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ON THE MYOLOGY OF HYRAX CAPENSIS.

By JAMES MURIE, M.D., AND ST. GEORGE J. MIVART, F.Z.S.

Since the time of Cuvier, naturalists seem generally to have agreed to show him in associating the *Hyrax* with the perissodactyle Pachyderms.

Professor Huxley, however, in an elaborate and interesting paper on the structure of the placenta in this species, read before the Zoological Society in June 1863, stated important facts, which had led him greatly to doubt the accuracy of his illustrious predecessor's determination.

It therefore becomes a matter of great zoological and anatomical interest to ascertain *precisely* the details of the anatomy of this somewhat anomalous genus, so that valid data may be obtained for the formation of a true judgment as to its real affinities, and from which its definite place in the system of nature may be correctly ascertained.

It would be a superfluous task to enumerate here all the earlier and well-known dissertations on, and descriptions of, this animal; but we may refer to two papers published in the 'Proceedings' of this Society,—one by Professor Owen, read in December 1832, containing a most interesting description of its internal structure, and comparing many of its varied characters with those of the Rodents, Pachyderms, and Edentates; the other by the late Mr. W. Martin, read in February 1835, corroborating Pallas's and Professor Owen's observations. We may also allude to H. Kaula's earlier Monograph, published in 1830*.

Since this present paper was undertaken, our attention has been called to a notice by Prof. J. F. Brandt, in the 'Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg,' tome v. no. 7, p. 508, in which that author appears inclined to restore the *Hyrax* to the place assigned to it by Pallas, namely, among the Rodents, although at the same time he mentions his discovery in it of a sac-like enlargement of the Eustachian tube similar to that existing in the Horse.

The author further announces his intention of soon laying before the Imperial Academy a complete account of the anatomy of the *Hyrax*; but we are not aware that this has yet been done; so that we may, in fairness, be permitted to state the results of our examination of the myology of this animal—the more so since, as far as we know, scarcely anything has hitherto been published on this subject beyond Meckel's observations, and because several of the facts we have noticed seem to us of considerable interest, and perhaps may even be found, if taken along with the peculiarities of the skeleton, to contribute some little towards the elucidation of its natural affinities.

Before proceeding to the description of the muscles, we must express our regret that the mutilated condition of the lower part of the neck and the abdomen in our specimen, prevented the accurate determination of several points of considerable interest.

* Monographia Hyracis. Diss. inaug. quam præside Rapp. publ. examini submittit H. Kaula. Tubing. 1830.

Muscles of the Head and Neck.

Masseter.—From the very great size of the ascending ramus of the mandible, this muscle presents a very broad surface, and it answers the description given by Cuvier * and Meckel †.

The *external pterygoid* arises from the pterygoid fossa at its outer and anterior margin, and is inserted into the neck of the mandible (fig. 1, *E. p.*).

The *internal pterygoid* has origin by a strong tendon from the hook-like process at the lower extremity of the outer margin of the pterygoid fossa, and from the posterior and inner margin of that fossa. It spreads out in a fan-shaped manner, and is inserted into the concavity of the mandible behind the mylo-hyoid foramen, between the *digastric* and the bone (figs. 1 & 2, *I. p.*). The external and internal pterygoid we found to be completely and distinctly separate, and by no means confounded together as Cuvier states ‡. We particularly mention the distinctness of these two muscles, in order to demonstrate more clearly the true nature of the *digastric*.

Fig. 1.

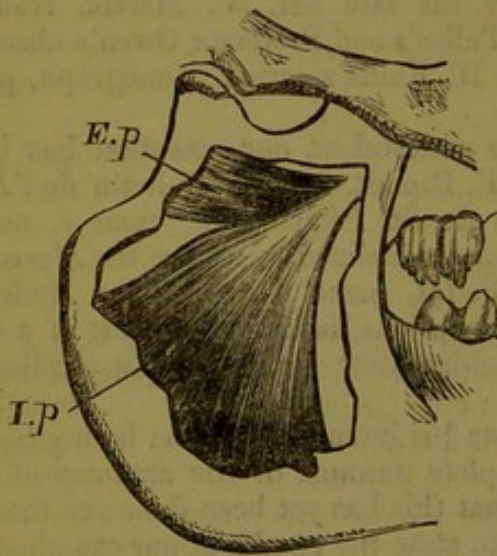


Fig. 2.

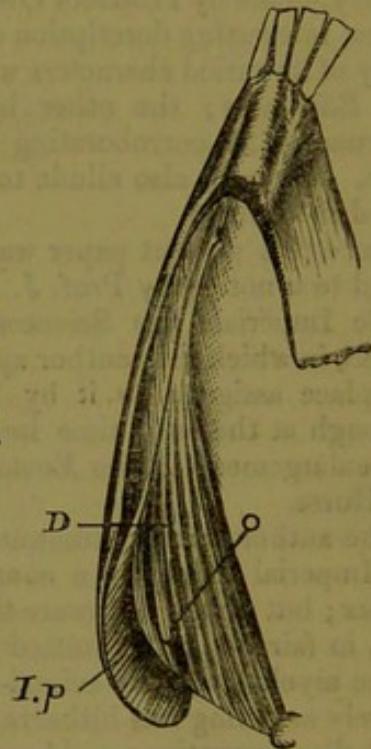


Fig. 1. Ramus of the lower jaw. A portion of the bone is removed, to show the pterygoid muscles. *E. p.* External pterygoid. *I. p.* Internal pterygoid.

Fig. 2. Right half of inferior maxilla, seen from below. *D.* Digastric. *I. p.* Fibres of insertion of the internal pterygoid into the angle of the mandible.

The *stylo-hyoid* arises from the paramastoid process, behind the

* Anat. Comp. tome iv. part 1, p. 69.

† Anat. Comp. tome viii. p. 476.

‡ Anat. Comp. vol. iv. part 1, p. 91.

digastric, and is inserted as usual; it is strong and relatively thick, as Meckel says*.

The *stylo-glossus* is very well defined, arising from the anterior margin of the paramastoid, and having the usual insertion into the tongue.

On the left side we observed a long narrow muscular slip, arising from the paramastoid by a delicate tendon, and descending the neck; but its insertion we could not ascertain. This we took to be the *stylo-pharyngeus*.

Digastric.—This is very large and much flattened, and lies closely appressed to the concavity inside the mandible, behind and beneath the mylo-hyoidean ridge. It arises from the paramastoid, along with the three last-mentioned muscles and the third head of the *sterno-cleido-mastoid*; but the digastric occupies the greater portion of that process. It is inserted inside and along the whole of the inferior margin of the mandible, as far as a little behind the symphysis, delicate fibres running on almost to the symphysis itself (see fig. 2, D.). Though this muscle is not exactly double-bellied, yet there is more or less of glistening tendon on both sides posterior to its middle. Cuvier's description is correct as far as it goes†, also that of Meckel‡, who particularly mentions its great width.

The *sterno-hyoid* and *thyroid* muscles had their usual insertions into the hyoid bone and thyroid cartilage; but their *origin* was destroyed. All the other muscles connected with the larynx were well developed, except the *omo-hyoid*, which we did not find. Meckel§ says that it (*le scapulo-hyoïdien*) is wanting.

The fibres of the *platysma myoides* are strongly developed, and posteriorly the muscle is in intimate union with the *cleido-mastoid* (or *cephalo-humeral*), which it overrides (fig. 3, P. m.).

Sterno-cleido-mastoid.—First part, *cephalo-humeral* or *cleido-mastoid*, strong and long, arises from the occiput, and is inserted into the ulna in common with the biceps (figs. 3 & 4, C. h.). At the upper part, as already mentioned, its union with the *platysma myoides* is so close that the line of demarcation is hardly to be defined.

On comparing the muscles of a Guinea-pig (*Cavia*) with those of our *Hyrax*, we found the *sterno-cleido-mastoid* had nearly the same origin and insertion at the upper part of the humerus; however, it differed from the *Hyrax* in having a distinct attachment to a rudimentary clavicle.

The second part, or true *sterno-mastoid*, is very thick and bulky, and with an unusual origin, which may perhaps have led to its being confounded with the digastric||. It arises by a strong tendon from the summit of the posterior margin of the ascending ramus of the mandible, and also by fasciæ from the posterior border of the same, and from the surface of the *masseter*. It is inserted into the manubrium, and joins its fellow of the opposite side in the lower half of the neck (fig. 4, S. cl. m. 2).

