

XLIV.—*On some points in the Myology of the Chimpanzee and others of the Primates.* By ALEXANDER MACALISTER, Professor of Zoology and Director of the Museum, University of Dublin.

A YOUNG female Chimpanzee was purchased by the Rev. Dr. Haughton for the Dublin Zoological Gardens during the past year; she was in feeble health, and after a short time died; and a very careful dissection of her body was made by Dr. Haughton and myself. As this species has been frequently dissected, and as records of its anatomy have been published by Vrolik (*Recherches d'Anat. Comparée sur le Chimpanzé*, 1841, Amsterdam), Prof. Jeffrys Wyman (*Proc. Boston Soc. of Nat. Hist.* Nov. 21, 1855, vol. v.), Burt G. Wilder (*Boston Journ. of Nat. Hist.* 1862, vol. vii. No. 3. p. 352), Prof. Huxley (*Med. Times & Gazette*, 1864, p. 429), Prof. Humphry (*Journ. Anat. & Phys.* 1867, vol. i. p. 254), there is no necessity to refer to any of the structural points in which my dissection agrees with those already published. I will content myself with noticing such points as either have escaped the attention of these authors, or in which the animal dissected by us differed from those previously examined.

The poor creature was suffering from an extensive necrosis of the lower jaw; and this prevented us from observing the natural arrangement of the parts in this locality.

The occipito-frontalis was very thin and weak. Wilder found the fleshy fibres seemingly to meet at the vertex, both from the occipital and frontal bellies; this I did not notice, but found it arranged as in man. This is interesting; for I have elsewhere recorded the occurrence of a continuity of the occipital and frontal bellies of this muscle as a rare anomaly in man. The occipital belly was thicker than the frontal. I have found an occipito-frontal in every quadruman which I have dissected. In the Orang, Tyson and Traill state that they could not find it; but Prof. Owen traced it distinctly in this animal. The commonest form of occipito-frontalis in *Quadrumana*, I think, is that described by Dr. Wilder; for I have found it in *Ateles paniscus*, *Macacus cynomolgus*, *Cebus capucinus*, *Cercopithecus sabæus*, *Cynocephalus porcarius* and *hamadryas*.

The *retrahens aurem* was split into two in the manner that most commonly occurs in man; and it received a slip from the *transversus nuchæ*, which arose as usual from the middle line of the occipital bone, and passed outwards, overlying the *trapezius*; it crossed the occipital artery and occipitalis-minor nerve. This muscle was found by Prof. Franz E. Schultze,

of Rostock, as a human muscle, and has not been noticed before in this animal. Wilder found the retrahens aurem with its upper border touching the occipito-frontalis.

The atollens aurem was very weak and indistinct, not nearly so large as the muscle which Wilder found over the parietal and frontal bones.

The attrahens aurem I could not distinguish; but it was found by Wilder as a slip parallel to the anterior border of the occipito-frontalis. The lobe of the ear was very short.

Of facial muscles the orbicularis palpebrarum was extremely indistinct and weak, but seemed to consist of orbital, ciliary, and subtarsal portions (Möll.). A triangular *dilatateur supérieur* (Bourjut St.-Hilaire) was present; but the tensor tarsi (Duvernoy and Horner) was scarcely detectable; and the valvula superior of the nasal duct was very weak and imperfect. The corrugator supercilii was inseparable from the orbicularis palpebrarum, as described by Fabricius in man: this, indeed, is the commonest arrangement among the Primates, as in *Troglodytes*, *Macacus*, *Cercopithecus*, *Hapale*, *Cynocephalus*, *Ateles*, *Mycetes*, *Cebus*, and *Cercocebus* this is the arrangement.

The pyramidalis nasi was absent. The compressor nasi was represented by a little cellular tissue. In a Bushwoman, Messrs. Murie and Flower describe it as "distinct, though scanty of fibres." It is generally extremely rudimentary in Quadrumana (Journ. of Anatomy, vol. i. p. 196). The zygomatics were inseparably united—not an uncommon human anomaly. A slip from the levator labii superioris took origin from the lower border of the tendo palpebrarum; otherwise this muscle could not be divided into two parts.

The other facial muscles were destroyed by the disease. The orbital muscles showed nothing abnormal.

The platysma has been described by Vrolik. I have found this muscle only in rudiment in other Quadrumana; but in the Chimpanzee it is developed as in man. There was not any other portion of the panniculus carnosus developed, as Dr. Wilder very accurately observes.

