ischium at the acetabulum. While the caudal angle unites with the Ischium to form the inner boundary of the obturator foramen.

## **ISCHIUM**

It forms the caudal part of the ventral wall of the bony pelvis sloping ventromedially. It presents for description 2 surface (pelvic and ventral), 4 borders (cranial, caudal, medial and lateral) and 4 angles (craniomedial, craniolateral, caudomedial, caudolateral). The pelvic surface is smooth and slightly concave while the ventral surface provides for the attachment of the adductor muscle of the thigh. The cranial border forms the caudal border of the obturator foramen.

The Caudal border is thick and rough and slopes craniomedially uniting with its other border to form the ischial arch. The Medial border unites with its opposite at pelvic symphysis. The lateral border is thick and rounded and concave in its length forming the lesser ischiatic notch.

The caudolateral (acetabular) angle is thick and 3 sided especially in the dogs and horses, triangular in the cattle and pig. The Ischium can be largely divided into 3 parts: body, caudal plate and medial branch. The medial branch forms the caudal part of the pelvic symphysis. The caudal plate extends cranially into two angles: acetabular and medial angle both of which form the caudal circumference of the obturator foramen.

The body of the Ischium forms a part of the acetabulum while its dorsal border continues with the dorsal border of the ilium to form the Ischiatic spine. The Ischiatic arch is usually broad except in the horse where it is rather shallow and irregular.

## **THE ACETABULUM**

It is a deep cotyloid cavity formed by the three pelvic bones and lodges the head of the femur. An additional small bone, the small acetabular triangle in the carnivores also contributes to its formation. It faces ventrally and laterally and is formed by the body of the ilium craniolaterally and the body of the Ischium caudolaterally and the body of the pubis medially. The articulation of the acetabulum of the pelvic girdle with the femur forms the hip / coxal joint and is an

example of spheroidal joint. The acetabular cavities formed by the 3 bones are made of 2 parts; the peripheral articular lunate surface and the central acetabular fossa. The lunate surface of the acetabulum is crescentic and indented medially by a deep acetabular notch. The lunate surface is divided in the bovine by a craniolateral notch into a larger craniodorsal notch and a smaller caudoventral notch. The articular (lunate) surface is enlarged by a fibro-cartilagenous articular labium. The non-articular surface.

## **THE BONY PELVIS**

It is a broad-wing around the pelvic cavity is composed of the ossa coxarum, sacrum and first 3 caudal vertebrae. Specific differences in general form are very pronounced. The dorsal wall of the roof of the bony pelvis is formed by the sacrum and the first 3 caudal vertebrae. The floor of the ventral wall is formed by pubic and Ischial bones while the lateral wall formed by the acetabular part of the Ischial bone and the ilium. The broad sacro-tuberal ligaments closes up the bony defect in the lateral wall except in the carnivores where in the ligament is string shaped in the dog and absent in the cat. The pelvic inlet (cranial pelvic aperture) is bounded by the terminal line (Brim). The terminal line is composed of the sacral promontory dorsally, the ilio-pectineal lines laterally and the pectin ossis pubis ventrally. There are two principal diameters of the pelvic inlet of the bony pelvis: the conjugate or sacro-pubic diameter which spans from the sacral promontory to the cranial end of the pelvic symphysis and the transverse diameter which is measured at its greatest width just above the psoas tubercle. The pelvic outlet is formed by the first 3-4 caudal vertebrae dorsally, ventrally by the Ischiatic arc and the tuberosity and laterally by the broad sacro-tuberal ligament (absent in the cat). The floor of the pelvis is of obstetrical

importance; it is deep concave in ruminant especially in the transverse direction and inclined dorsally in the horse. The content of the pelvis are rectum, parts of the urogenital system, pelvic vessels and nerves. The pelvic cavity is lined by the peritoneum in the cranial part and by pelvic fascia in the caudal part.

## **FEMUR**

It is the largest long bone and it is at an angle of 70-80 to the horizontal plane inclined obliquely and articulates with the acetabulum above: tibia and patella distally in the standing animal.

The bone presents for description: a shaft and two extremities (proximal and distal extremities); 4 surfaces (cranial, medial, lateral and caudal surface). The shaft (diaphysis) in its general length is cylindrical except at its distal portion.