* Anat. Comp. tome viii. p. 507.

† Op. cit. tome iv. part i. p. 94.

‡ Op. cit. tome viii. p. 478.

§ Loc. cit. p. 507.

|| Owen, Proc. Zool. Soc. 1832, p. 207.

The connexion of this second part of the sterno-cleido-mastoid with the mandible offers an interesting resemblance to the attachment of the same muscle in the Horse.

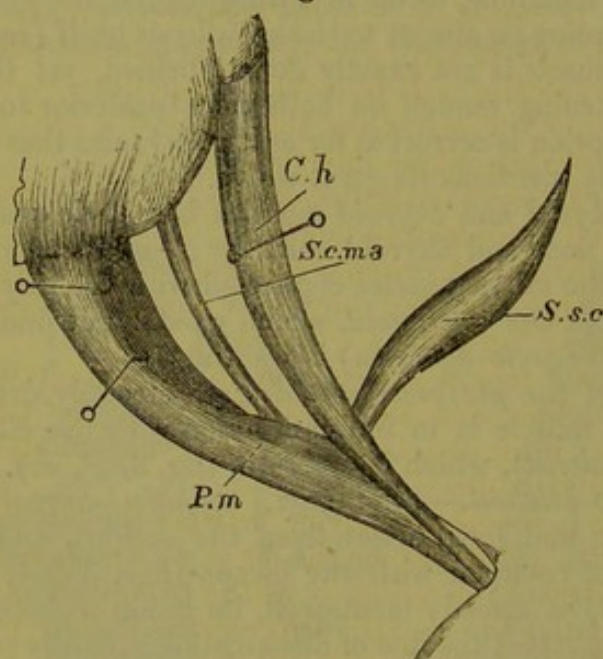
Meckel describes this muscle, in the *Hyrax*, as connected with the mastoid process by a strong and long tendon*.

In the Guinea-pig this portion of the muscle did not arise from the jaw, but from the skull, as usual.

The third part of the *sterno-cleido-mastoid* is very slender, and not unlike an *omo-hyoid* in appearance (see fig. 3, *S. c. m. 3*). It arises from the paramastoid, and joins deeply the conjoined portions of the two foregoing parts of this muscle.

This may be what Meckel alludes to in the passage just referred to, and appears also to be the "*troisième ventre*" spoken of by him, at page 162, as being often found in Man.

Fig. 3.



Diagrammatic view of superficial muscles of the neck.

P. m. Platysma myoides, its attachments to the lower jaw and forearm; above, it is cut open and drawn back by hooks to expose *S. c. m. 3*, the third small portion of the sterno-cleido-mastoid. *C. h.* Cephalo-humeral. *S. sc.* Sterno-scapular.

The *longus colli* has attachment upon the ventral surface of the cervical vertebræ, the 2nd to 7th inclusive, and is inserted in the thorax, on the bodies of the first six dorsal vertebræ.

The *rectus capitis anticus major* arises from the cervical vertebræ, from the 6th to the 3rd, and is inserted into the basioccipital.

We found no trace of the *rectus capitis anticus minor*, at least as a separate muscle.

The *rectus lateralis* is well developed, arising from the transverse process of the atlas, chiefly its anterior surface, and being inserted into the paramastoid.

* Anat. Comp. tome vi. p. 163.

The *scalenus anticus* is strong, though small, extending from the transverse processes of the 5th, 6th, and 7th cervical vertebræ to the first rib.

A slip of this muscle descends in front of the thorax as far almost as the cartilage of the third rib. This is not noticed by Meckel*.

The *scalenus posticus* is very long and flattened, proceeding from the 3rd, 4th, and 5th ribs, and being inserted into the transverse processes of the 4th, 5th, and 6th cervical vertebræ. Meckel† gives but one insertion, namely, into the 5th cervical vertebra.

There is no third scalenus.

The *splenius capitis* and *splenius colli* arise in common from the spinous processes of about the 4th, 5th, and 6th dorsal vertebræ, and proceed upwards and outwards, the first being inserted into the occiput, the second into the transverse process of the atlas, as mentioned by Meckel‡.

The *complexus major* is large, and separable at its origin into several slips. It has origin from the transverse processes of the vertebræ, from the axis to sixth dorsal, and is inserted into the occiput internal to the splenius. It is in close apposition, vertically, to its fellow of the opposite side (like the leaves of a book), no strongly developed *ligamentum nuchæ* intervening.

The *complexus minor* is smaller, and is found to arise from lowest cervical and first two dorsal vertebræ, and to be inserted into the occiput between the *splenius capitis* and *complexus major*, immediately below the former. Like the *complexus major*, it is separable below into several slips; but these are united by fasciæ.

The *complexus tertius* arises from the zygapophyses of the two first dorsal vertebræ, and continues upwards to the transverse process of the atlas, being attached also to the zygapophyses of the intervening cervical vertebræ.

This muscle is very distinct, lying between the last and the *transversalis cervicis*; yet it has not, as far as we know, received a separate name. Meckel§ describes it as the *transversalis cervicis*; but this it cannot be, as the *transversalis cervicis* is always the continuation into the neck of the *longissimus dorsi*, whereas our muscle lies distinctly internal to such continuation. Both Quain and Ellis|| are

* *Loc. cit.* p. 260.

† *Loc. cit.* p. 156.

‡ *Loc. cit.* p. 140.

§ *Loc. cit.* p. 147. He describes the true *transversalis cervicis* as the *cervicalis ascendens*.

|| 'Demonstrations of Anatomy,' 5th edition, page 427. The author, in a footnote, says, "The anatomy of the prolongation from the longissimus might be simplified by describing it as the transversalis muscle with a double insertion, like the splenius, into the head and neck—" *transversalis capitis*," " *transversalis colli*." These muscles, we think, may, however, be better tabulated as follows:—

Sacro-lumbalis	Cervicalis ascendens.
Longissimus dorsi	Transversalis cervicis.
	Complexus tertius.
	Complexus minor.
	Complexus major.

The transversalis cervicis is the transversalis colli of Ellis.

The complexus minor is his transversalis capitis, also the trachelo-mastoid of many authors.

clear as to this essential nature of the *transversalis cervicis* in Man; and Burdach corrects Meckel on this point as regards the Apes. Of course it cannot be considered as the *biventer cervicis*, as this is always on the *inside* of the *complexus*.

The *transversalis cervicis* is but the continuation of the *longissimus dorsi*, and is very wide and conspicuous. It is inserted into the five lowest cervical vertebræ by muscle, which has superimposed conspicuous tendons, one to each transverse process. This is the *cervicalis ascendens* of Meckel*.

The *cervicalis ascendens* is wanting, as there is no evident continuation of the *sacro-lumbalis* into the neck, except perhaps a few fibres to the seventh cervical vertebra.

The *rectus capitis posterior major* is a large and powerful muscle, arising from the spine of the axis, its whole outer surface, and with an insertion into the occiput.

The *rectus capitis anterior minor*, as usual, extends from the neural laminae of the atlas to the occiput, beneath the last.

The origin of the *obliquus capitis superior* is the transverse process of the atlas. Its insertion is into the occiput, between the superior and inferior curved lines.

The *obliquus capitis inferior* is very large. Its origin is from the neural lamina and base of the spinous process of the axis, and it is inserted into the transverse process of the atlas.

These last four muscles are exceedingly well developed, and they together form a prominent inverted fleshy pyramid.

The *levator claviculae* is strong; it arises from the transverse process of the atlas, and is inserted into the fascia covering the *teres minor*, passing over the neck of the scapula. Meckel does not notice this muscle in the *Hyrax*.

Muscles of the Back and Abdomen.

Trapezius.—This muscle is very extensive, arising along the median line of the back, from the occiput as far as the middle of the dorsal region, overlapping the *latissimus dorsi*. It is inserted into the scapula—the anterior part of the muscle upon the spine towards its acromial end, the posterior part of the muscle below (behind) the spine. Some fibres of the anterior portion of the muscle are involved with the *platysma myoides*, somewhat in the manner described by Meckel†.

The *rhomboideus major* has origin from the spines of the 6th, 7th, 8th, 9th, and 10th dorsal vertebræ, with an insertion into the posterior angle of the scapula.

