December 4, 1894.

HENRY SEEBOHM, Esq., F.Z.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of November 1894 :—

The total number of registered additions to the Society's Menagerie during the month of November was 169, of which 65 were by presentation, 16 by birth, 8 by purchase, 10 by exchange, and 70 were received on deposit. The total number of departures during the same period, by death and removals, was 122.

Amongst the additions I wish to call special attention to the following :—

1. Ten Surinam Water-Toads (*Pipa americana*), kindly presented by Mr. F. E. Blaauw, C.M.Z.S., and received November 14th, 1894. These have been placed in one of the large tanks in the Reptile-House, where they are kept at a temperature of between 75° and 80°. They are free swimmers, and in their present stage appear to pass the whole of their time in the water. They were in rather poor condition on arrival, but have since fed well on worms and small fishes, and appear to be thriving. We may, therefore, hope to see the extraordinary phenomena of their development exhibited in the Gardens.

2. A fine example of Pel's Owl (*Scotopelia peli*), brought home from Sierra Leone by the Hon. C. B. Mitford, C.M.Z.S., Deputy Governor of the Colony, and presented November 16th. A single other specimen of this species was received by the Society from the Gambia in 1866. (For a figure of this Owl, see 'Ibis,' 1859, p. 445, pl. xv.) The iris in the present species is dark.

3. Two Tree-Kangaroos from Queensland, received in exchange from the Zoological and Acclimatisation Society of Victoria, Melbourne, as examples of Bennett's Kangaroo (*Dendrolagus bennettianus*), which appears not to have yet been sufficiently described¹.

I exhibit a coloured drawing of this animal by Mr. Smit (Plate XLVI.). It is apparently quite distinct from *Dendrolagus lumholtzi*. Mr. Le Souef has kindly sent me a photograph of four examples of this rare animal, taken when high up in a leafless tree in the Zoological Gardens at Melbourne, which I now exhibit.

An account of the capture of these interesting animals at Wyalla, near Bloomfield, in Northern Queensland, by Mr. D. Le Souef will be found in the 'Victorian Naturalist' for April 1894 (vol. xi. p. 11). Mr. Le Souef speaks of them as follows :—“The Tree-climbing Kangaroo (*Dendrolagus bennettianus*) is generally found on or near the top of these ranges, where the timber is not so high or difficult to climb. They remain during the day on the highest branches of a tree, and descend at night to pass from one tree to

¹ See Thomas, 'Catalogue of the Marsupialia and Monotremata in the Collection of the British Museum,' 1888, p. 96.

another. They seem to feed on bird's-nest ferns, leaves of certain trees, creepers, and probably on wild fruits."

Our specimens may be shortly described as follows:—

DENDROLAGUS BENNETTIANUS. (Plate XLVI.)

Dendrolagus bennettianus, De Vis, Abstr. Proc. Linn. Soc. N. S. W. p. v (Oct. 27, 1886) ?

Dark mouse-brown above and beneath, head and sides of neck rufescent; muzzle and ears blackish; patch on back above the tail black; hands and feet blackish; lower surface of tail and tip of tail blackish. Length of body about 24 inches, of tail about 30 inches.

Hab. Queensland.

Prof. F. Jeffrey Bell, F.Z.S., called attention to the acquisition by the Natural History Museum of some specimens of remarkable Corals of great size from North-west Australia, of which he showed some admirable photographs taken by Mr. Percy Highley. Prof. Bell urged the necessity of the acquisition of large specimens of Corals, before coming to any conclusion as to their specific distinctions.

The following papers were read:—

1. On some Points in the Anatomy of *Ornithorhynchus paradoxus*. By T. MANNERS-SMITH, B.A. (Cantab.), M.R.C.S., Chief Demonstrator of Anatomy, Mason College, Birmingham.

[Received October 30, 1894.]

The following is a series of notes upon certain points in the anatomy of *Ornithorhynchus paradoxus*. Though the muscular system of this animal has been frequently described, *e. g.*, by Meckel¹, Owen², and more recently by Coues³, it has occurred to me that there is room for a description of the muscles of the limbs, together with the nerve-supply in those cases where such supply is peculiar, wholly or partially, to the animal under examination.

The work of Coues was undertaken without reference to Meckel's memoir, and Coues differs, in some particulars, from the description of the muscles as given by Owen.

In view of these circumstances, and considering the development

¹ 'Ornithorhynchi paradoxi Descriptio Anatomica,' 1826; and 'Traité général d'Anatomie Comparée,' vi.

² Article on Monotremes in Todd's 'Cyclopedia of Anatomy and Physiology,' vol. iii.

³ Proceedings Essex Institute U.S. 1868, vol. vi.

of opinion during recent years as to the value of nerve-supply in determining muscular homologies, the present seems opportune for a re-examination of the limb myology, and a description of the nerve-plexuses of this animal.

I injected the animal with the intention of giving an account of the vascular system, but as I proceeded I observed that an investigation of the arterial and venous systems would be more successfully undertaken upon a fresh specimen. I have incorporated a few preliminary observations on the trunk and head arteries, and I hope to give a complete description of this part of the anatomy of the animal.

My best thanks are due to Professor Windle for kindly providing me with the specimen.

Trapezius.—This muscle consists of two portions, an anterior and posterior. The upper portion is broad. It arises from the occipital bone and from the ligamentum nuchæ. It is inserted into the spine and acromion of scapula and into the outer third of clavicle. The lower portion is triangular in shape. It arises from the seventh, eighth, ninth, and tenth dorsal vertebræ, and from the ninth, tenth, and eleventh ribs. It is inserted by its narrow apex into the spine of the scapula. Both parts of the muscle are supplied by the same nerve: this passes out just below occiput, gives small branches to anterior part, turns round posterior edge of this portion of the muscle, and ends in posterior part.

Latissimus dorsi.—This muscle has an extensive origin from the lower eleven ribs, all the dorsal and lumbar vertebræ, and the crest of the ilium. It is inserted by two portions, upper and lower, into the humerus, reaching down nearly to the elbow. Both parts are supplied by a nerve derived from the seventh cervical. Coues speaks of the slight spinal and extensive costal origin of this muscle¹. Costal origin seventh to fourteenth ribs. Spinal origin from dorsal vertebræ fourth to ninth. No lumbar origin is mentioned by him. I found both origins more extensive than those mentioned by Coues, and agreeing more with the description given by Owen. The muscle gives off a distinct dorsi-epitrochlearis.