The cranial, medial and lateral surfaces of the femur are continuous and strongly convex. They are enveloped by the quadriceps femoris muscle. It has 2 border; lateral and medial border. The lateral border is prominent in the upper part bearing the trochanter tertius at the junction of its proximal and middle third. This process is curved forward and has a thick end to which the tendon of the superficial gluteal muscle is attached. Distal to it is the supracondyloid fossa from where the superficial flexor muscle arises. The supracondyloid fossa is bounded laterally and medially by the lateral and medial supra-condyloid crest respectively. The lateral supracondyloid crest furnishes the attachment of the medial head of gastrocnemius muscle. The border bears on its proximal part of trochanter minor which is a rough ridge that allows for the attachment of the ilio-psoas muscle.

The proximal extremity of the femur is large and consists of 3 parts: the head, neck and trochanter major (greater trochanter). The head is on the medial surface of the femur and is

directed medially, dorsally and somewhat cranially. It is almost hemispherical in shape and bears a smooth articular surface except where it is interrupted medially by a deep notch called fovea capitis into which the round and the accessory ligament are lodged.

The neck is indistinct except at the cranial and medial surface. The greater trochanter is on the lateral side possessing 3 prominent features. The cranial part is located opposite the head of the femur and rises above the level of the head thus giving attachment to the gluteus profundus. The caudal part is separated from the cranial part of the greater trochanter by notch. This furnishes the attachment of the gluteus muscle. It is continued downwards as the trochanteric ridge. Trochanteric ridge bears the lateral boundary of the trochanteric fossa into which there are numerous foramina. The distal extremity articulates with the tibia and patella. The articulation with the tibia is provided by 2 condyles directed caudo-distally and separated by a deep intercondyloid fossa. The abaxial surfaces of the condyles are roughed and are to give attachment to the lateral ligament of the stifle.

The lateral condyles also carry 2 depressions close to the articular margin. Epicondyles are found on the corresponding side of the condyles of the femur a little above it. The former being more distinct while latter is less pronounced - each bearing the medial and lateral collateral ligament respectively. The distal extremity bears the condyles behind and the trochlea in front. The trochlea articulates with the patella. It is made up of two ridges separated by a groove thus forming an extensive surface for the ligament of the patella. The patella or knee cap is a sesamoid bone developed within the insertion of the quadriceps femoris. It is ovoid in the dog but prismatic in the horse and cattle.

## **TIBIA AND FIBULA**

Unlike the analogous element of the fore-limb, they run side by side without any tendency to cross. The tibia is a long bone extending obliquely ventrocaudally from the stifle to the hock. It has a shaft and two extremities. The proximal extremity articulates with the femur and the distal extremity with the tarsal. The shaft is large which becomes reduced distally. It presents for description 3 surfaces (Medial, lateral and caudal surface) and 3 borders: the medial surface is broad above where it possesses rough prominence for the attachment of the medial ligament and the **sartorius** and **gracilis** muscle. The lateral surface is smooth and somewhat spiral while the caudal surface is rough and divided into 2 parts by the rough popliteal line which runs obliquely from the proximal part of the lateral border to the medial border. The region above this line is occupied by the popliteus muscle while that below the line is marked by rough muscular lines and this serve as point of attachment of the deep flexor muscle.

The cranial border is very prominent forming the crest of the tibia (tibia crest). The medial; surface of this crest provides a prominence for the attachment of the tendons of the semitendinosus. The proximal half of the medial border serves as the attachment for the popliteus muscle while the proximal part of the lateral border together with the fibula forms the interosseous space. The proximal extremity is 3-sided and bears 2 articular eminences (the medial and lateral condyles) that articulate with the corresponding condyle of the femur.

The intercondyloid eminence of the spine of the tibia is a central projection between the lateral and medial condyles. This is made up of 2 parts: the high medial part and the lower lateral part. Before, on and behind the spine are intercondyloid fossae into which the cranial cruciate ligament and menisci are attached. Both condyles are separated by a deep popliteal notch. The lateral condyle bears an over-hanging outer margin below which there is a facet for articulation with fibula.



The distal extremity is much smaller than the proximal extremity. It is quadrangular in outline (4 angle) and relatively larger medially than laterally. It presents an articular surface that fits the trochlea of the tibial tarsus (talus) bone and consists of two groove separated by a ridge. These grooves are bounded on either side by a malleolus which furnishes the collateral ligament of the hock joint. The medial malleolus being more prominent than the lateral malleolus.