The *rhomboideus minor* is represented by a small delicate muscle, arising from the spine of the sixth dorsal vertebra, and being inserted, superficially to the last, into the cartilaginous portion of the scapula.

These muscles are probably subject to some variation, as Meckel‡ describes three muscles in the place of these two, and in addition our next muscle also.

* *Loc. cit.* p. 149.

† *Loc. cit.* p. 225.

‡ *Loc. cit.* p. 241.

Rhomboideus capitis or *occipito-scapular*.—From the occiput, ligamentum nuchæ, and spines of the vertebræ*. It narrows as it proceeds outwards and backwards, and is inserted into the scapula opposite to the base of the spine. At its insertion, this muscle is folded, the concavity of the fold being directed backwards (fig. 5, *R.c.*). It is the "*rhomboïde antérieur*" of Meckel†.

The *latissimus dorsi* is closely connected with the *panniculus carnosus*. It arises as usual (that is, taking into consideration the great number of dorsal vertebræ), and at its insertion bifurcates, one slip joining a part of the similarly bifurcating *panniculus carnosus*, and being with it attached to the aponeurosis covering the *biceps*; the other part, which is tendinous, unites with the *teres major* and another portion of the *panniculus carnosus*, and with them is inserted into the inner margin of the bicipital groove of the humerus. As Meckel remarks‡, the vessels and nerves of the arm pass out between its two insertions.

The *serratus magnus* is a most extensive and powerful muscle, which contains inseparably united with it the *levator anguli scapulæ*, as Meckel is also inclined to think§. It arises from the transverse processes of the cervical vertebræ, from the third to the seventh, besides from the first five ribs, and by ten digitations from the ribs posterior to these. It is inserted along the whole length of the border of the scapula (fig. 5, *S.m.*). Meckel|| remarks its great size: it is indeed an excellent example of the way in which the body of quadrupeds is, as it were, slung to the scapula by this muscle, as was remarked by Cuvier¶.

The *serratus posticus* is most remarkably developed: Meckel says** that the *Hyrax* is apparently the mammal in which it is the most so. It arises by tendon from the ligamentum nuchæ, quite at the hinder end of the neck, and from the fascia of the back. It is inserted by well-marked digitations (so as truly to merit its name *serratus*) into all the ribs, except the first three. It covers and is closely applied to the *sacro-lumbalis*.

The *sacro-lumbalis* is very small and narrow, though long. It has the usual origin and insertion, its all but completely aborted cervical continuation being the *cervicalis ascendens*.

The *longissimus dorsi* is rather largely developed; it arises and is inserted as usual. Its large and marked cervical prolongation is the *transversalis cervicis* above described.

The *panniculus carnosus* appears as an extensive sheet of muscular fibres, covering the whole back, the sides, and abdomen. It is thinnest towards the median line of the back, but is of considerable

* The attachments of this muscle differed slightly on the two sides, on the left extending as far backwards as the sixth dorsal, but on the right its attachment was not so extensive; and in general appearance it more resembled a levator anguli scapulæ.

† *Loc. cit.* p. 241.

§ *Loc. cit.* p. 234.

¶ *Leçons d'Anat. Comp.* vol. i. p. 369.

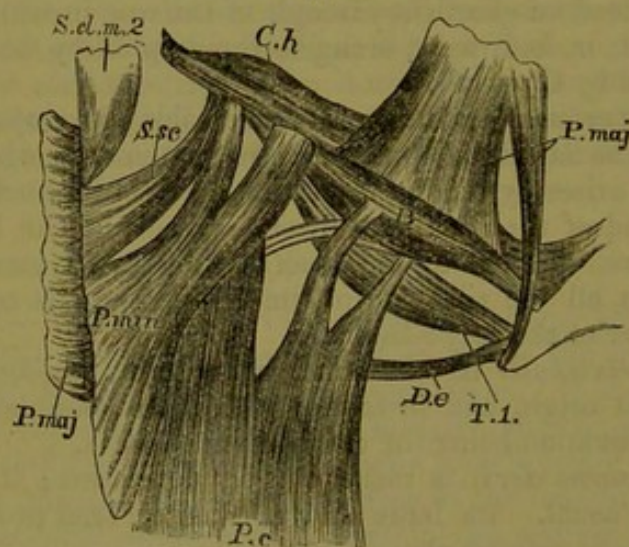
** *Loc. cit.* p. 188.

‡ *Loc. cit.* p. 263.

|| *Loc. cit.* p. 246.

thickness in the pectoral region. Its attachments are the median line of the back, the median line of the abdomen, anteriorly and above to the fascia covering the scapula. Anteriorly below (where the muscle is thicker) it divides into two separate layers, the deep and much narrower one being inserted into the lesser tuberosity of the humerus, and so intimately connected with the insertion of the pectoralis minor as to be readily confounded with it. The more superficial portion, with its antero-posteriorly directed fibres, covering the front of the thorax, fixes itself so as to be in a manner fused with the obliquely directed fibres of the pectoralis minor at the posterior border of that muscle. The outer portion of this superficial layer, however, terminates in a slip, which bifurcates, one part being attached to the fascia covering the biceps in common with a portion of the latissimus dorsi, as above described, the other part being inserted into the inner margin of the bicipital groove of the humerus, in common with the teres major and other portion of the latissimus dorsi (see fig. 4, *P. c.*). The fibres of the posterior part of this muscle (the panniculus carnosus) converge from the back opposite the ilium, and from the lower portion of the abdomen, to form a pyramidal fasciculus, which passes to the lower limb, and is inserted into the superficial aponeurosis of the leg over the knee.

Fig. 4.



Muscles of the thoracic region.

P. maj. Pectoralis major (cut through and turned back). *P. min.* Pectoralis minor. *S. cl. m. 2.* Sterno-mastoid, its second part. *S. sc.* Sterno-scapular. *C. h.* Cephalo-humeral. *B.* Biceps. *T. 1.* First portion of triceps. *D. e.* Dorso-epitrochlear. *P. c.* Panniculus carnosus.

The *external oblique* is very long, considering the proportions of the animal. It arises from the whole of the ribs, except the three most anterior ones; Meckel * states, from all except the first five. Its other attachments are from the crest of the ilium and linea alba,

* *Loc. cit.* p. 194.

its anterior two-thirds. It does not go to form a Poupart's ligament, nor an outer inguinal ring; but the fibres converge opposite the crest of the ilium, and proceed by a pointed fasciculus, which is inserted upon the adductors of the femur to the outer side of the pyramidalis muscle. At its insertion, the fibres are very weak and reduced to a mere fascia. Meckel* says that those animals in which the testicles do not descend externally offer no trace of an inguinal ring; and this is a characteristic example.

The *internal oblique* and *transversalis* were closely united together. They offered no remarkable peculiarities, except their attachment to many ribs.

From the mutilated condition of the specimen, we could not make out with certainty the boundaries and attachments of the *rectus abdominis*; but, according to Meckel†, it is wide, attached anteriorly to the sternum, high up, and all the ribs to the first.

We found the *pyramidalis* unmistakeably present in our specimen, although this would seem to be opposed to what Meckel says with reference to the non-existence of this muscle generally, and to his unsuccessful search for it in the *Hyrax* ‡. It is inserted into the symphysis pubis, as usual.

Muscles of the Fore Limb.

The *pectoralis major* arises from the anterior three-fourths of the sternum, the median raphe between it and its fellow of the opposite side being very slight. At its upper border, between the anterior end of the sternum and the head of the humerus, it is closely connected with the cephalo-humeral or first part of the sterno-cleido-mastoid, which covers its insertion into the humerus. The *p. major* bifurcates opposite the axilla, the posterior part being inserted into the fascia of the forearm just beneath the olecranon, the anterior part into the humerus external to the biceps (fig. 4, *P. maj.*). The pectoral muscles are very adherent to each other, but still their limits are easily traced. We did not find two *layers* in the *pectoralis major*, as Meckel§ mentions. We fancy, from his description, that he has included a portion at least of the *p. minor*, and possibly part of the *panniculus carnosus*, in his description of this muscle. At its insertion into the humerus, this muscle has a pouch-like fold, the concavity being turned forwards and inwards.