Rhomboideus.—Is a single muscle having both an occipital and a nuchal origin. It is inserted into the base of the scapula.

Epicoraco-brachialis.—This is a triangular muscle. It arises from the epicoracoid and is inserted close to the anterior portion of the deltoid.

Pectoralis major.—This is a large muscle, extending posteriorly almost as far as pubes. It arises from the sternum and from the upper six ribs. The lower part unites with the muscle of the opposite side in a thin aponeurosis. It is inserted into the pectoral ridge of humerus. The muscle is supplied by a large nerve derived from the front of the lower trunk of brachial plexus. It divides into several branches before passing to the muscle.

Levator anguli scapulæ (Trachelo-scapular).—This muscle arises

¹ Vide Proceedings of Essex Institute U.S. vol. vi. 1868, p. 142.

from the transverse process of the atlas in conjunction with the trachelo-acromial. Below, it is inserted into the superior border of the scapula, blending with serratus magnus. It is supplied by a branch of the same nerve which supplies the next muscle. This muscle is called atlanto-scapularis by Coues¹.

Trachelo-acromial.—Is a fairly large muscle. It arises by a narrow strong tendon from the transverse process of the atlas. Below, it is inserted into the spine and acromion process, and also into a small portion of outer end of clavicle. It is supplied by a branch from cervical plexus. Mivart mentions two muscles in this position in *Echidna* as levator claviculæ². This muscle is called atlanto-acromialis by Coues³.

Serratus magnus.—This is a large compound muscle. It arises in separate slips from the lower five or six cervical vertebræ⁴ and from the upper three ribs. It is this costal portion only which Coues describes as serratus magnus, costo-scapularis, or s. anticus. The vertebral portion of the muscle consists of two parts, an anterior and a posterior. The anterior passes to the acromion, the posterior to the base of scapula. It is this portion which is continuous posteriorly with the costal part of the muscle; this latter passing also to the base of the scapula. The whole of these muscles, viz., trachelo-acromial, trachelo-scapula, together with cervical and costal part of serratus magnus, appear to be segmentations of one large muscular sheet. The whole sheet might be called costo-scapular.

Supra-spinatus.—Is a narrow slender muscle arising from a small portion of costal surface of scapula. It is inserted into top of radial tuberosity. In *Echidna* it is much larger and fills the whole costal surface of the bone.

Infra-spinatus.—Arises from the scapula immediately below the spine and from the vertebral border. It is inserted just below the head of humerus into the radial tuberosity, beneath epicoraco-brachialis. It is supplied from the upper trunk of the brachial plexus. Testut⁵ (quoting Sabatier) says that the infra-spinatus and teres minor are fused in *Ornithorhynchus*. Coues also considers them probably fused.

*Teres major*⁶.—Arises from posterior part of vertebral border of scapula. It is inserted into the humerus just below the head.

Teres minor.—Is placed underneath infra-spinatus. It arises from the scapula just below the spine, and is inserted close to the head of humerus, more anteriorly than the infra-spinatus. It is supplied by a special branch from the upper part of the brachial plexus. Testut says the muscle is fused with infra-spinatus.

¹ *Vide supra*.

² Proceedings of Linnean Society, 1866.

³ *Vide supra*.

⁴ This vertebral portion is described by Coues as levator anguli scapulæ.

⁵ 'Les Anomalies Musculaires,' Testut, 1884.

⁶ This is the part corresponding to the muscle described by Coues as lower part of teres major. The part described by Coues as upper part of teres major would appear more probably to belong to subscapularis.

Owen does not mention it in this animal. Mivart says it is absent in *Echidna*.

Subscapularis.—There would appear to be a difference in the origin of the two muscles supra-spinatus and subscapularis in the two species of Monotremes. According to Mivart, in *Echidna*, supra-spinatus occupies the whole of the costal surface of scapula, while subscapularis is confined to outer surface. Owen states that subscapularis is a narrow muscle in *Ornithorhynchus*. It would appear, rather, to be a large muscular sheet arising from the so-called subscapular fossa, *i. e.*, posterior part of outer surface, and from almost the whole of the costal surface, so-called supra-spinous fossa. The two parts are intimately blended, as they pass beyond scapula to humerus, and are inserted together on the ulnar tuberosity. In the portion of the tendon which springs from the costal surface is a sesamoid bone; the other portion is inserted into the ulnar tuberosity just below the sesamoid bone. It is, however, an artificial dissection to separate the two portions. The larger portion, containing the sesamoid bone, would seem from its insertion to represent the subscapular muscle of human anatomy; the portion arising from the so-called subscapular fossa, *i. e.*, posterior part of outer surface, would seem to represent that portion of the subscapularis of human anatomy which arises close to axillary border of scapula. This portion is often separate, and is called in human anatomy subscapulo-capsularis by Macalister. It is in Man inserted just below the chief portion of the subscapular muscle. In this animal it is also inserted below the rest of the muscle. If we imagine the axillary border of the human scapula twisted backwards, so that it, together with the origin of triceps, comes to occupy the middle of the bone, then this subscapulo-capsularis would be also twisted backwards and its origin would occupy the exact position which it has in *Ornithorhynchus*. The two portions of the muscular sheet are supplied by the separate branches of the same nerve which is a branch from the upper part of brachial plexus. Coues describes this muscle as upper part of teres major, *i. e.*, the muscle which he speaks of as arising from both sides of scapula and embracing the bone. Since, however, the two portions of his teres major are quite distinct from their origin to their insertion, and separated, moreover, by the long head of the triceps, this would lead one to think that that portion which passes to ulna tubercle is subscapularis.

MUSCLES OF ARM.

Deltoid.—Consists of two parts, anterior and posterior. They are both inserted into strongly marked deltoid ridge of humerus, and are quite distinct to their insertion.

Biceps.—Arises by two heads; both are coracoid in their origin and both are radial in their insertion. The larger arises from sternal extremity of coracoid, the smaller arises nearer the glenoid cavity from epicoracoid. They blend about the middle of the arm

and are inserted into the radius at the junction of the upper and middle thirds. Between the two heads of origin a muscle is inserted which is probably the pectoralis minor. Only one head is present in *Echidna* (Mivart, *loc. cit.*).