## **FIBULA**

Like the classical long bone it has a shaft and two extremities. The shaft is a slender rod forming the lateral boundary of the interosseous space of the crus (leg). The proximal extremity or the head of the fibula is comparatively large with respect to the rest of the body with a narrow medial surface which presents along its dorsal border an articular surface for articulation with the lateral condyle of the tibia. The lateral surface is roughened providing attachment to the lateral ligament of the stifle joint. The distal extremity is fused with the tibia forming the lateral malleolus.

## **PATELLA**

The patella is a large sessamoid bone that articulates with the trochlea of the femur. It possesses for description 2 surfaces, 2 borders a base and an apex. The free surface is quadrilateral, convex and rough for muscular ligament attachment. The articular surface is also quadrilateral but is not extensive as the free surface. This surface has a ventral rounded ridge which fits into the groove of the trochlea of the femur.

It has medial and lateral borders which converge at the apex below. The apex is the ventral portion in a standing animal and the base faces caudo-ventrally. The lateral and medial border of

the patella both form angles at the base. The apex is directed distally while the base is directed dorsocaudally.

## **TARSAL BONES (HOCK)**

These are arranged in 3 tiers; the proximal tier which consists of 2 relatively large bones, the talus medially and the calcaneus laterally. The middle tier consists of a single central bone while the distal layer comprises of up to 4 bones which are numbered medio-laterally

The lateral fourth tarsal bone is constantly present and being deeper than the other intrudes into the middle tier. The Talus has a proximal trochlear surface; the distal surface which articulates with the central tarsal bone is flattened in the horse and rounded in other species. The calcaneus lies mainly lateral to the talus but extends a shelf-like process that overlaps the talus on its plantar surface and this process is called sustentaculum tali which support the deep digital flexor tendon. The larger part of the calcaneus projects proximally behind the tibia as a free lever arm to which the common calcaneal tendon attaches. This projection ends in a thickening that forms the basis for the hock (tuber calcis or calcaneal tuber)

The distal extremity of the calcaneus rests on the 4<sup>th</sup> tarsal bone. The central tarsal bone is interposed between the talus proximally and the first, second and third tarsal bones distally. Its proximal surface conforms to the talus being concave in most species except in the horse where it is flattened. Its distal articular surface is flattened. The central tarsal and fourth tarsal is fused in the ruminant. The distal tarsal bones are not always separate and present across species. In the horse I and II are fused, in the ruminant II and III are fused.

The metatarsal bones are longer than the metacarpals; the first metatarsal bone of the dog is rudimentary. The equine metatarsal bones are three in number with the 2<sup>nd</sup> and 4<sup>th</sup> metatarsal

bone located on the long axis of the plantar surface of the 3<sup>rd</sup> metatarsal bone. In the bovine the 3<sup>rd</sup> and 4<sup>th</sup> metatarsal bones are thought to be fused being separated by a vascular groove and so often regarded to as the large metatarsal bone. A small metatarsal bone (2<sup>nd</sup> metatarsal bone) may be present on the plantar surface of the large metatarsal bone. The phalanges resemble those of the thoracic limb so closely as to render separate description unnecessary.

## **THE PELVIS**

The pelvic peritoneum is continuous with that of the abdominal peritoneum which is then reflected into the viscera from one organ to other thus a number of folds and pouches are formed and are named accordingly. **The peritoneum is the thin serous membrane which lines the abdominal cavity and the cranial part of the pelvic cavity and covers a greater extend or less the viscera contained there in.** In the male, it is a completely closed sac but in the female, it has 2 small opening at its caudal portion. These openings are the abdominal orifices of the uterine tube. The structures that bound the outlet of the pelvis incloses the perineum.

- a) **Mesorectum:** This suspends the rectum within the peritoneal cavity and its reflection of the peritoneum from the dorsal wall onto the rectum. A pouch is formed as a result of this and is called sacro-rectal pouch.
- b) The **peritoneum** again passes thru the ventral aspect of the rectum to form a transverse fold which lies between the rectum and the urinary bladder and is called a **Urogenital Fold**. Its concave free part on either side passes into the inguinal canal. The formation of the genital fold produces a recto-genital pouch and in the male the genital fold contains the ductus deferens, part of the seminal-vesicles and the remnant of the uterus (uterus masculinus). In the female, the genital fold becomes enlarged in order to accommodate

the uterus and part of the vagina. It forms fold externally and this is the broad ligament of the uterus which attaches the uterus to the side of the side of the pelvic cavity and the lumbar part of the abdominal wall. The broad ligament appears therefore to divide the peritoneal cavity into a dorsal and ventral compartment. The reflection of the ventral fold in the dorsal part of the urinary bladder produces a vesico-genital pouch.