The sterno- and cleido-mastoids were separable and related to each other as in man, the former being the larger of the two in the proportion of 19 to 4; this is noticed by Wilder, but the proportion is not given by him. In the Gorilla, Duvernoy states that the cleido- exceeds the sterno-mastoid, but Prof. Wyman found it not so; however, the sterno-mastoid is much the smaller in *Cercopithecus*, and the two are inseparable; it is still smaller but present in *Macacus* (*rhesus*, *sinicus*, *nemestrinus*, and *cynomolgus*) and *Inuus sylvanus*: Vrolik states that

it is absent in the latter genus (Cyclopædia of Anatomy and Physiology, art. "Quadrumana," vol. iv. p. 203). The spinal accessory nerve pierces the muscle in the Chimpanzee as in man. The omo-hyoid is extremely feeble, but biventral, and, as usual, scapular in origin; Vrolik states that it is absent in *Inuus* and *Cynocephalus*; but I have found it in the *Inuus* and in *Macacus cynomolgus*, as well as in *Cynocephalus porcarius* and *hamadryas*. Inscriptiones tendineæ cross the bellies of the sterno-hyoid and thyroid muscles, which are otherwise as in man.

Of the laryngeal muscles none were far removed from the human type. No trace of the muscle described by Eschricht in the *Hylobates albifrons* (Archiv für Anat. 1834, p. 218) was present. No kerato-cricoid, triticeo-glossal, or other of the curious aberrant fascicles so frequently found in the neighbourhood of the human larynx could be seen, except a small kerato-arytenoid muscle on the left side: this muscle is described as an anomaly in man by Professor Gruber, under the appellation "Schildknorpelhorn-Giessbeckenknorpelsmuskel."

Digastric. I did not notice a splitting of its broad anterior belly, as described by Wilder; but that such should be the case is what one might expect from the analogy of other *Quadrumana*: the anterior belly is split in some *Cercopithec*i; and in the *Macacus rhesus*, *cynomolgus*, and *nemestrinus* the mesial tendon is prolonged from one side to the other above the hyoid bone: this I have found the commonest arrangement in *Quadrumana*. The thyro-hyoid, genio-hyoid, and other lower-jaw muscles were matted together by the products of the inflammation of the lower jaw, and were consequently undistinguishable.

The muscles of the back were carefully dissected, and exhibited the following points:—The trapezius extended down to about the tenth dorsal spine, and overlapped the latissimus dorsi, but was very thin and indistinct at this part. Wilder found it to be apparently continuous with the latissimus dorsi; and Vrolik notices the same. Duvernoy found it arranged in the Gorilla as I have above described in the Chimpanzee; and I found the same arrangement in an undetermined species of *Macacus*; in general, however, in the lower monkeys the inferior part of the trapezius is with difficulty separable from the latissimus dorsi, as it becomes thinned and gradually lost below. The human character of the rhomboidei (being without the occipital slip) has been noticed by the various authors whose dissections have been published; the *major* and *minor* portions are scarcely divisible, as very often occurs in man. The levator anguli scapulæ is also peculiar for its possessing

no connexion with the serratus magnus—a condition which is very constant in all the lower monkeys. The quadrumanous levator claviculæ (omo-atlantic) was very weak, but present; it only weighed $\frac{1}{500}$ of an ounce avoirdupois on each side: as I have elsewhere described, this is a rare human anomaly. The serratus magnus was divisible into three parts, as in man; Dr. Wilder found it only cleft into two in his specimen: the upper was attached to the first, second, and third ribs, the second to the fourth and fifth, and the lower to all the ribs between the fifth and twelfth (eleventh, Wilder, p. 356). The latissimus dorsi detached from its border a dorsi epitrochlear, which was short and ended in a fascia in the middle third of the arm, shorter than its corresponding part in most other Quadrumana, and proportionally feebler. The occurrence of this muscle as an anomaly in man has been noticed by Bergmann, and more recently by the late Professor Halbertsma (under the name *anconeus quintus*). It only weighed $\frac{1}{40}$ of an ounce.

The splenius capitis was quite distinct from the splenius colli, and its origin extended from the fourth to the seventh cervical vertebræ: the splenius colli arose from the spines of the last cervical and the six upper dorsal vertebræ, and was inserted into the four upper cervical transverse processes. The division between these muscles is seldom so well marked in Quadrumana.