Fig. 1.

MUSCLES OF ARM.

α. Brachialis anticus. β. Triceps. γ. Infra-spinatus. δ. Epicoraco-brachialis. ε. Deltoid.

Coraco-brachialis.—Two portions of the typical coraco-brachialis are present. A longer superficial portion, arising in conjunction with inner (larger) head of biceps from sternal portion of coracoid; it is inserted into the bar of bone bridging over the well-marked supra-condyloid foramen. The deeper portion arises from coracoid and whole of epicoracoid, just below and in front of glenoid cavity; it is inserted into the upper third of the humerus. The two portions are entirely distinct, the tendon of latissimus dorsi separating them from below; both parts are supplied by a branch from the median nerve. The first portion only is called by Coues coraco-brachialis; the second he describes as epicoraco-brachialis; the same two portions are found in *Echidna* (Mivart, *loc. cit.*). There is a distinct epicoraco-brachialis, but in addition two portions of the typical coraco-brachialis are present, as described above.

Brachialis anticus.—Arises from humerus, its origin extending as high as the head of the bone. The muscle is inserted into the upper fourth of the shaft of the ulna.

Triceps.—This is a very large, strong muscle, consisting of four

heads. The long head may be split up into three portions. It arises from the glenoid ridge, on outer surface of scapula, and passes down as a large separate muscle to the large expanded olecranon. The inner head, also large, arises from and covers the posterior surfaces of humerus; it is inserted into olecranon beneath outer and long heads. The outer head, smaller and longer, arises by a narrow tendon from outer surface; it blends with the long head at olecranon. Beneath the inner head is a fourth head, arising from posterior surface of humerus just above the lower extremity; it is inserted into the olecranon beneath inner head. It is this portion of the muscle with which the anconeus externus is continuous. Coues describes this part of the muscle as a portion of anconeus.

The triceps is supplied from posterior trunk of brachial plexus.

Anconeus externus.—Is a small muscle having the usual origin and insertion. It is supplied by a branch of one of the nerves which supplies triceps.

Anconeus internus.—Passes from internal condyle to olecranon. It is supplied by the ulnar nerve.

MUSCLES OF THE FOREARM.

Flexor digitorum.—This is a large muscle. It arises by three heads:—(a) from the internal surface of the ulna; (β) from the lower end of humerus; (γ) a central portion also arises from lower end of humerus. The three portions blend in the lower part of the forearm, where the muscle becomes tendinous, just above the wrist. The tendon expands into two portions, inner and outer, each portion containing a sesamoid bone. From the outer of these divisions tendons pass to the terminal phalanges of the fourth and fifth digits; from the inner, tendons pass to the first, second, and third. At the under surface of the muscle at the wrist is a strong tendinous band arising from cuneiform and passing to the sesamoid bone in the radial division of the tendon. The whole muscle has a very regular arrangement. The ulnar portion is supplied by the ulnar nerve, *i. e.*, the larger posterior portion of the plexus, from seventh and eighth C. and first D.; the central and humeral portions are supplied by median nerve. Four heads to this muscle are described by Mivart¹ in *Iguana*. Two are humeral, one is ulnar. His fourth head arises from the carpus and is inserted into the deep surface of a tendon containing a palmar sesamoid. The tendinous band mentioned above might represent the fourth head of the muscle as described by Mivart in the muscle of this Saurian.

Flexor sublimis digitorum.—There is a small sublimis. It consists of four distinct muscular bellies. They arise from the front part of the tendon of longus (profundus), which contains the sesamoid bones. They pass to the first, second, third, and fourth digits. The fibres of these small muscles arise both from the

¹ "Myology of Iguana," Mivart, P. Z. S. 1867, p. 785.

tendon and from the sesamoid bones in the tendon. They terminate in very slender tendons, which, after resting upon the corresponding tendon of sublimis, spread out into a thin fascia which blends with the digital sheaths of the profundus. The first, third, and fourth are larger than the second, which is very small. The first is more probably an abductor than a flexor of the pollex. The others give off two slender fascial slips, one on each side of the profundus tendon, to first phalanx, and send a third slip forwards to blend with the digital sheaths of the tendons of profundus. This muscle is not mentioned by Owen. Mivart says that flexor brevis is most probably absent in *Echidna* and *Ornithorhynchus*. Whilst the origin of a sublimis from the tendon of a profundus is common in Amphibians, it is rare amongst Mammals.

Flexor carpi radialis is a large muscle. It arises from the lower end of the internal condyle, and is inserted below into a fairly large radial sesamoid bone. From the sesamoid bone slips pass on the radial side to the scapho-lunar and trapezium; on the ulnar side to pisiform and, downwards, to second metacarpal. The muscle is supplied by the median nerve. In *Echidna* this muscle passes to metacarpal bones of pollex and index.

Pronator radii teres.—Arises from the inner condyle of humerus. It is inserted into middle of radius, a little below and on the opposite surface to supinator brevis.

Flexor carpi ulnaris is a large flat muscle, arising by two heads from the internal condyle of the humerus: from the posterior border of the ulna and expanded upper extremity of olecranon. The tendon is inserted into the pisiform, and sends slips to the fourth and fifth metacarpals. This muscle is supplied by the ulnar nerve.

Supinator brevis.—This is a somewhat triangular muscle. It arises from the external condyle, beneath the radial extensors of the wrist. It is inserted into the upper and middle fourths of the shaft of the radius. It is supplied by the posterior interosseous nerve. This muscle is not mentioned by Owen.

Extensor carpi radialis longior.—Arises from the lower third of the supinator side of the shaft of the humerus. Below it divides into three tendons, which pass to the bases of the second, third, and fourth metacarpal bones.

Supinator longus.—Arises from the lower end of the humerus, beneath the longior. It is inserted into the posterior surface of the peculiar large scapho-lunar. The muscle having this origin and insertion in *Echidna* is described by Mivart as the extensor carpi radialis longior. Only one radial extensor is described by Owen in *Ornithorhynchus* corresponding to longior. Supinator longus is not described by him.