The *pectoralis minor* has an origin from the lower half of the sternum, and it is inserted into the greater tuberosity of the humerus (fig. 4, *P. min.*). At a short distance from its insertion a strong muscular slip is given off, which diverges slightly and joins the sternoscapular muscle. At its outer border, the fibres of the *p. minor* are joined almost at right angles by those of the large *panniculus carnosus*, as previously described. As Meckel does not mention this muscle in the *Hyrax*, we suppose he has included it in his description of the *p. major*, as we have indicated above.

* *Loc. cit.* p. 194.

† *Loc. cit.* p. 203.

‡ *Loc. cit.* p. 208.

§ *Loc. cit.* p. 270.

The *subclavius* is absent; in this respect the Hyrax differs from the Guinea-pig. The muscle which we call the *sterno-scapular* evidently comes under the denomination *subclavius* in Meckel's* work.

Sterno-scapular.—This rather uncommon muscle arises from the sternum, immediately in front of the origin of the *pectoralis minor*, and, passing over the scapulo-humeral articulation, continues along the upper (anterior) border of the scapula, to be inserted into its anterior superior angle (figs. 3 & 4, *S. sc.*).

This muscle is very interesting, because it occurs in the Pig and other Ungulata†, not, however, that it is exclusively confined to that group, as we found it existing most unmistakeably in the Guinea-pig, which we examined on purpose.

There is a muscle described by Meckel‡ as existing in the Hare, Porcupine, and Agouti, extending from the spine of the scapula to the sternum, which evidently is our *sterno-scapular*, but which he considers rather belongs to the *subclavius* than forms part of the *trapezius*, as Cuvier§ thought.

The *deltoid* is very slightly developed, as occurs also in the Ungulata. It seems to consist of two portions, the first arising by tendinous fasciæ from the inferior border of the *infra-spinatus*, and inserted by a broad tendinous fascia into the outer border of the humerus, below its head (fig. 5, *D.*).

The second part, much smaller than the first, arises from the great tuberosity of the humerus, and not from the scapula, and is inserted into the deltoid prominence immediately internal to the insertion of the first head.

Our description seems to agree with Meckel's|| observation as to the deltoid being divided into two muscles.

The *supra-spinatus* muscle is very strong, and with the usual origin, but, on account of its bulk, occupying more space than the mere fossa (fig. 5, *S. sp.*). It ends in a forked manner, and is inserted into the whole inner side of the greater tuberosity, and outer margin of bicipital groove of the humerus. Meckel observes that the consequence of this double insertion in the Horse, Camel, and *Hyrax* is only to raise the arm, without carrying it outwards, in this way being an auxiliary to the deltoid¶.

The *infra-spinatus* arises from the infra-spinous fossa, the fibres being delicate towards the cartilaginous portion of the scapula. It contains, near the neck of the bone, a strong tendon within its substance, and the muscle is inserted into the great tuberosity of the humerus (fig. 5, *I. sp.*).

The *subscapularis* does not cover the subscapular fossa. It arises by four or five digitations, which do not reach the whole length of the scapula. The insertion is into the lesser tuberosity of the humerus.

The *teres major* is long and strong; as usual, it arises along mar-

* *Loc. cit.* p. 260.

† Huxley, in his recent Hunterian Lectures for 1865.

‡ *Loc. cit.*, pp. 259, 260.

§ *Leçons d'Anat. Comp.* vol. i. p. 373.

|| *Loc. cit.* p. 226.

¶ *Loc. cit.* p. 259.

gin of scapula, but not from the cartilage. In common with part of the latissimus dorsi and part of the panniculus carnosus, it is inserted into margin of bicipital groove, while it is also overlapped by the coraco-brachialis (fig. 5, *T. maj.*).

Fig. 5.



View of the outside of the fore limb.

S. m. Serratus magnus. *R. c.* Rhomboideus capitis. *S. sp.* Supra-spinatus. *I. sp.* Infra-spinatus. *D.* Deltoid. *T. maj.* Teres major. *D. e.* Dorso-epitrochlear. *T. 1.* First head of triceps. *T. 2.* Second head of triceps. *T. 4.* Fourth head of the triceps. *B. a.* Brachialis anticus. *S. l.* Supinator longus. *E. l. d.* Extensor longus digitorum. *E. m. d.* Extensor minimi digiti.

The *teres minor* is very small. It arises from the lower or posterior border of scapula, the whole length of its neck, but very little more. The insertion is into the great tuberosity of the humerus, beneath and behind the infra-spinatus. It is in intimate union with the scapular head of the triceps.

The *biceps* is single-headed, arising only from the scapula. It is inserted into the neck of the ulna in common with the cephalo-humeral, after passing round the inner side of the neck of the radius, where it has a strong tendon (fig. 4, *B.*). We thus agree with Meckel* as to its single head and insertion into the ulna. In the Guinea-pig we found it also to have but one head.

The *brachialis anticus* arises by a single and very strong head from the back of the neck of the humerus, and turns round to the front of the bone, descending into the forearm to be inserted into the ulna (fig. 5, *B. a.*). In its very high origin this muscle resembles

* *Loc. cit.* p. 286.

its homologue in the Pig and Horse; but the Guinea-pig presents us also with the same structure.

The *coraco-brachialis* comes from the rudimentary coracoid process, and is inserted into the humerus from the lesser tuberosity down to quite the middle of the shaft, in a line along the inner margin of the bicipital groove. It lies in front of the *teres major*.

We found the *triceps* to be divided into four distinct portions, without counting the small muscle which we have called the dorso-epitrochlear. The first of these, or scapular head, is very strong, and arises from the neck of the scapula, adherent to the *teres minor* and *infra-spinatus*. It has an insertion into the olecranon (fig. 5, T. 1).

The second, which corresponds to the outer head, is nearly equal in size to the former. It arises from the neck of the humerus, below the *teres minor*, just behind the greater tuberosity. It is also inserted into the olecranon and outer condyle of the humerus (fig. 5, T. 2).

The third or inner head is much smaller than either the first or the second. It arises from the inner side of the neck of the humerus, below the *brachialis anticus*, and below the insertion of the *teres major*, intervening between these two muscles at its origin. The insertion of this third portion is into the inner side of olecranon.

The fourth part of the *triceps* is much smaller and also shorter than the three preceding; it arises in common with the last, but is clearly separated from it below. It covers the posterior surface of the shaft of the humerus, and is inserted into the inner condyle and olecranon process (fig. 5, T. 4).

Meckel does not appear to have observed our fourth belly of the *triceps* proper. What he calls "the fourth" is our dorso-epitrochlear.

The *dorso-epitrochlear* is a long and very narrow muscle. The origin is very different from that of the muscle usually described under this name. We found it to arise from the lower border of the *infra-spinatus*, and to be inserted into the olecranon by a strong tendinous fascia (figs. 4 & 5, D. e.).

The *supinator longus* is exceedingly diminutive, and arises from the outer side of the shaft of the humerus, just above the common origin of the next two muscles, and is inserted into the radius near its neck (fig. 5, S. l.).

The presence of the *supinator longus* is interesting, inasmuch as it is wanting in the Pig and Horse, as also, according to Meckel, in the Hare, Porcupine, Agouti, Beaver, Rat, &c.*

The *extensor carpi longior* and *brevior* were not quite separated as described by Meckel†, but the two had a common origin from the external condyle of the humerus, a little above the carpus giving rise to two distinct tendons. They have an insertion, the one into the metacarpal bones of the index, and the other into metacarpal bones of the middle digits.

The *extensor communis digitorum* arises ^{neath} ~~between~~ the last-mentioned muscle, and divides into two fleshy bundles which give origin to four flat tendons, one being inserted into each of the four digits.

* *Loc. cit.* p. 304.

† *Loc. cit.* p. 208.

The *extensor minimi digiti* arises as usual (Fig. 5, *E. m. d.*), but soon divides into two separate delicate muscles, each of which ends in a tendon, one being inserted into the proximal phalanx of the fifth digit; the other, passing beneath the outermost tendon of the *extensor communis digitorum*, goes to the distal end of the fourth metacarpal bone. Meckel found only a single tendon, which went to the fifth digit*.

The *extensor ossis metacarpi pollicis* is a well-developed muscle, with rather an extensive origin, and with much tendon in its substance. It is inserted into the trapezium and rudiments of the pollex.