- c) The peritoneum passes from the ventral surface of the bladder to the pelvic floor forming the pubo-vesical pouch or vesico-pubic pouch. All these pouches communicates cranially, on passing or moving from the bladder into the pelvic, the peritoneum forms a median plane.
- d) The middle ligament of the bladder. The peritoneum also passes on either side of the urinary bladder to form the lateral ligament of the bladder. The lateral ligament contains in its edge, the round ligament of the bladder

#### SEXUAL DIFFERENCE IN THE ANATOMY OF THE PELVIC GIRDLE

- ❖ The conjugate and transverse diameter is usually larger in females than in the male. Imaginary line from the shaft of a ilium to the shaft of another (transverse diameter) an imaginary line from the sacral promontory to the pubis (conjugate diameter)
- ❖ The pelvic floor of the female is more concave than the male
- ❖ The obturator foramen of the female is wider and bigger than the male.
- ❖ The ischiatic arch is deeper and larger in the bovine than in the equine

#### **ARTHROLOGY OF THE PELVIC LIMB/HIND LIMB**

The pelvic limb is joined to the trunk by the pelvic girdle. The hip bone is united mid-ventrally by the cartilage to form a pelvic symphysis. The cranial part of the pelvic symphysis ossifies with advancement in age whereas the caudal part remains unossified (Ischial symphysis) in most species. The ilium articulates dorsally with the sacrum to form the sacro-iliac joint. The bony pelvis is formed by the 2 hip bones, the sacrum and the first 2-3 caudal vertebrae. The obturator membrane is a thin layer of fibrous tissues which covers the obturator foramen. The major joints of the pelvic limbs are; sacro-iliac joint, coxo-femoral joint, stifle joint, hock joint (tarsal joint). The prime movers of the hip joint are the gluteus, medius, ilio-psoas and the biceps femoris muscle. The prime movers of the pelvic joint are the biceps femoris, quadriceps femoris and gastrocnemius muscle. The quadriceps femoris muscle forms the patella after it is fully ossified.

**SACRO-ILIACX JOINT:** Is a highly apposed synovial joint (true joint) formed by the auricular surfaces of the wing of the ilium and the wing of the sacrum. The articular surfaces are covered by cartilages and a joint is enforced by the ventral sacroiliac ligament, and the interosseous sacro-iliac ligament (divided into 2 branches, a short branch which extends between the sacral tuber and the mammillary processes in the carnivores and pigs or the spinous process of the sacrum (ruminant and horses) and long branch which extends between the sacrum tuber and the lateral part of the sacrum. The sacro-tuberal ligament which is fibrous cord in the dogs absent in the cat extends between the transverse process of the last sacral vertebrae and the Ischial tuberosity. In the ungulates (hoofed animals), it is expanded to the broad sheet between the lateral part of the sacrum in the bovine or the transverse processes of the 1<sup>st</sup> caudal vertebrae in the equine and swine and the dorsal border of ilium and Ischium and it is thus called the broad sacro-lateral ligament. Both the greater and the lesser Ischiatic foramina remain uncovered to allow for the passage of vessels, nerves and tendons.

## HIP JOINT (COXA-FEMORAL)

It is a spherical joint; it is formed by the head of the femur articulating with the acetabulum. The acetabulum forms the articular surface of the horse coxae and the head of the femur fits with the acetabulum rather closely. The acetabulum is deepened by a band of fibro-cartilage (acetabular ridge) applied to the acetabular rim. Unlike in the dog and cat, the range of motion of the hip joint is restricted in the ungulates to flexion and extension with limited capacity for abduction and adduction and rotation. This is due to the shape of the head of the femur, the intra-articular ligament and massive muscle of the thigh.

## LIGAMENTS OF THE HIP JOINT

There are at least 3 ligaments associated with the hip joint.