Extensor communis digitorum.—Arises by a common tendon from the external condyle. It expands on the back of the wrist, the expansion containing a fibro-cartilage. The expansion divides into two parts, each part giving off three tendons. Two go to the

middle finger, one from each part; the remaining digits have one each. A slip is sent round radial side of manus. Nerve-supply from posterior interosseous.

Fig. 2.

MUSCLES OF FRONT OF FOREARM AND HAND.

- a. Flexor profundus digitorum.
- β. Flexor carpi ulnaris.
- γ. Portion of insertion of Panniculus.
- δ. Extensor minimi digiti. } Muscles of posterior surface seen at left side
- ε. Extensor indicis. } of diagram.
- A. Expanded olecranon.
- B. Lower end of internal condyle of humerus.
- C. Lower part of shaft of ulna.

Extensor minimi digiti.—This is a fairly large muscle. It arises from the lower end of the humerus, in common with the other extensors. It is inserted into the fifth digit. There is also a slender special extensor passing to the fourth digit.

Extensor indicis.—Arises from the posterior border of ulna and from expanded olecranon. It divides into two tendons which go to the second and third digits. This muscle is not mentioned by Coues as distinct; he describes an abortive slip of communis as probably representing an indicis. In my specimen indicis was a most distinct separate muscle, situated on a deeper plane than extensor communis.

Fig. 3.

MUSCLES OF POSTERIOR SURFACE OF FOREARM AND HAND.

- α. Extensor communis digitorum.
- β. Extensor indicis going to 2nd and 3rd digits.
- γ. Extensor ossis metacarpi pollicis.
- δ. Extensor carpi radialis.
- ε. Extensor minimi digiti.

Extensor ossis metacarpi pollicis.—Arises chiefly from ulna; slightly also from radius. It is inserted, in usual position, into base of first metacarpal bone. There is a tendinous band arising from the cuneiform, which crosses the back of the carpus to join the ulnar margin of the tendon.

MYOLOGY OF MANUS.

There is a small short muscle of the thumb, which is most probably a combined flexor and abductor. There is a small muscle passing to the little finger, which appears to be an abductor.

Palmar inter-ossei.—Are fairly well marked and are three in number.

MUSCLES OF THE POSTERIOR EXTREMITY.

Gluteus maximus.—Is a large flat muscle, which arises from the posterior part of the crest of the ilium, from the sacral, and upper eight caudal vertebræ. It is inserted into the lower end of the tibia, this part being closely united with the inter-tibialis, and into the sole of the foot, this portion going partly to os calcis and partly to bone supporting the heel. The muscle has a very similar origin and insertion in *Echidna*¹. Meckel mentions its attachment into the bone supporting the heel in the male.

Beneath the gluteus maximus is a muscle which arises from the first four caudal vertebræ. It is inserted into the femur about its middle, just below the gluteal ridge. This deeper portion is supplied by a branch from great sciatic. This is the muscle described by Meckel as medius; Mivart, too, in *Echidna* describes a muscle having a similar position. The next-mentioned muscle they both look upon as minimus. Mivart, however, mentions that the muscle described above may represent a deep part of maximus. Its insertion would point to that conclusion. Coues describes this muscle as pyriformis: neither its origin nor insertion would indicate that it corresponds to the ordinary pyriformis.

Gluteus medius.—This is a large thick muscle divided at its origin into two parts, superior and inferior. The superior, the larger, arises from the crest and posterior surface of the ilium. The anterior has a narrow origin, from the same surface, close to the cotyloid border of the bone. The two portions are united below, at their insertion into the great tuberosity of the femur. The superior part is supplied by a branch from the sacral plexus. The anterior part is supplied by a branch which arises in abdomen from the anterior crural, and, passing under the rectus, is distributed to this portion of the muscle. Meckel and Mivart in *Echidna* describe this as minimus. From the nerve-supply it would seem that only posterior portion corresponds to ordinary gluteus medius. The anterior portion may be a muscle divorced from the muscles in front of the thigh. There is a small muscle

¹ Mivart.

placed deeply between superior and inferior portions of medius; at its insertion it is blended with medius. It arises from dorsum ilii just behind the superior part of medius. It is a very narrow muscle. It may represent minimus.

There is a muscle arising from the lateral processes of the caudal vertebræ, and inserted into the upper part of the femur. A muscle is described by Mivart in *Echidna*, in this position, which he states he is disposed to regard as the pyriformis. Meckel says pyriformis is present and fairly large. Owen does not mention it. This is apparently the muscle described by Coues as quadratus femoris. Its origin and insertion would approximate it more to pyriformis than the muscle described by Coues under that name.

MUSCLES OF FRONT OF THIGH.

Sartorius.—Is a long muscle. It arises from the pectineal spine of the pubes and is inserted into the head of tibia.

Rectus femoris.—Arises from the cotyloid border of ilium and is inserted into the patella. It is supplied by a branch of the anterior crural, which arises within the abdomen below the nerve which supplies the anterior part of the gluteus medius. This muscle is quite distinct from the rest of the quadriceps.

The remainder of the extensor mass can be separated where the nerve enters into two portions, inner and outer vastus; the two vasti arise from the superior surface of the shaft of the femur, the outer vastus extending as high as greater tuberosity. They are inserted into patella and are supplied by the anterior crural nerve.

Psoas magnus and *Iliacus* have the usual position, relations, and attachments. Their insertion into femur extends as far as a little below the middle. They are supplied by the obturator nerve.

Adductor Group.

Gracilis.—This is a large muscle concealing the other adductors. It arises from the marsupial bone and from the inferior surface of the pubes. It is inserted into the inner side of tibia. The muscle sends a slip to sphincter ani. It is supplied by the obturator nerve. It has much the same origin and insertion in *Echidna* (Mivart).

The named adductors consist of well-marked and easily separable longus, brevis, and magnus. Meckel mentions two only.

Adductor longus.—Arises from the pubes close to marsupial bone. It is inserted into the lower end of femur. It receives a distinct branch of the obturator nerve on its deep surface. This muscle is apparently absent in *Echidna* (Mivart).

Adductor brevis.—This is a narrow muscle, arising by a flat tendon from the mesial portion of the inferior surface of the pubes; it is inserted into the lower end of the femur. In position it is situated

between the longus and the magnus. It receives a fine branch of the obturator nerve.