The *extensor primi*, the *secundi internodii*, and the *extensor indicis* are all wanting.

The *extensor carpi ulnaris* has origin from the outer side of the coronoid process of the ulna and the outer condyle of humerus, but chiefly from the latter. Its insertion is into the proximal end of the fifth metacarpal and the pisiform bone.

The *pronator teres* arises from the internal condyle, as usual. The insertion is by a flattened and pretty strong tendon into the middle of the shaft of the humerus, at its inner side.

The *flexor carpi radialis* arises from the inner condyle, below the last. This muscle, which is tendinous at its lower half, is inserted into the trapezium.

The *palmaris longus* is rather largely developed, and arises from the inner condyle and intermuscular fascia. Passing down to the palm of the fore limb, it forms the palmar fascia, which contains a flat fibro-cartilaginous disk, the palmar fascia ending in four slips for the four digits. At the carpus, a bursa is interposed between the tendon of this muscle and that of the *flexor carpi ulnaris*. Meckel† says that this muscle is only represented by a long, wide tendon; but in our specimen it had a good fleshy belly.

The *flexor carpi ulnaris* is a very strong muscle, with the usual origin, and inserted into the pisiform bone by a very broad tendon, the muscular fibres on the outer side reaching down to that bone (fig. 6, *F. c. u.*).

The *flexor sublimis digitorum* arises in intimate union with the deep flexor as far nearly as the carpus, but is divisible into three slips, each of which gives off a tendon, these three tendons going to the second, the third, and the fourth digits; that into the second is inserted in the inner side of the tendon of the deep flexor; that to the third forms its perforated tendon; that to the fourth unites with a tendon of the next muscle to form the perforated tendon of that digit. Meckel's description does not at all agree with our description (fig. 6, *F. s. d.*).

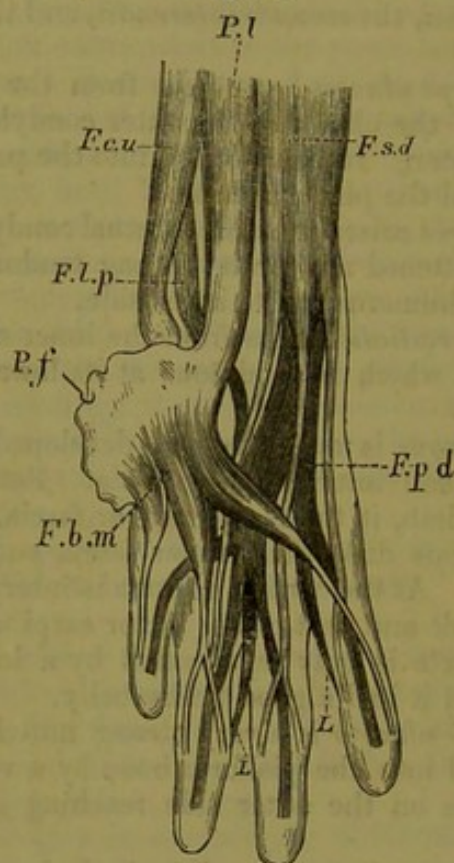
Flexor brevis manus.—This very peculiar and, as far as we know, hitherto undescribed muscle arises from the fibro-cartilaginous disk above mentioned, and from both the superficial and the deep palmar fasciæ. It divides into three distinct and rather long digitations, each ending in a tendon. These three tendons go to the second, fourth, and fifth digits; that going to the fourth digit unites

* *Loc. cit.* p. 321.

† *Loc. cit.* p. 317.

with the corresponding tendon of the flexor sublimis to constitute the perforated tendons of that digit; that going to the fifth digit is inserted by itself outside the deep flexor; that going to the second digit is inserted singly on the inner side of the deep flexor tendon. The perforated tendon of the third digit is formed by the flexor sublimis only (fig. 6, *F. b. m.*). The fleshy belly, which Meckel* describes as investing the tendons of the sublimis at their origin, is doubtless our flexor accessorius manus.

Fig. 6.



Flexor muscles and tendons of the fore foot.

P. l. Palmaris longus. *F. c. u.* Flexor carpi ulnaris. *F. s. d.* Flexor sublimis digitorum. *F. p. d.* Flexor profundus digitorum. *F. l. p.* Flexor longus pollicis. *P. f.* Palmar fascia. *F. b. m.* Flexor brevis manus. *L.* Lumbricales.

The *flexor profundus* and *longus pollicis* are distinct above, but united at the wrist, where they give origin to a very broad and strong tendon, which, dividing into four, forms the flat and strong perforating tendons of the four digits. The tendon to the index does not pass through a truly perforated tendon, but the tendons from the flexor brevis and flexor sublimis so cross each other as to produce the appearance and action of a normal perforated tendon (fig. 6, *F. p. d.* and *F. l. p.*). Meckel† appears to have confounded this muscle with the flexor sublimis. They are indeed very closely connected, but still able to be separated.

* *Loc. cit.* p. 333.† *Loc. cit.* p. 333.

The *lumbricales*, instead of being absent, as Meckel* says, are very distinct, though only two in number (as are also those in the foot). One of these arises from the palmar surface of the broad tendon of the flexor profundus, between the origin of the tendons of the two inner digits, and is inserted into the proximal phalanx of the second digit at its outer side; the other arises between the deep tendons of the third and fourth digits, and is inserted into the inner side of the proximal phalanx of the fourth digit (fig. 6, *L. L.*). In the ~~left~~^{right} foot, however, we found these two muscles to be inserted into the outer sides of the second and third digits.

The pollex is not destitute of muscles, as Meckel† asserts, as it possesses at least two separate, though very small, muscular bundles; but what they represent we cannot pretend to say (fig. 7, *P.*).

The fifth digit possesses a large and strong *abductor minimi digiti*. This arises by a strong tendinous fascia from the outer side of the pisiform bone, and is inserted into the outer side of the proximal phalanx of the fifth digit (fig. 7, *Ab. m. d.*).

Fig. 7.

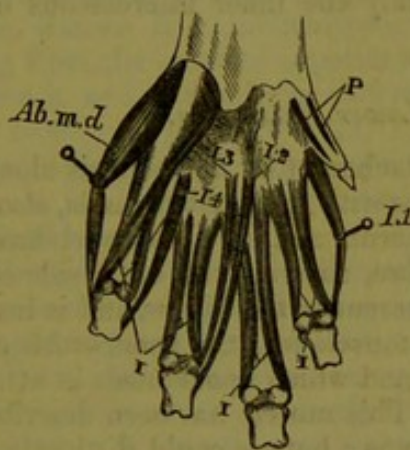


Fig. 8.

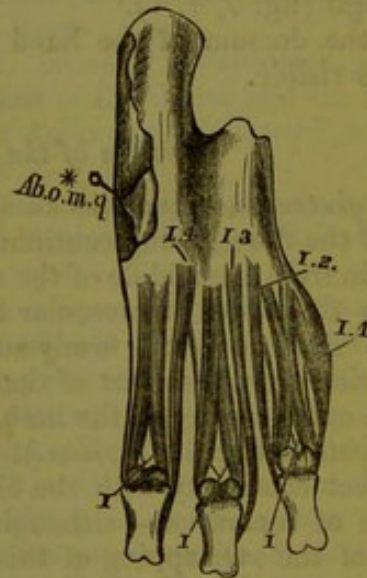


Fig. 7. Palmar interossei of the fore foot, and small muscles to first and fifth digits. *P.* Muscular fibres upon pollex. *Ab. m. d.* Abductor minimi digiti. *I. I. I.* The indicators point to the four pairs of interossei. *I. 1.* The first single interosseous muscle. *I. 2.* The second single interosseus. *I. 3.* The third single interosseus. *I. 4.* The fourth single interosseous muscle.

Fig. 8. Same muscles, sole of hind foot. *I. I. I.* The three double pairs of interossei. *I. 1.* First single interosseous muscle. *I. 2.* Second single interosseus. *I. 3.* Third single interosseous muscle. *I. 4.* Fourth single interosseous muscle. *Ab. o. m. q.* Abductor ossis metacarpi quinti.

There are four pairs of *interossei* covering the plantar surfaces of the metacarpal bones. They arise from the strong tendinous fascia which covers the proximal ends of the metacarpal bones beneath,

* *Loc. cit.* p. 333.