- i. Cotyloid ligament
- ii. The ligament of the head of the femur/round ligament: This is a very short or strong ligament that originates from the floor of the acetabulum at the acetabular fossa and attaches to the head of the femur particularly at the fovea capitis. It is well developed in the horse where it gives a lot of strength to that joint. It is largely intra-scapsular and is covered by the synovial membrane.
- iii. Accessory ligament of the femur: It is present only in the horse and is detached from the rectus abdominis muscle which has its origin at the pre-pubic tendon. Passes through the acetabular notch and inserts close to the ligament of the head of the femur in the fovea capitis.
- iv. Transverse acetabular ligament: It bridges the acetabular notch and keeps the other two ligaments (ligament of the head of the femur and accessory ligament) in place.

In the dog, the ligament of the femoral head is well developed while in the bovine, it is weak or even absent.

### **GLUTEUS SUPERFICIALIS MUSCLE**

In the ruminant it is widely incorporated into the biceps femoris to form gluteo-biceps muscle

### **GLUTEO BICEPS MUSCLE**

It is a very large muscle, situated on the caudo-lateral aspect of the hip and thigh. It runs caudal to the femur, superficial to the gluteus medius and it is believed to mark the end of the gluteus superficialis. It is fused to the gluteus medius.

O: Sacral spine, broad sacro-tuberal ligament Ischiatic tuber, gluteal fascia by a strong tendon to the portion of the Ischium near the obturator foramen.

I: Cranially to the lateral patella ligament to the fascia lata, crural fascia and also the patella and the calcaneus.

A: Flexes the hip joint, the stifle and to rotate the limb away (abduct)

B.S: Cranial and caudal gluteal artery, medial circumflex femoral, lateral circumflex femoral and the popliteal arteries

N.S: Caudal gluteal nerve/tibia nerve

### **GLUTEUS FEMORALIS**

Narrow band muscle between the gluteus superficialis and the biceps femoris. It is found only in the cat.

O: 2<sup>nd</sup> and 4<sup>th</sup> caudal vertebrae

I: lateral aspect of patella and fascia lata by means of an aponeurosis

A: Retraction and abduction on the limb and extension of the hip

### **GLUTEUS MEDIUS**

Is a large, thick and fleshy muscle largely filling space between the tuber coxae and the greater trochanter of the femur. It has 2 heads (superficial and deep heads). The deep head is a band-like (gluteus-accessory muscle).

O: Lateral angle of the ilium (tuber coxae) on its gluteal surface, sacro-tuberal ligament and gluteal fascia

I: Greater trochanter and the trochanteric ridge

A: It extends the hip joint, rotates the femur and abducts the hip

B.S: Cranial gluteal, deep circumflex iliac, medial and lateral circumflex femoral

N.S: Cranial gluteal nerve

### **GLUTEUS PROFUNDUS**

It's a thin wide fan-shaped muscle which crosses over the hip caudoventrally.

O: Tuber coxae, the lateral part of the shaft of the ilium, the ischiatic spine, broad sacro-tuberal, sacro-iliac ligament.

I: neck of the femur

A: Abduct the thigh and rotate it medially

B.S: Cranial gluteal and lateral circumflex femoral

N.S: Cranial gluteal nerve

### **TENSOR FASCIA LATA**



Most cranial part muscle of the thigh

I: Fascia lata and femoral fascia

O: Tuber coxae as well as gluteal fascia

A: Tenses the fascia lata and flex the hip joint, extend the stifle, abducts the limb.

B.S: Deep circumflex iliac and lateral circumflex iliac art

N.S: Cranial gluteal nerve

## **CAUDAL MUSCLES OF THE THIGH**

These muscles cover the caudal part of the thigh and extend from the Ischium to the tibia with their tendinous components continuing as part of the common calcaneal tendon. These muscles are multi-articular spanning the hip, stifle joint and in some the tarsus. In the ungulates, some of these muscles possess vertebral heads (origin: which arises from the sacral and caudal vertebrae in addition to their pelvic heads. The vertebrae heads are well developed in the horse and account for the specie-specific round appearance of the rump. They include; biceps femoris, abductor muscles of the thigh, semitendinosus and semimembranosus.

## **BICEPS FEMORIS**

The largest and most lateral of the muscles of the thigh, it is superficially covered only by the fascia and skin. It consists of the strong cranial part which arises from the sacrum and sacrotuberal ligament (vertebral head) and the smaller head (pelvic head) which arises from the Ischium. In the ruminant and pigs, the vertebral head is firmly fused to the gluteus superficialis to form the gluteo-biceps.