Fig. 4.

MUSCLES OF THIGH.

α. } Gracilis reflected.
β. }

γ. Adductor mass. 1. Upper one, going to femur, is longus. 2. Middle, slender one is brevis. 3. Lowest, going to tibia, is magnus.

δ. Is a small portion of semi-membranosus seen from the front.

ε. Sartorius cut through.

Adductor magnus.—Is a thick muscle which has a comparatively narrow origin from the inferior surface of ramus of ischium, its origin extending as far back as tuberosity. It is inserted by its base into the upper third of tibia. It may be separated into two parts, anterior and posterior. Each part receives a branch from the obturator nerve. The anterior portion receives in addition a branch from great sciatic, which enters it on its superior surface. The nerve supplies three muscles, adductor magnus, semimembranosus, and two slender branches to supposed inferior gemellus. In *Echidna*, this muscle is inserted into linea aspera, in common with brevis (Mivart, *loc. cit.*). The muscle Coues describes as adductor magnus is inserted into thigh-bone. He homologizes it by its insertion into femur. Its nerve-supply, however, together with the fact that in many mammals adductor magnus is inserted into tibia, lead me to think that the one described above is true adductor magnus.

Pectineus.—There are two pectinei, an internal and an external. The internal arises from the lesser spinous process, as it is called by Owen. The muscle is inserted into the femur just below lesser tuberosity and close to the obturator externus. It is supplied by the obturator nerve. The pectineus externus arises from the pectineal spine (greater spinous process of Owen). It is inserted into the femur halfway down the shaft.

Obturator externus.—Occupies the usual situation. At first sight it appears to be divided into a superior and an inferior portion. Superior portion is more probably inferior gemellus, or, since it receives two branches from the same nerve, it may represent inferior gemellus and quadratus femoris. Its origin, too, would correspond in position to the combined origin of those muscles. The two parts of the obturator externus are easily separated at their origin, but not so at their insertion. The inferior portion is supplied by obturator nerve; the superior by two fine twigs from that branch of great sciatic which supplies adductor magnus in part and semimembranosus¹. Quadratus femoris is present in *Echidna* and appears to have a similar origin and insertion to the muscle described as superior part of obturator externus. The muscle is most probably combined quadratus femoris and gemellus inferior.

Obturator internus is absent. The muscle which occupies the usual situation of origin of this muscle is one of the ischio-caudal muscles. Coues describes three ischio-femoral muscles in the region of externus, *a*, *b*, and *c*: *a*, and probably *b*, he considers represent obturator externus; *c* he considers represents obturator internus.

Hamstring Muscles.

Semi-membranosus.—This is a fairly large muscle arising from the tuber ischii. It is situated between the muscle representing semi-tendinosus and biceps above and the adductor group below. It is inserted into the inner side of the head of the tibia. The chief nerve-supply is from the sciatic, the nerve reaching the muscle on its superior surface. There is, in addition, a very slender branch of the obturator nerve, which supplies the inferior posterior portion of the muscle².

Semi-tendinosus, with which biceps appears to be blended, is a large sheet which arises by a narrow tendon from the tuber ischii. The muscle spreading out is inserted by its anterior fibres into the expanded upper extremity of the fibula and into a strong tendinous band which passes from this process to patella. These portions most probably represent biceps; the posterior part becomes thin and apneurotic and is inserted into the crest of the tibia. Coues describes this muscle entirely as biceps, looking upon semi-

¹ Macalister mentions a large gemellus ('Vertebrate Morphology'). Meckel says they are both absent in *Ornithorhynchus*.

² It appears to have very much the same attachment and position in *Echidna* (Mivart, *loc. cit.*).

tendinosus as a portion of the muscle described above as semi-membranosus.

MUSCLES OF THE LEG.

Gastrocnemius.—Is a large muscle. It arises by two distinct heads: a larger from the upper expanded portion of the head of the fibula; a smaller head arises from the lower end of the femur. The two portions blend and the tendon is inserted into the os calcis. It does not fuse with the soleus. The femoral head is supplied by the internal popliteal.

Soleus.—Arises from the expanded head of the fibula and from the shaft of the same bone. A few fibres arise also from the tibia. The fibres from the fibular shaft arise on the anterior aspect of the bone, and pass backwards between the tibia and fibula to join the other fibres. The two heads blend and pass deeply in a groove beneath the bone supporting the spur on heel. The tendon is here in company with the tibialis posticus. In this situation the soleus divides into two tendons—one passes to the astragalus, the other to the bone supporting the heel. Tibialis posticus passes between the two tendons. Owen states that soleus arises from a large proportion of tibia. This is certainly a mistake; a few fibres only arise from this bone.

Flexor longus digitorum.—Is a large strong muscle. It arises from the upper expanded extremity and from the shaft of the fibula. At the ankle it passes between a process of calcaneum and the bone which supports the spur. In the sole it expands and divides into five strong tendons, one for each digit. Coues describes three tendons.

Flexor brevis digitorum (perforatus).—This muscle is in two parts. One portion springs from superficial surface of flexor longus and passes to the second and third toes. Another portion arises from the calcaneum and passes to the remaining toes. There is a small flexor accessorius seen on reflecting flexor longus, having the usual relationship of that muscle to the longus tendon, *i. e.* passing from calcaneum to deep surface of flexor tendon. The flexor longus is also attached to os calcis by a strong tendinous band. Coues describes the portion arising from flexor longus only as flexor brevis. The part arising from the calcaneum he describes as a dismemberment of flexor fibularis. The two portions have, however, an entirely similar relationship to the longus tendons. I am disposed to regard both the tendinous part and the calcaneal part as dismemberments of the same muscle, *i. e.* a plantaris, which has contracted separate attachments in its course. The resemblance of the tendinous part to the flexor sublimis (brevis) of the anterior extremity will be at once apparent.

Tibialis posticus.—Arises from the upper expanded extremity of the fibula. The tendon passes deeply at the ankle together with the soleus, and, after perforating the latter muscle, very much in the same way that the profundus passes through sublimis in human anatomy, is inserted into a sesamoid bone at junction of the

scaphoid and ento-cuneiform. In the leg it is superficial to soleus.

Fig. 5.