The serratus posticus superior passed over the upper pair of ribs, and was inserted into the third, fourth, and fifth. The serratus posticus inferior is larger, but thinner, and attached to the lowest five ribs. The trachelo-mastoid is digastric, and extends from the transverse processes of the uppermost pair of dorsal and lower two cervical vertebræ; its insertion is as usual. Beneath it is a second, deeper trachelo-mastoid, perfectly separate, which arises from the transverse processes of the second, third, and fourth cervical vertebræ, and is inserted underneath the last muscle. I have not found this second trachelo-mastoid in any other quadruman.

The deeper spinal muscles resemble those of man in all respects.

The great pectoral was anthropoid, not segmented as described by Sandifort in the Orang, its clavicular and sternal fibres being inseparable at the insertion; the former occupied half the clavicle; the muscle gave rise to a tendon which was split into two laminae. There was no pectoralis quartus, a muscle so commonly existing in other of the lower Primates. The pectoralis minor did not extend beyond the coracoid process, in which respect it differed from the corresponding muscle

in the specimen described by Prof. Humphry (*loc. cit.* p. 266), as in his case it crossed the process to the great tuberosity of the humerus. In Dr. Wilder's specimen it was inserted into the coracoid on the left and into the humerus on the right. Prof. Humphry remarks that this is the most common quadrumanous arrangement; but though this is quite true as regards the humeral or capsular insertion of the pectoralis minor, yet it is, in my experience, far from common to find a lesser pectoral in monkeys crossing the coracoid process. I have found the lesser pectoral thus inserted either into the greater tuberosity or the capsular ligament in *Macacus rhesus*, *cynomolgus*, *sinicus*, *nemestrinus*, *Inuus sylvanus*, *Cercopithecus ruber* and *sabæus*, *Colobus*, *Cebus apella* and *capucinus*, *Cercocebus fuliginosus*, *Cynocephalus porcarius*, and others.

Above the lesser pectoral on the left side was a small muscle, somewhat similar to a remarkable human anomaly described by Prof. Gruber, of St. Petersburg, the tensor semivaginæ humero-scapularis; it arose from the cartilages of the third and fourth ribs, and, passing outwards over the tendon of the lesser pectoral, was inserted into the capsule of the shoulder, under cover of the deltoid. In the Gorilla, Prof. Duvernoy found a second lower part of the lesser pectoral inserted into the short head of the biceps; and the same was seen by Prof. Wyman. No such arrangement existed in our Chimpanzee: the little tensor above described seemed at first sight like a second lesser pectoral; but its insertion was superficial to the seat of the normal attachment of a prolonged lesser pectoral tendon, if such had been present. The subclavius was normal, and the costo-coracoid membrane overlying it was, as usual, split by the pectoralis-minor tendon at its outer end. This is an extremely common human arrangement. The ligaments of the shoulder-joint are very like those of man, but all the accessory ligaments are weak: this is not the case in all monkeys; for I have found both the gleno-humeral ligament (Flood's) and the inferior ligament of Humphry very strong and cord-like in *Cercopithecus ruber*. (A specimen showing these I have placed in the Museum of the Royal College of Surgeons, Dublin.)

A very slight rudiment of a coraco-brachialis brevis was present, a muscle which has not been noticed by Wilder, but was seen by Vrolik; the rest of this muscle was split by the musculo-cutaneous nerve, and extended down rather further than usual on the arm. The coraco-brachialis brevis I have found in all the Quadrumana which I have dissected, either as a tendinous or muscular slip; it seems much more constant in them than in man.

The three scalenes were normal, not extending downward on the thorax beyond the second rib, as in man, and thus differing from the arrangement seen in almost all the lower monkeys. There is no rectus sternalis, nor supracostalis, nor was the rectus abdominis prolonged upwards on the thorax. The deltoid was normal, not continuous with the triceps and brachialis as it was in Prof. Humphry's animal (*l. c.* p. 264).

The supraspinatus was to the infraspinatus as 10 to 15, the teres minor was one-fifth the size of the infraspinatus, and the subscapularis was nearly equal to the sum of the two spinati. There was no subscapularis secundus or subscapulo-humeral separate; but a fleshy lower slip of the subscapularis seemed to represent it. The biceps and brachialis anticus were normal, and the two humeral heads of the triceps were with difficulty separated. The anconeus was small, and there was no anconeus epitrochlearis. The supinator longus did not arise as high as it did in Dr. Wilder's specimen, but its tendon was attached to the lower fourth of the radius. There was no coronoid origin of the pronator teres. The palmaris longus arose tendinously, and equalled the pronator teres in size. Traill failed to find it on one occasion; but all other authors describe it. The radial and ulnar flexors of the carpus were nearly equal, the radial on the left side being slightly larger than the ulnar, but they were both equal on the right; this was not the case in Wilder's animal (*loc. cit.* p. 363).