† *Loc. cit.* p. 347.

and are *inserted* into sesamoid bones, one on each side of the distal ends of the metacarpals, the sesamoids acting on the proximal phalanges by means of the connecting fasciæ (fig. 7, *I. I. I.*).

Besides these four pairs, there are also four single interosseous muscles.

The *first* covers the inner side of the index metacarpal, and is visible on the dorsum, as before mentioned. It arises from the whole length of that bone, and is inserted within the innermost sesamoid (fig. 7, *I. 1.*).

The *second* is a thin muscular slip, lying between the third and fourth metacarpals, rather on their plantar surfaces. It *arises*, in common with the other interossei, from the fascia before mentioned, and is inserted by a delicate tendon into the inner side of the proximal phalanx of the fourth digit (fig. 7, *I. 2.*).

The *third* (close adjoining the last, and similar in form) lies on the outer side of the second. It has a similar *origin*, but is *inserted* into the inner sesamoid bone of the fourth digit (fig. 7, *I. 3.*).

The *fourth* *arises* from the fascia on the inner side of the pisiform bone, and is inserted into the inside of the middle phalanx of the fifth digit (fig. 7, *I. 4.*).

On the dorsum of the hand only the inner interosseous of the index is visible.

Muscles of the Lower Extremity.

The *gluteus maximus* has an attachment by aponeurosis along the crest of the ilium, being continuous with the lumbar fascia, also with an origin from the middle of the sacrum and the caudal vertebræ. It forms a thin sheet of muscular fibre, covering the outer side of the thigh. Posteriorly it is firmly adherent to the biceps, and is inserted along with the upper part of that muscle into the aponeurosis covering the outer surface of the limb, and which aponeurosis is attached to the patella (fig. 11, *G. max.*). This muscle has been described as in perfect continuity with the biceps; but we could distinctly trace the line of separation—although it was not so very clear above, by reason of the overlapping of this muscle by the biceps; but, on dissecting from below, the line of demarcation was readily traceable.

At pages 354 and 406, Meckel describes part of this muscle as corresponding to the tensor vaginæ femoris, and seems to confound with it more or less of the biceps.

The *gluteus medius* is very large and entirely fleshy, thin in the middle and thick at its borders, thus differing from muscles in general. It arises from the whole outer surface of the ilium, from the sacrum and caudal vertebræ, as far back as the origin of the semitendinosus. It is inserted into the third trochanter, except a small portion of its anterior part, which joins the aponeurosis of the *gluteus maximus* going to the patella (fig. 11, *G. med.*). We cannot agree with Meckel* in saying that it is smaller than the *gluteus maximus*.

The *gluteus minimus* is an extraordinarily thick and powerful muscle,

* *Loc. cit.* p. 359.

arising from the whole outer surface and upper margin of the ilium as far down as the acetabulum, as also from the sacrum and several caudal vertebræ. It is inserted into the great trochanter.

The *tensor vaginæ femoris* is thick though small. It arises from the anterior inferior spinous process of the ilium, and is inserted into the fascia as usual. This muscle does not lie here so superficial as ordinarily, but is somewhat wedged in between the glutei and iliacus (fig. 11, *T. v. f.*). It has been described by Meckel* as the sartorius.

The *psoas magnus* is a stout muscle, arising from the fronts of the bodies of the last dorsal and all the lumbar vertebræ, and from the bases of the transverse processes of the lumbar vertebræ. Insertion into the small trochanter (fig. 10, *P. m.*).

The *psoas parvus* has attachments upon the fronts of all the lumbar vertebræ, and is inserted by a long tendon into the ilio-pectineal ridge. Its proportion to the *psoas magnus* seemed to us larger than as described by Meckel†.

The *quadratus lumborum* is very long and narrow, arising from the sides of the bodies of the last twelve dorsal vertebræ and from the heads of the ribs, also from the transverse processes of all the lumbar vertebræ, and from the anterior part of the sacrum. It is inserted into the sacro-iliac synchondrosis.

The *iliacus* is a moderate-sized, laterally compressed muscle, arising from the anterior superior spine of the ilium, and the margin between it and the anterior inferior spine; it is inserted into the lesser trochanter (figs. 10 & 11, *I.*).

The *coccygeus* arises from the spine of the ilium, and, spreading out in a fan-shaped manner, is inserted into the caudal vertebræ (fig. 9, *C.*).

Although the tail is so extremely rudimentary, yet the *pubo-coccygeus* is distinctly developed as a delicate band of muscular fibre arising from the pubes behind the symphyses, and inserted into the caudal vertebræ. This muscle is not noticed by Meckel. (Fig. 9, *P. c.*)

The *pyriformis* is very closely connected with the gluteus minimus, appearing as it were to wrap round it at its lower part; so that the line of demarcation is not easily ascertained. It arises from the ventral surface and outer border of the sacrum, immediately behind the sacro-iliac synchondrosis, and is inserted into the great trochanter in union with the gluteus minimus, as Meckel‡ describes.

The *quadratus femoris*, as justly observed by Meckel§, is very voluminous (fig. 10, *Q. f.*). It arises from the front part of the tuberosity of the ischium, and is inserted into the line between the greater and lesser trochanters.

The *gemellus superior* extends from the spine of the ischium to the trochanteric fossa.

The *gemellus inferior* has the following attachments, viz. from the surface of the ischium, near the tuberosity, to the trochanteric fossa (fig. 9, *G. i.*).

The *obturator internus* is rather a small muscle, arising from the

* *Loc. cit.* p. 399.

† *Loc. cit.* p. 361.

B

‡ *Loc. cit.* p. 368.

§ *Loc. cit.* p. 365.

inner side of the ascending ramus of the pubes, close to the ilium, and from the inner surface of the ilium as high as the ilio-pectineal line. It is inserted into the trochanteric fossa by a delicate tendon, with which the gemelli are closely connected (fig. 9, *O. i.*).

Fig. 9.

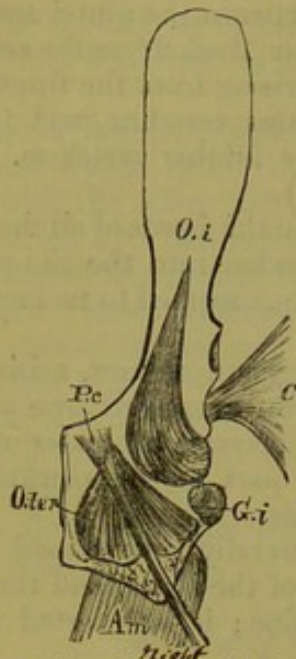


Fig. 10.

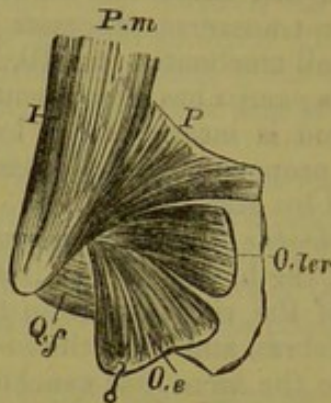


Fig. 9. Inner view of ~~left~~ half of the pelvis. *O. i.* Obturator internus. *O. ter.* Obturator tertius. *P. c.* Pubo-coccygeus. *C.* Coccygeus. *G. i.* Gemellus inferior. *A. m.* Abductor magnus.

Fig. 10. Right side of pelvis, seen in front. *I.* Iliacus. *P. m.* Psoas magnus. *P.* Pectineus. *O. ter.* Obturator tertius. *O. e.* Obturator externus.

The *obturator externus* is thick and fleshy, having its usual origin and insertion (fig. 10, *O. e.*).

Obturator tertius.—This very peculiar and anomalous muscle, of which we have not met with any record, arises from the inner surface of the ischium, close to its junction with the pubes, passing through the obturator foramen. It is inserted into the trochanteric fossa, in common with the obturator externus (figs. 9 & 10, *O. ter.*).

The *biceps* is of extraordinarily large dimensions, and, arising by a strong tendon from the tuberosity of the ischium, and spreading out into a wide sheet of muscle, separates into two main divisions. The anterior of these overlaps the gluteus maximus, with which it is closely connected, and is inserted by strong tendinous fascia into the patella and outer head of the fibula. The posterior division of the biceps, which is more separated from the anterior division than is this last from the gluteus maximus, is inserted into the fascia of the leg along the outer border of the fibula (fig. 11, *B.*). Meckel*, in his description of this muscle, takes no notice of the anterior division, which he appears to have interpreted as part of the gluteus maximus.