MUSCLES OF THE POSTERIOR SURFACE OF LEG AND SOLE OF FOOT.

- α*. Adductor magnus.
- β*. Femoral head of gastrocnemius.
- γ*. Inter-tibialis.
- δ, δ*. Tibialis posticus (its tendons seen below).
- ε*. A part of soleus.
- θ*. Flexor longus digitorum.
- κ, κ*. Tendinous and calcaneal parts of flexor brevis digitorum.

Extensor longus hallucis.—Arises by two heads, the superficial head from the expanded upper extremity of fibula and the deeper

one from the shaft of the bone. The muscle is inserted into the first digit; the superficial portion from the upper extremity of fibula is supplied by a branch of the same nerve which supplies tibialis anticus.

Fig. 6.

MUSCLES OF ANTERIOR SURFACE OF LEG AND DORSUM OF FOOT.

- α. Tibialis anticus.
- β. Extensor longus hallucis.
- γ. Extensor indicis.
- δ. Superficial extensor of the toes.
- ε. Deep extensor of the toes.
- θ. Peroneus longus.
- κ. Peroneus brevis.

Extensor longus digitorum.—There are two long extensors of the toes, superficial and deep. They both arise from the expanded upper extremity of the fibula. Superficial extensor also from part of shaft of bone. They both expand on the dorsum of foot and give tendons to the second, third, fourth, and fifth digits. Super-

ficial extensor is supplied by the same nerve which supplies the extensor indicis. There is a distinct extensor for second digit arising from upper expanded extremity of fibula, from head of bone, and from a tendinous band between these two points; it is supplied by a slender branch from the peroneal nerve. It will be noticed that index receives three tendons—one from superficial extensor, one from deep, together with a special extensor.

Tibialis anticus.—Arises by two heads: a superficial from upper expanded extremity of fibula, from a strong tendinous band passing from fibula to patella, from patella itself, and from tibia. The deep head from shaft of tibia. It is inserted into ento-cuneiform. Both heads are supplied by a nerve from the front of the thigh, which passes beneath the above-mentioned tendinous band.

Peroneus longus.—Arises from the upper expanded extremity of the fibula. Passing down the outer side of the leg, it reaches the interval between the large os calcis and the cuboid, and passes deeply into the sole of the foot, traverses the sole, and is inserted in the usual situation. It is supplied by the peroneal nerve.

Peroneus brevis.—Arises beneath longus from the expanded extremity of fibula. Its tendon divides below into two slips, one passing to first, the other to second phalanx of fifth toe. It is supplied by the peroneal nerve. Coues describes this as *peroneus tertius*. Its origin and nerve-supply would rather correspond to that of *brevis*.

MYOLOGY OF PES.

Of the muscles of the big toe, flexor brevis hallucis is the only one which can be made out, and this is extremely small.

Of muscles of the little toe, the flexor brevis, the adductor, and the abductor, and a small abductor minimi digiti can be made out.

Plantar and dorsal inter-ossei are also present.

PLEXUSES.

Brachial plexus.—This is formed by the fifth, sixth, seventh, eighth cervical and first dorsal nerves. There is a small filament, in addition, from the fourth cervical, and the first dorsal receives a small branch from the second. The plexus consists of two main trunks—an upper and a lower. The fifth and sixth unite and form the upper trunk. Immediately beyond the formation of this trunk two nerves arise: one passes upwards and forwards and, joining the branch to the plexus from the fourth cervical nerve, it is distributed to the so-called infra-spinatus muscle; the other nerve passes downwards and backwards and forms one head of median. The trunk itself passes backwards in a somewhat similar manner to the circumflex of human anatomy, gives off a branch to subscapularis, and divides into two parts—one passes into forearm and supplies the skin on the outer posterior aspect of the

hand, and gives off a branch to the sup. longus and extensor carpi radialis longior. The lower trunk, formed by the seventh and eighth cervical, first dorsal, and a filament from second dorsal, is much the larger of the two. This trunk divides into three terminal branches about the middle of the arm:—(α) One passes downwards, enters forearm, and is distributed to the cleft between the index and middle fingers on palmar aspect; (β) The next, also a cutaneous branch, is about the same size as the first; it is distributed to the third and fourth clefts. The above two nerves would seem to represent superficial portion of median and part of ulna. (γ) The third branch of the lower trunk, the largest of the three, passing down arm, gives off two branches to the triceps, which curve round the lower border of latissimus dorsi. One of these is the posterior interosseous, which passes through triceps, winds round humerus something like the musculo-spiral of human anatomy. This nerve next passes between brachialis anticus and muscles arising from the radial condyle of humerus, and, passing into forearm, perforates the supinator brevis and supplies the usual muscles on the back of the forearm, with the exception of extensor carpi radialis brevior, extensor primi and secundi inter-nodii pollicis, all of which muscles are absent.

The continuation of the third branch passes into forearm, beneath the anconeus internus, and, after supplying the muscle, gives off branches to the flexor carpi ulnaris and the ulnar portion of the flexor sublimis digitorum; it then continues its course down forearm and ends by supplying the ulnar side of the fifth digit. It communicates in the forearm with the branch to the fourth cleft.

Other branches from lower part of plexus:—The seventh nerve gives off a branch to latissimus dorsi before it joins the plexus. From the lower part of plexus a branch is given to the pectoralis major. The median nerve arises by two roots, and, after supplying the biceps, coraco-brachialis, and brachialis anticus, passes through supracondyloid foramen into the forearm.

Lumbar Plexus.

Obturator nerve.—Its chief origin is from the sixteenth dorsal nerve, allowing two lumbar vertebræ. The nerve passes out between the sixteenth and seventeenth dorsal vertebræ. It is joined by a slender branch from the seventeenth dorsal, a subcostal nerve. The nerve passes along pelvis in the usual position and supplies the usual muscles, together with a slender branch to the semi-membranosus. It also gives off a branch in the abdomen, which, after dividing into several branches, passes to psoas and iliacus.

The anterior crural nerve arises by two fairly large branches from the seventeenth dorsal and the first lumbar nerves. The rest of the first lumbar together with the whole of the second pass into the pelvis, forming the lumbo-sacral cord.

Sacral Plexus.