The flexor sublimis was three-eighths of the flexor profundus in weight, and had no radial origin; this has been remarked before: it had four tendons, as usual. Mr. Moore found, in the right arm of the Chimpanzee which he dissected, that the ring-finger received two tendons, and the little finger none; but in the left arm Dr. Wilder found it as in ours (Wilder, *loc. cit.* p. 365).

The flexor profundus et pollicis was a single muscle sending off five tendons to the four fingers and thumb; these all arose side by side, and the indicio-pollicial part was not separate as Wilder found it, or as Duvernoy saw it in the Gorilla; nor did the pollicial tendon cross the others, as it did in Prof. Humphry's specimen. This pollicial tendon seems thus to vary remarkably in its position and course. Vrolik found it with no tendon to the thumb. Humphry found it in one Chimpanzee as a slender tendon arising from the palmar fascia and going to the last phalanx of the thumb, and in another as a long thin tendon from the ulnar side of the flexor profundus (*l. c.* p. 267). Wyman found it as in ours; and Wilder found it conjoined with the flexor profundus indicis.

The pronator quadratus was very small and thin, but occu-

piated the lower third of the radius, and was exceedingly weak. The radial extensors of the carpus were separate and nearly equal; and the short supinator was very large, equal to the combined round and square pronators in weight; the posterior interosseous nerve pierced it as usual. Neither the tensor ligamenti annularis anterior nor posterior (Gruber and Cruveilhier) was present.

The extensor digitorum longus sent single tendons to the second, third, fourth, and fifth fingers, and was not divisible readily, as was the case in Wilder's animal. This author, Vrolik, and Moore describe the absence of the little-finger tendon of this muscle.

The extensor minimi digiti went to the fifth finger alone, by a single tendon. The extensor carpi ulnaris was only half the size of either of the radial extensors, and had a distinct ulnaris-quinti tendon prolonged onwards to the first phalanx of the little finger. The indicator sent a tendon to the middle finger, and arose as usual; in Wilder's specimen it only supplied the index, and arose a little lower than usual. Prof. Humphry found the middle-finger slip in his animal (*loc. cit.* p. 267).

The extensors of the thumb agreed exactly with those described by Prof. Humphry, except that the first of his muscles went to the scaphoid and metacarpal bones, whereas in ours it ended in the trapezium; the second was, as he describes, attached to the metacarpal bone, and the third to the last phalanx of the thumb; the second of these was in size equal to the sum of the other two. Vrolik, Wilder, and Wyman have found the same arrangement.

The lumbricales were like those of man; and the fourth arose from its proper tendon, not as in Wilder's specimen. All the thumb-muscles were as in man. The abductor was not split into Sömmerring's slips; and the flexor brevis did not extend beyond the first phalanx, as Humphry found in his specimen. The interossei were also arranged on the human type; these muscles, though usually regular, are not always absolutely constant in this mode of arrangement in *Quadrumana*. Thus the disposition in *Ateles fuliginosus* (in which the thumb is only represented by a rudimentary metacarpal bone little more than half the length of the second metacarpal) is as follows:—Of palmar interossei there are, 1st, a normal first palmar, from the second metacarpal to the index finger; 2ndly, a thin superficial palmar interosseus arising from the front of the third and fourth metacarpal bones, and inserted into the ulnar side of the first phalanx of the index finger; this muscle looks like an adductor pollicis with

a displaced insertion: the two other palmar interossei are normal. To the metacarpal bone of the pollex two small muscles are attached, one on the ulnar and one on the radial side, both springing from the second row of the carpus; the inner of these may either be an interosseus primus volaris or a flexor; the outer is evidently the adductor*. The flexor tendons in the Chimpanzee were not so contracted as those in Wilder's Chimpanzee, and they permitted the perfect extension of the fingers.