The *semitendinosus* has a double origin, as in the Horse†, one

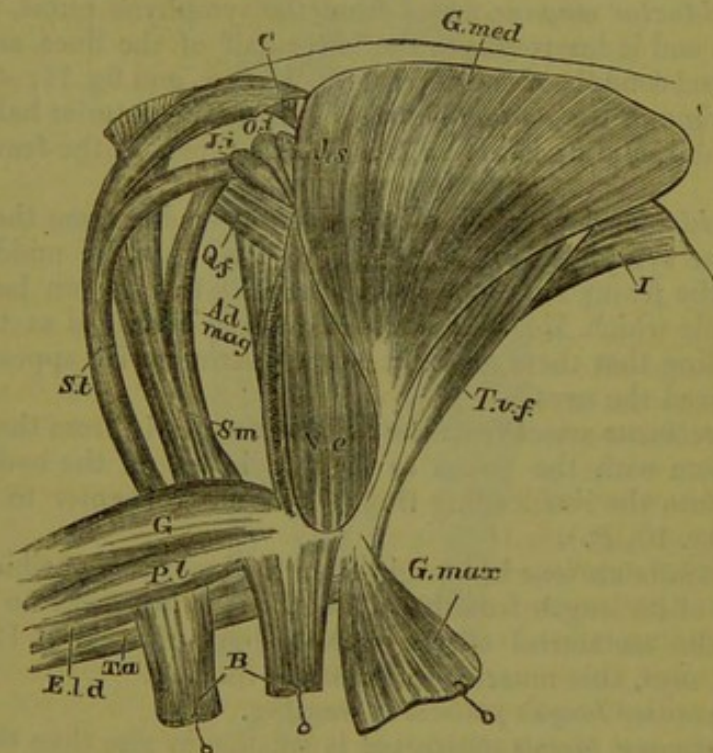
* *Loc. cit.* p. 390.

† *Loc. cit.* p. 383.

head arising from the tuberosity of the ischium, behind the last-described muscle; the other, larger and broader, has an origin from the caudal vertebræ fully an inch broad. These two flat heads unite to form a single roundish muscle, which is inserted by a thin tendon into the upper third of the front of the tibia, below the insertions of the gracilis and semimembranosus (fig. 11, *S. t.*).

The *semimembranosus*, as Meckel* remarks, has an extraordinary breadth and thickness. It has, like the last, a double origin, one head arising from the ischium behind the semitendinosus, the other head arising from all the caudal vertebræ posterior to the origin of the last named, and closely connected with the levator ani. These two flat muscular heads unite, like those of the semitendinosus, to form a large and powerful muscle, which is inserted into the inner condyle of femur and upper part of tibia (fig. 11, *S. m.*).

Fig. 11.



Buttocks and lower limb, to below the knee.

- I.* Iliacus. *G. max.* Insertion of gluteus maximus. *G. med.* Gluteus medius. *T. v. f.* Tensor vaginæ femoris. *C.* Coccygeus. *O. i.* Obturator internus. *G. s.* Gemellus superior. *G. i.* Gemellus inferior. *Q. f.* Quadratus femoris. *Ad. mag.* Adductor magnus. *V. e.* Vastus externus. *B.* The insertions of the biceps, turned back. *S. t.* Semitendinosus. *S. m.* Semimembranosus. *G.* Gastrocnemius. *P. l.* Peroneus longus. *E. l. d.* Extensor longus digitorum. *T. a.* Tibialis anticus.

The *sartorius* was not represented, even in the most rudimentary manner; and, as above said, the muscle described by Meckel† under this name is really the tensor vaginæ femoris.

* *Loc. cit.* p. 386.

† *Loc. cit.* p. 399.

The *gracilis* is a broad muscle, arising from the symphysis pubis, being inserted into the inner side of the tibia between the insertions of the semitendinosus and the semimembranosus.

The *rectus femoris* is a very strong muscle, arising from the anterior inferior spinous process of the ilium just above the acetabulum, and inserted as usual.

The *vastus externus* (fig. 11, *V. e.*) and the *vastus internus* were not unusual, except that they were well separated from the next, and were almost entirely muscular to their insertion into the patella.

The *crureus* is wonderfully distinct and strong, remarkably so if contrasted with its condition in Man. Fibres extend all along the front shaft of the femur, and are inserted into the patella and capsule of the joint. There is a strong glistening tendon in the middle of its front surface; but the sides are muscular down to its insertion. Meckel* notes the distinctness in this animal of the four component parts of the quadriceps extensor femoris.

The *adductor magnus* arises from the symphysis pubis, its posterior half, and is inserted into the lower half of the linea aspera and the internal condyle of the femur (fig. 9, *A. m.* and fig. 11, *Ad. mag.*).

The origin of the *adductor brevis* is from the anterior half of symphysis pubis, and its insertion is into the linea aspera of the femur, above the last.

The *adductor longus* arises by a distinct tendon from the anterior end of the symphysis pubis, and is inserted into the middle of the shaft of the femur anteriorly, and internally to the two last. It is this muscle which Meckel† appears to have described as the pectineus, adding that there are only two adductors. He appears not to have noticed the next.

The *pectineus* arises from the brim of the pelvis, from the junction of the ilium with the pubes to the middle line of the body. It is inserted into the line leading from the lesser trochanter to the linea aspera (fig. 10, *P.*).

The *tibialis anticus* has origin from the inner side of tibia to about a quarter of its length from its summit. It is inserted into the inner side of the metatarsal of the second digit (figs. 11 & 12, *T. a.*). Huxley‡ says, this muscle is wanting in the Pig.

The *extensor longus pollicis* is wanting.

The *extensor longus digitorum* is smaller in size than the tibialis anticus, and it is situated on its outer side. It arises between the heads of the tibia and fibula, a few fibres of origin coming from both, but chiefly by a tendon from the outer condyle of the femur. It ends in three tendons, which are inserted into the three digits. Meckel§ says, this muscle does not arise from the femur either in the *Hyrax* or Pig; but we found it to do so distinctly in our specimen, and Prof. Huxley, in his recent Hunterian Course, described it as so doing in the Pig. (Figs. 11 & 12, *E. l. d.*)

The *peroneus longus*, which is comparatively a large muscle, arises from the head of the fibula, the external lateral ligament passing

* *Loc. cit.* p. 403.

† Hunterian Course for 1865.

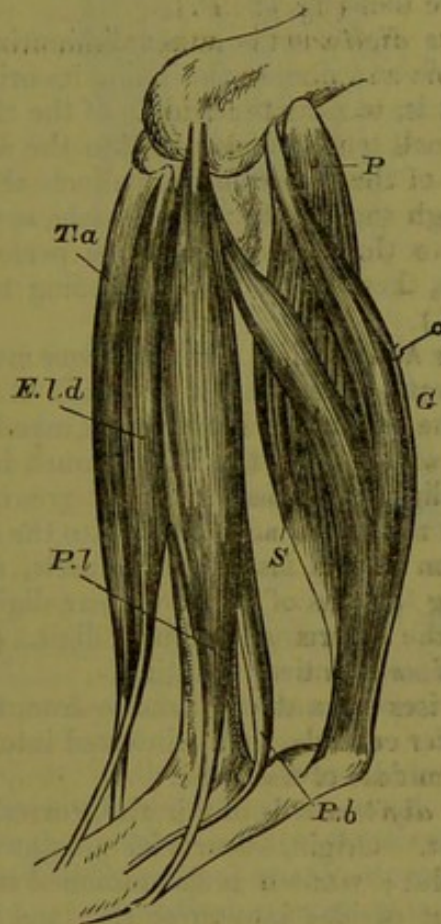
‡ *Loc. cit.* p. 377.

§ *Anat. Comp.* t. viii. p. 426.

between the two slips of its origin. The tendon does not pass under the external malleolus, but on its outer side; it then passes through to the sole of the foot, between the navicular and the head of the outermost metatarsal, the tendon dividing, one part being inserted into the navicular bone, the other running on between that bone and the head of the innermost metatarsal, to its inner side, where it seems to be inserted.