## **ABDUCTOR MUSCLES OF THE THIGH**

Is a strap-like abductor muscle of the thigh; **found only in the carnivores.**

O: The sacro-tuberal ligaments extends distally under the caudal edge of the biceps femoris

I: Crural fascia

A: Assist the biceps femoris in the abduction of the limbs

N.S: Fibular nerve

B.S: Caudal gluteal artery

### **SEMI TENDINOSUS MUSCLE**

Long fleshy fusiform muscle lying between the gluteo, biceps and the semimembranosus.

O: Caudo ventral surface of the ischiatic tuber and the gluteo biceps

I: By an aponeurotic tendon to the tibial crest the crural fascia and tuber calcis

A: Extends the hip and hock, flexes the stifle and rotates the leg medially

B.S: Deep femoral, medial circumflex femoral

N.S: same as the gluteo biceps

### **SEMIMEMBRANOSUS**

Long and thick fleshy muscle lying on the caudal part of the rump

O: Ventral surface of the Ischiatic tuber, caudoventral surface of the Ischium

I: Medial epicondyle of the femur behind the medial collateral ligament and also the medial articular margin of the tibia

A: Extends of the hip joint and adducts the limb

B.S: femoral, caudal gluteal and the obturator arteries

N.S: Ischiatic nerve and tibia nerve

## **MEDIAL MUSCLES OF THE THIGH**

Primarily responsible for the adduction of the limb and it prevents unwanted abduction. It extends between the pelvic floor and the femur on the medial surface of the thigh. They include the Sartorius muscle, gracilis, pectineus, adductor muscle, and the first two being the most medial muscle.

### **SARTORIUS MUSCLE**

A narrow band-like muscle, extending from the cranio-medial surface of the thigh to the stifle.

O: Iliac fascia and the tendon of the psoas minor and the shaft of the ilium

I: By aponeurosis, to medial surface of the proximal end of the tibia and the medial patella ligament

A: Flexes the hip joint and adduct the limb

B.S: Circumflex iliac

N.S: Femoral and saphenous nerve

### **GRACILIS MUSCLE**

A broad flat muscle, quadrilateral in outline which lies superficially on the caudal portion of the medial aspect of the thigh behind the sartorius.

O: Ventral median raphe of the ilium formed by the symphyseal tendon, also the pre-pubic tendon

I: Medial patella ligament, crural fascia surrounding the tendon of the gastrocnemius muscle and the flexor digitorum superficialis

A: To adduct the limb & simultaneously flexes the stifle joint and extend the hock joint

B.S: Saphenous and femoral

N.S: Obturator nerve (for all medial thigh muscle)

### **PECTINEAL MUSCLE (PECTINEUS)**

A long muscle in the bovine, somewhat triangular, it is fusiform in the equine

O: Pre-pubic tendon, cranial border of the pubic bone and the accessory ligament (in the equine)

I: the middle of the medial border of the femur near the nutrient foramen

A: Adduct the limb and flexes the hip joint

N.S: Obturator nerve

B.S: Femoral and saphenous nerve

### **ADDUCTOR MUSCLE**

Is fleshy prismatic muscle which lies behind the pectineus and the vastus medialis

O: Ventral surface of the pubis and Ischium

I: Medial epicondyle of the femur, medial ligament of the stifle joint

A: To adduct the limb and to extend the hip joint and rotate the femur medially

B.S: Deep femoral art

N.S: Obturator nerve

The femoral canal is exposed in the dissection of gracilis and the Sartorius muscle. It is bounded cranially by the Sartorius caudally by the pectineus, laterally by ilio-psoas and the vastus

medialis. The medial wall is formed by the femoral fascia and the gracilis muscle. It contains deep inguinal lymph node femoral artery and the saphenous nerve.

## **INNER PELVIC MUSCLES**

They form a rather heterogeneous group of small muscles which are situated close to the hip joint. They have minor functions i.e. coordinating the movement of the hind limb. Except for the articularis coxae, they are called the small pelvic association. They are found between the pelvis and trochanteric fossa of the femur and they include; internal obturator muscle, quadrates femoris, Articularis coxae, Gemellus muscle and external obturator muscle.