The muscles of the hinder limb were as follows:—Gluteus maximus and tensor vaginae femoris forming one thin expansion, quadrilateral in shape, but with the femoral side prolonged; it equalled the gluteus medius in weight. Of all the muscles in the body this is perhaps the least anthropoid in appearance. Prof. Humphry found the tensor vaginae femoris separate; but Wilder found them continuous, and describes the latter part as being larger than in man, while the lowest portion was also thick and strong. All agree in having seen this muscle extend along the entire of the back of the femur. It was not in our specimen continuous with the popliteus or external gastrocnemius, as found by Prof. Humphry. The gluteus medius, though wide, was only half the weight of the gluteus minimus, instead of being the largest of the three glutei, as it was in Dr. Wilder's Chimpanzee (*l. c.* p. 369); the latter muscle did not arise from the coccyx—a point about which Dr. Wilder was not certain. The gluteus quartus or scansorius was one-fifth the size of the gluteus medius; it has been found by Traill, Wilder, and Wyman, but was not found in Prof. Humphry's specimens. The pyriformis was perfectly separate; the gemelli were joined to the internal obturator, which was to the external obturator in the proportion of 6 to 5; the quadratus femoris was also present, and about half the size of the external obturator.

The psoas parvus was present on both sides, and was one-thirteenth the size of the psoadiliac muscle; it was not found by Vrolik, Wilder, or Wyman. The psoas magnus and iliacus are inseparable, and the anterior crural nerve lies on the inner side of both muscles. The pectineus was distinctly bilaminar; the three adductors also could be without any laceration separated, and they were developed in the following proportions:—pectineus, adductors longus and brevis nearly equal; adductor magnus nearly twice their combined weights.

* In the forearm of this specimen of *Ateles fuliginosus* I found a tendinous slip passing from the middle of the tendon of the flexor carpi radialis and running inwards to join the tendon of the palmaris longus, just as the last-named joined the apex of the palmar fascia.

The sartorius is long, but normal; the rectus has but its straight single origin; and the parts of the quadriceps are thus related:—vastus externus = 13, rectus = 5, and the combined vastus internus and crureus = 14. There is no subcrureus. The biceps is arranged as in man. The semitendinosus presented its usual inscription; and the semimembranosus was, as described by Prof. Humphry, quite separate from the fascia. These hamstrings are developed in the following proportions:—biceps ischiaticus = 2, femoralis = 6, semimembranosus = $1\frac{1}{2}$, semitendinosus = $2\frac{1}{2}$. The femoral biceps nearly equals the vastus externus, and the ischiatic equals the rectus; the gracilis is larger than the semitendinosus. Altogether the flexors of the knee by weight are to the extensors as 150 to 100.

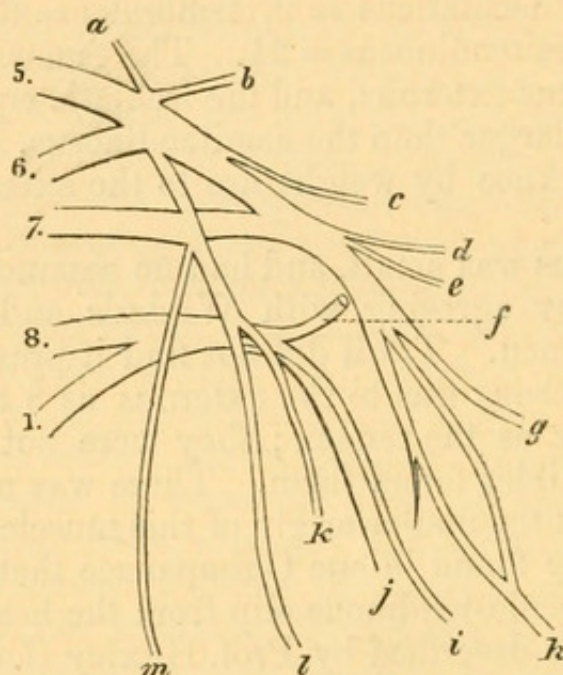
The popliteus was small, and had no sesamoid nodule in its tendon, thereby agreeing with Wilder's and differing from Vrolik's specimen. Traill did not find it present. The gastrocnemius internus was to the externus as 8 to 5; they were separate as far as the tendon; they were not quite fleshy to the heel, as Wilder found them. There was no tibial head of the solæus; but the fibular origin of this muscle was very large. Prof. Humphry found in one Chimpanzee that it was reduced to a small musculo-tendinous slip from the head of the fibula; and the same is described by Prof. Huxley (*l. c.* p. 429). The former author found a distinct tibial head to the solæus in a Chimpanzee. The plantaris was extremely fine and its tendon was inserted separately into the os calcis on the left side; on the right it was absent. This was just the contrary of the arrangement seen by Wilder, who found the muscle suppressed on the left and present on the right. Vrolik also found it, and so did Huxley and Humphry, while Traill reports its absence.