The *peroneus brevis* extends from the outer margin of the fibula, and, passing as usual, has its tendon inserted into the distal end of the proximal phalanx of the outermost digit (fig. 12, *P. b.*).

Fig. 12.



Inferior part of lower limb.

T. a. Tibialis anticus. *E. l. d.* Extensor longus digitorum. *P. l.* Peroneus longus. *P. b.* Peroneus brevis. *S.* Soleus. *G.* Gastrocnemius. *P.* Plantaris.

The *extensor brevis digitorum* occupies the outer half of the dorsum of the foot. It arises from the external lateral ligament, the astragalus, and os calcis, and ends in three digitations, each terminating in a minute tendon. These tendons are inserted into the outer sides of the proximal ends of the three proximal phalanges, and not alone into those of the two internal ones, as Meckel* records.

* *Loc. cit.* p. 429.

The *gastrocnemius*, which is a well-developed muscle, arises by two heads from the outer and inner condyles of the femur; these unite, as usual, to give origin to the tendo Achillis, which is broad (figs. 11 & 12, *G.*).

The *soleus* arises from the head of the fibula, beneath the popliteus, and is united to the tendo Achillis (fig. 12, *S.*).

The *plantaris* is likewise a very strong muscle, arising from the external condyle. Its tendon passes to the inner side of the tendo Achillis, and then over the tuberosity of the calcaneum, being there separated from the last-named tendon, as are the homologous muscles of the hand. The tendon then passes into the sole of the foot to form the plantar fascia, which last divides into three slips to be inserted into the three toes (fig. 12, *P.*).

The *flexor longus digitorum* is rather diminutive, and arises from the heads of the tibia and fibula, continuing its origin as far down as the popliteus—that is, to near the middle of the tibia.

Its somewhat small tendon passes within the internal malleolus, and joins with that of the flexor longus hallucis about the middle of the foot, and although smaller than that muscle, appears to contribute the greater share to the formation of the perforating tendons of the two inner digits, these two muscles blending together as in the Pig (fig. 13, *F. l. d.*).

The *flexor longus hallucis* is a much stronger muscle than the preceding, rather beneath and external to which it takes origin, *i. e.* from the neck of the fibula and interosseous membrane. Its broad and strong tendon, which, as in the Pig, is much larger than that of the flexor longus digitorum, passes in the groove between the os calcis and the inner malleolus, and thence into the middle of the foot, and joins the tendon of the last-named muscle, uniting with it to form the perforating tendons of the two inner digits, but sending a separate tendon to the outermost or fourth digit. (Fig. 13, *F. l. h.*)

The *tibialis posticus* is entirely wanting.

The *popliteus* arises by a strong tendon from the groove on the outer side of the outer condyle, and is inserted into the tibia from its neck to almost the middle of the bone.

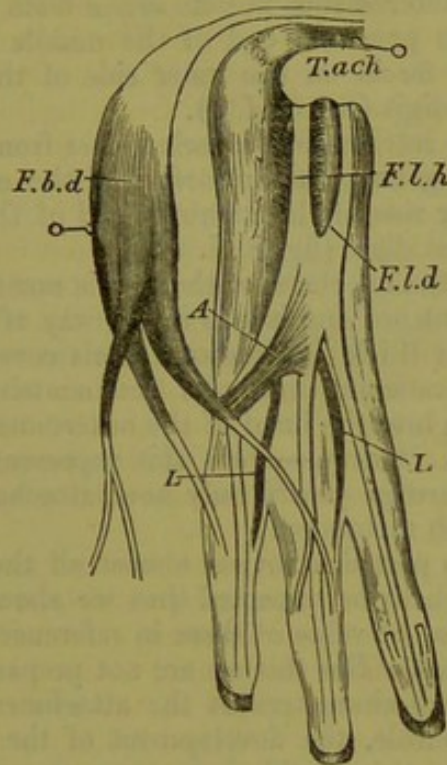
The *flexor brevis digitorum* is of fair size, corresponding to the dimensions of the foot. Origin, superficial plantar fascia, calcaneum, and external malleolus; while it is also attached to the deep plantar fascia. Anteriorly it divides into three thin and flattened tendons, which are very closely applied to the deep flexor tendons, and bifurcate, as usual, to give passage to the latter. We could not but remark the very close correspondence between this muscle and the flexor brevis manus, both in appearance and attachment. (Fig. 13, *F. b. d.*)

There is a small bundle of muscular fibre which arises from the plantar surface of the deep flexor tendon, and is inserted into the middle tendon of the flexor brevis. This is, apparently, all that represents the *accessorius* (fig. 13, *A.*).

The *lumbricales* are two in number, as in the hand: one arises from the deep middle tendon close to the accessorius (of which it almost appears a continuation), and is inserted by a delicate tendon

into the inner side of the proximal phalanx of the middle digit; the other one arises from the outermost deep tendon, on the inner border of its plantar surface, and is inserted into the inner side of the proximal phalanx of the outermost (fourth) digit (fig. 13, *L, L.*).

Fig. 13.



Sole of the hind foot.

T. ach. Tendo Achillis. *F. l. h.* Tendon flexor longus hallucis. *F. l. d.* Tendon flexor longus digitorum. *F. b. d.* Flexor brevis digitorum, with one of its perforated tendons cut through, and the whole muscle drawn to the one side to expose the deep flexor tendons. *A.* Accessorius. *L.* Lumbricales.

As in the hand, so in the foot, the only muscle visible on the dorsal surface is that situated on the inner side of the innermost digit.

The muscles on the plantar surface are seven in number, three being more or less double, and apparently corresponding to the four pairs of interossei above described as existing in the hand, the other four being single. The three more or less double muscles arise (as in the hand) from the fasciæ covering the proximal ends of the lower surfaces of the metatarsal bones, and are inserted into sesamoid bones, one on each side of the distal end of each metatarsal, the sesamoids acting on the proximal phalanges by the connecting tendinous fasciæ (fig. 8, *I, I, I*).

The single interosseous muscles are also four in number, as in the fore foot.

The first single interosseous is very large and strong. It arises from the inner half of the plantar surface of the metatarsal of the index, filling the concavity on the inner and dorsal surface of that

bone, and is *inserted*, by a small tendon, into the fascia adjoining the innermost sesamoid (fig. 8, I. 1).

The second single interosseous *arises* from the plantar surface of the *os naviculare* and one of the cuneiform bones, and is *inserted* into the outer surface of the proximal end of the proximal phalanx of the index digit by a small tendon (fig. 8, I. 2).

The third single interosseous muscle *arises* from the fascia on the under surface of the proximal end of the middle metatarsal bone, and is *inserted* into fascia on the inner side of the inner sesamoid bone of the middle digit (fig. 8, I. 3).

The fourth single interosseous muscle *arises* from the strong tendinous fascia covering the plantar surface of the cuboid, and is *inserted* into the inner side of the proximal end of the proximal phalanx of the outermost digit (fig. 8, I. 4).

The existence of the interossei of the foot is mentioned by Meckel (*loc. cit.* p. 461), but nothing is said in the way of description.

A very strong and thick ligamentous fascia covers the under and outer side of the calcaneum; muscular fibre contained in and arising from this is inserted into the head of the outermost metatarsal bone (fig. 8, *Ab. o. m. q.*). Query,—Does this represent Prof. Huxley's *abductor ossis metacarpi quinti*, only here attached to the fourth instead of to the fifth metatarsal?

After having thus passed in review almost all the muscles of the *Hyrax*, it might perhaps be expected that we should express some decided opinion as to the value of these in reference to the zoological affinities of the animal. But this we are not prepared to do.

It is true that such characters as the attachment of the sternomastoid to the mandible, the development of the sterno-scapular, the very small size of the deltoid, but enormous proportions of the triceps, and great extent of the brachialis anticus, together with the arrangement of the glutei, the vast size of the semimembranosus, the attachment of the extensor longus digitorum to the femur, &c., tend rather to confirm than otherwise those ungulate affinities which have been attributed to the *Hyrax*.

But, on the other hand, we find so many resemblances to the Rodentia, as exemplified in the Guinea-pig (specially selected by us for comparison as the most Pachyderm-like of accessible Rodents), that we are indisposed, from the consideration of the muscular structure alone, definitely to assign the *Hyrax* to one or other of the *existing* orders constituting the class Mammalia.

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