The nerves entering into this plexus are a large part of the first lumbar, the whole of the second lumbar, and the whole of the first sacral. Portion derived from lumbar nerves divides into two branches; the first sacral also divides into two branches. One of the branches from lumbar part of plexus fuses with one of the branches from sacral part of plexus and forms the peroneal nerve; this, as it passes down the leg, divides into two branches, which seem to represent peroneal and external plantar. Peroneal divides into a muscular branch passing to muscles mentioned in text and a cutaneous branch to the dorsum. The external plantar divides into a cutaneous branch to outer side of foot, and supplies certain muscles of the sole. The remaining branch from lumbar part of plexus unites with remaining branch from sacral part, and forms the internal popliteal nerve; this divides into three branches: two lateral, to the inner and outer heads of the gastrocnemius; one to outer head supplying flexor longus digitorum in addition; one to inner head supplying soleus and tibialis posticus. The continuation of the trunk passes down and becomes the internal plantar, which is mainly cutaneous.

A NOTE ON THE ARTERIAL SYSTEM.

The arch of the aorta has the usual mammalian arrangement, turning to the left side. It gives off the three large cervical and brachial branches in the usual order, viz. innominate, left carotid, left subclavian.

The trunk aorta passes down to the nineteenth vertebra (last lumbar), where it ends by dividing in a peculiar tree-like manner into three small and exceedingly short trunks on each side and a median caudal continuation of the vessel itself—thus there are seven trunks in all.

Passing from without inwards, the outermost of the three trunks divides almost immediately into the following branches:—A small outermost branch for the region of the crest of the ilium. A large branch which passes beneath the psoas parvus and divides here into three branches, which, running down parallel to each other, are all distributed to the deep part of the front of the thigh, as seen in the diagram. A fairly large branch which soon divides into three, two passing to the superficial part of the front of the thigh, the remaining branch to the abdominal wall. These arteries pass over the psoas parvus; they may represent superficial femoral and epigastric. The last branch from the outermost trunk is a vessel which is partly distributed to abdominal wall and also gives off branches which descend into pelvis, together with two obturator arteries—large and small.

The second trunk division of the abdominal aorta: this 2nd division corresponds in its distribution with Hyrtl's¹ internal iliac,

¹ Denkschriften Wiener Akademie, Bd. v.

This divides at once into the following branches proceeding from without inwards:—

A slender branch to bladder. This is Hyrtl's cystic artery.

A large branch, which runs downwards and backwards; leaves pelvis beneath symphysis pubes; runs down on the side of the rectum, and is distributed to the penis and to Cowper's gland. This may represent internal pudic; it gives off branches to bladder, rectum, and an artery, which divides into a pencil of fine vessels and passes to the under surface and side of middle of tail. This artery Hyrtl speaks of as the common pudendal.

A pencil of fine vessels, four in number, which descend into the pelvis parallel to each other, soon subdivide, and passing from thence are eventually distributed to the sides of the tail. This pencil has divided into a set of ten or twelve fine vessels at the side of the anterior part of caudal region.

The innermost of the three trunk branches divides at once into three vessels; these descend into pelvis parallel to each other, and emerging from thence are distributed to the gluteal region; the largest of the three passes to the back of the thigh. These arteries represent gluteal and sciatic.

The central caudal artery descends in the middle line to tip of tail.

The whole arrangement is repeated on the opposite side.

Branches of the Trunk Aorta.

The only branches given off from thoracic trunk are the intercostal arteries. These are nine in number on each side. The first supplies the third and fourth spaces, running along the line of the fourth rib and giving off branches anteriorly and posteriorly to third and fourth spaces. The fifth to the twelfth intercostal intervals are supplied by the second, third, fourth, fifth, sixth, seventh, and eighth arteries. The thirteenth, fourteenth, and fifteenth intervals are supplied by the ninth aortic intercostal. The sixteenth interval is supplied by the first and second lumbar arteries. The upper two spaces are supplied by a superior intercostal. There are five lumbar arteries. They come off by a common trunk which immediately divides into the arteries of opposite sides; the first and second supply the last intercostal spaces; the others are quite below the ribs; the last one passes backwards to the posterior surface of the sacrum and traverses the sacral arcade of Howes¹.

Visceral Branches.

There is a coeliac or coelio-mesenteric axis dividing into gastro-hepatic, splenic, and superior mesenteric. They are distributed to the structures indicated by their names.

Renal arteries.—There are two short renal arteries, which are not very large. Midway between the renal and the division of the aorta is a slender spermatic artery which is extremely tortuous.

¹ 'Journal of Anatomy and Physiology,' vol. vii., n. s., 1892-93.

Fig. 7.

- a.* Cælio-mesenteric axis.
- β.* Renal.
- γ.* Spermatic.
- δ.* Lumbar arteries.
- ε.* Internal pudic.
- θ.* Lateral caudal.
- κ.* Superficial and deep branches to front of thigh.
- π.* Branches to back of thigh and gluteal region.
- ρ.* Central caudal.
- σ.* Branch to supra-hyoidian region.
- τ.* Lingual arteries.
- υ.* Sub-mental.
- ν.* Arteries which seem to represent internal and external pterygoid vessels. The one curving downwards going to the cheek-pouch.
- μ.* Terminal vessel.
- φ.* Internal carotid.

SCHEME OF ARTERIES OF TRUNK, HEAD, AND NECK.

There is no separate inferior mesenteric artery, in this respect agreeing with certain Marsupials.

Arteries of Head and Neck.

The common carotid.—Is a large artery arising from arch of aorta on left side, from innominate on the right. It divides at about the level of the thyroid cartilage into external and internal carotid. Just at the point of bifurcation an artery is given off which passes directly inwards and divides in a regular cross-like manner into ascending, transverse, and descending. The ascending and descending pass to the pre-vertebral muscles; the transverse to the back of the larynx and trachea.

The external carotid.—Passes upwards and backwards; gives off a branch to the supra-hyoid and genio-hyoid muscles. More anteriorly a small lingual artery arises. There is a second smaller lingual just above this, next to submental branch which runs along the whole length of the inferior surface of the lower jaw, close to the bone. Coming off here, in addition, are two slender branches, one passing to the sub-lingual gland, the other to superficial structure, skin, &c. A little higher arises an artery which divides almost immediately into two branches, one passing to the inner surface of the lower jaw, the other to the outer surface; they may represent internal and external pterygoid arteries. The internal is fairly large and gives off several branches to the cheek-pouch. The trunk artery passing a little further on divides into two branches; one, passing to the superficial structures on the side and roof of the skull, is distributed to the deep structures in these regions.