## **MUSCLES OF THE STIFFLE**

Most of the hip muscles especially the hamstring acts on the stifle joint because they insert on the structures found around the joint or part of the joint which is located distal to the stifle joint. There are only 2 muscles that act primarily on the stifle joint and they are quadriceps femoris (Vastus lateralis, Vastus medialis, vastus intermedius and rectus femoris). Popliteal muscle

## **MUSCLES OF THE CRUS (LEG)**

They include the extensors and flexors of the tarsus and digits. They are grouped into 2 broad divisions according to the location of their bellies. They are muscles found on cranio-lateral aspect of the tibia, caudo-lateral aspect of the tibia whereas the medial aspect of the tibia is free of the muscle bellies. The muscles of the caudo-lateral aspect of the crus are the flexor of the digit extensors of the tarsus. The cranio-lateral muscles of the crus flex the tarsus and extend the digits. The flexors of the tarsus (hock joint) are on the dorsal surface of the leg while the flexors of the digits are on the plantar surface.

## **THE CRANIO-LATERAL (OR DORSO-LATERAL) MUSCLES OF THE CRUS**

They are long with extended and fleshy belly. They arise from either the distal end of femur or from the proximal end of the tibia or fibula. Their tendons of insertions are multi articular and divided into a branch for each functional digits they either to the metatarsus or phalanges. They are innervated by fibula nerve. Based on the actions of these muscles, they are divided into:

- i. Flexors of the tarsus
- ii. Extensors of the digits

## **FLEXORS OF THE TARSUS**

- i. Tibialis cranialis
- ii. Fibularis longus
- iii. Fibularis brevis
- iv. Fibularis tertius

## **EXTENSORS OF DIGITS**

Extensor digitorum longus

Extensor digitorum lateralis

Long extensor muscles of the 1<sup>st</sup> digit extensor

## **PLANTAR MUSCLES OF THE CRUS AND DIGITS**

They arise from the distal end of the femur and/or from the proximal end of the tibia and fibula. The extensor of the tarsus insert on the calcaneus while the flexor of the digits is continued in the middle and distal phalanges. They are all innervated by the nerves while the muscles are gastrocnemius muscle and the soleus muscle.

The flexors of the digits are flexor digitorum superficialis, flexor digitorum profundus. This is deep are divide into 3 sub parts; tibialis caudalis, lateral digital flexor muscle and medial digital flexor muscles.

The interosseous muscle and lumbricales muscles are well developed in the carnivores as compared to other domestic animals and arranged like those of the thoracic limb.

## **INNER PELVIC MUSCLES**

Internal Obturator Muscle

Origin: Pelvic surface of the pubis and Ischium around the obturator foramen

A: To rotate the femur outward

Insertion: The trochanteric fossa

B.S: Obturator & pudic arteries

N.S: Great sciatic nerve

### **EXTERNAL OBTURATOR MUSCLES**

O: Ventral surface of the pubis and Ischium

I: The trochanteric fossa

A: To adduct the thigh and to rotate it outward

B.S: Deep femoral and obturator arteries

N.S: Obturator Nerve

### **GAMELLUS MUSCLE**

O: Lateral border of the Ischium near the Ischiatic spine

I: The trochanteric fossa and ridge

A: To rotate the femur outward

B.S: Obturator artery

N.S: Great sciatic nerve



## **QUADRATUS FEMORIS**

O: The ventral surface of the Ischium

I: An oblique line on the caudal surface of the femur near the trochanter minor

A: To extend the hip joint and adduct the thigh

B.S: Deep femoral and obturator arteries

N.S: Great sciatic nerve

## **MUSCLES OF THE STIFFLE**

### **VASTUS MEDIALIS**

O: The medial surface of the femur

I: The medial border of the patella and its cartilage

A: To extend the stifle joint

B.S: Femoral and anterior femoral arteries

N.S: Femoral nerve

### **VASTUS LATERALIS**

O: The lateral border and surface of the femur

I: The lateral part of the cranial surface of the patella

A: To extend the stifle joint

B.S: Iliaco-femoral and popliteal arteries

N.S: Femoral nerve

### **RECTUS FEMORIS**

O: Two depressions on the shaft of the ilium

I: The base and cranial surface of the patella

A: To extend the stifle joint and flex the hip joint

B.S: Femoral and iliaco-femoral arteries

N.S: Femoral nerve