The tibialis anticus is double, one tendon being inserted into the scaphoid and one into the entocuneiform and the metatarsal bone of the hallux; this has been noticed by Vrolik, Wilder, Humphry, and Wyman. The extensor digitorum sends a tendon to all the toes, as Wilder found. The peronæus tertius was absent, as it is in all the *Quadrumana*, the so-called peronæus tertius of Wyman in the Howling Monkey being a peronæus quinti. The other peronæi were anthropoid. The extensor hallucis was normal, as also was the tibialis posticus. The flexors were as described by the various authors.

In the dissection I carefully sought for the various nerve-arrangements, and found in them few varieties which were not anthropoid; the disposition of the cervical plexus, the phrenic and vagus nerves were just as in man; the anterior

crural lay internal to the psoas; otherwise the branches of the lumbar and sacral plexuses were not noteworthy. The coccygeal gland was very small, far more indistinct than in the *Macacus rhesus* or *cynomolgus*.

The brachial plexus, however, was arranged upon a type diverse from the ordinary human method of arrangement. The method of its branching can be better seen in the figure than it could be understood from a description.



Brachial plexus of Chimpanzee.

a, branch to fourth; *b*, muscular; *c*, suprascapular; *d*, anterior thoracic; *e*, posterior thoracic; *f*, circumflex; *g*, external cutaneous; *h*, median; *i*, musculo-spiral; *j*, lesser internal cutaneous; *k*, internal cutaneous; *l*, ulnar; *m*, posterior thoracic.

The general conclusions which can be drawn from this dissection are the following:—1. The facial muscles and head-muscles in this specimen were even more human than any of those hitherto described. The very strong risorius Santorini noticed by Vrolik may have existed; but the facial disease matted together the parts in this locality. 2. The neck- and laryngeal muscles were in general also far more anthropoid than pithecoïd; this is especially true regarding the platysma, digastrics, omo-hyoid, and the laryngeal muscles, as well as the scaleni. 3. The back-muscles were anthropoid in the separateness of the levator anguli scapulæ and the serratus magnus, in the non-development of the occipital rhomboid, but pithecoïd in the presence of a dorsi epitrochlear and of a levator claviculæ; the other shoulder-muscles were anthropoid. 4. The upper limb-muscles departed from the human type in the absence of a coronoid head of the pronator teres, of a

radial origin for the flexor sublimis, and of a specialized flexor pollicis longus; but the presence of a third thumb-extensor and the limitation of the extensor minimi digiti to the fifth finger are tendencies towards the anthropoid disposition of parts. The small and variable psoas parvus, the absent pyramidalis, are interesting in consideration of the variability of these parts in man. 5. In the lower limb the most decidedly pithecoïd features are the small size of the gluteus maximus and its elongated insertion, the position of the semimembranosus, the absence of a tibial head of the solæus and of the peronæus tertius, and the doubling of the tibialis anticus.

XLV.—Contributions to the Crag-Fauna. Part II.*

By ALFRED BELL.

CLOSE research in some new sections and excavations that have been made in the Suffolk-Crag district during the past autumn and winter has produced some very interesting results. Upwards of fifty species of shells (some being undescribed) new to our English Crag, and more than thirty species of others which occur at different horizons to those known previously, have amply rewarded the efforts of my brothers and self, the Red-Crag Polyzoa being also increased from fifteen to thirty species.

Species marked thus * signify the new additions; the others are simply new to the horizon to which they are referred.

C. C., R. C., Norw. C., and Chil. ser. are used as contractions for the Coralline, Red, and Norwich Crag, and the Chillesford series.

MAMMALIA.

**Balæna emarginata*, Ow. The only previously recorded cetotolite from the C. C. (now in the Museum of Practical Geology) was obtained by Col. Alexander, many years since, and is of another species, probably *B. gibbosa*, Ow. C. C. Orford. Second examples of *Castor veterior*, Lamk. (an incisor), and *Ziphius mediolineatus*, Ow., have been lately obtained by myself in the Red Crag.

PISCES.

No list of Crag fishes having been published (probably owing to the difficulty of identifying the fragmentary portions of the skeleton met with), I offer the following short one,

* For Part I. see Ann. & Mag. Nat. Hist. Sept. 1870.