Internal carotid.—Passes deeply at the neck and divides into two branches. The smaller passes deeply beneath pharynx and in front of the longus colli muscle to the anterior margin of foramen magnum. The other is the continuation of the trunk, passes upwards and enters the skull.

2. On some Points in the Visceral Anatomy of *Ornithorhynchus*. By FRANK E. BEDDARD, M.A., F.R.S., Professor to the Society.

[Received December 4, 1894.]

Mr. B. P. Lascelles, assistant master at Harrow School, was so good as to allow me to examine a frozen *Ornithorhynchus* which he had obtained for the purpose of making a skeleton for the Butler Museum at Harrow. After thawing, I found the viscera in a very fair condition for anatomical investigation, though they were naturally somewhat softened.

The first point to which I directed my attention was the

epigastric vein. Some years since I described¹ in the *Echidna* "a large vein running along the ventral wall of the body in very close connection with it," which I identified with the Anterior Abdominal Vein of the lower Vertebrata, and regarded as a persistent Allantoic Vein, persistent nowhere else among the Mammalia.

I am not quite certain whether Prof. Gegenbaur² actually saw this vein himself two years later. But in any case he quotes its existence to emphasize the remoteness of the Monotremata from other Mammalia—"den Besitz einer Abdominalvene theilen sie mit Reptilien." This sentence seems to imply an agreement between *Echidna* and *Ornithorhynchus*, which is not the fact, as our principal authority upon the vascular system of the Vertebrata, Prof. Hochstetter, has quite recently pointed out³. In the paper referred to, the author entirely confirms my discovery of the vein in *Echidna*, without entirely pledging himself to the comparisons made by me. He examined *Ornithorhynchus* with quite negative results. If the vein in question were present in that animal and happened to be turgid with blood, it could hardly, judging from my experience of *Echidna*, be missed, even in a spirit-specimen. But if not in this favourable state, it might conceivably be passed over. The matter therefore appeared to be worth looking into again, particularly since Prof. Howes has dealt with it from a far different point of view.

Prof. Howes⁴ has recently directed attention to the matter in connection with the visceral anatomy of the Australian Torpedo, *Hypnos subnigrum*. He considers that the falciform ligament of the liver in mammals is a vestige of the continuous ventral mesentery preserved in the Dipnoi and Amphibia, and remarks as follows⁵:—"Beddard has briefly described (P. Z. S. 1884, p. 553) a median epigastric vein in the adult *Echidna*. It is most desirable that the relationships of this vessel should be more fully worked out. I cannot reconcile with this the belief (Balfour, Comp. Embryology, vol. ii. p. 623) 'that the falciform ligament is not a remnant of a primitive ventral mesentery.' Beddard's discovery would appear to me fatal to this consideration, and it calls for a re-investigation of the matter."

My investigation of the fresh *Ornithorhynchus* fully bears out Prof. Howes's criticism of the late Prof. Balfour's opinion of the falciform ligament. I am also able to confirm Hochstetter's statement that the epigastric vein is wanting in *Ornithorhynchus*. The confirmation is of some little importance, as it might con-

¹ "Note on the Presence of an Anterior Abdominal Vein in *Echidna*," P. Z. S. 1884, p. 553.

² 'Zur Kenntniss der Mammarorgane der Monotremen.' Leipzig, 1886.

³ "Ueber die Entwicklung der Abdominalvene bei *Salamandra maculata*," Morph. Jahrb. xxi. 1894, p. 26.

⁴ "On the Visceral Anatomy of the Australian Torpedo (*Hypnos subnigrum*), with especial reference to the Suspension of the Vertebrate Alimentary Canal," P. Z. S. 1890, p. 669.

⁵ *Loc. cit.* p. 673, footnote.

ceivably be a variable structure. The animal, after having been skinned, was carefully opened to the left of the middle line so as not to interfere with any structures which might be there. I found in the middle ventral line a fold of thin membrane depending from the parietes into the body-cavity. This fold was crumpled up, but could be readily extended and was then seen to be fully a quarter of an inch in diameter. This fold was attached posteriorly to the bladder, and anteriorly became continuous with the falciform ligament of the liver. This fold must, I think, be regarded as the remains of the primitive ventral mesentery. I strongly suspect, but have unfortunately an insufficient recollection of the facts to confirm my suspicions, that a similar fold exists in *Echidna*. That it should be anangious in the one case and bear a blood-vessel in the other is interesting but not unintelligible. To quote one out of many analogous instances, certain of the mesenteries supporting the cæcum in the Lemurs may or may not have blood-vessels¹.

The *Alimentary viscera* have been described by so many authors, including Home², Meckel³, and Owen⁴, that I can limit myself to a very few remarks. The expression "de grandeur moyenne," applied by Meckel to the stomach⁵, and repeated by Sir R. Owen⁶, is less applicable to the stomach which I examined than the expression used by the translators of Meckel, viz. "extrêmement petit." In Meckel's original figure, copied by Owen in the 'Comparative Anatomy,' the dimensions are too great. I found the greatest diameter of the stomach to be $1\frac{1}{2}$ inch (exactly Sir E. Home's measurement), as against 5 feet 4 inches total length of alimentary canal.

When the viscera were fully displayed by cutting and reflecting the abdominal parietes, the omentum was seen to extend right back to the pelvic region. It is attached to about the last four inches of the large intestine.

The slender cæcum is about one inch long and is about 11 inches from the cloaca. The valvulæ conniventes of the small intestine have been figured by Meckel; but as his figures are a little rough and do not quite do justice to the structures, I have thought it worth while to have the accompanying drawing prepared (fig. 1, p. 718). At about the distance of one foot from the cæcum the valvulæ conniventes come to an end. Their termination is rather more abrupt than I should have supposed from

¹ Beddard, "Additional Notes upon *Haplemur griseus*," P. Z. S. 1891, p. 451 et seqq.

² "A Description of the Anatomy of the *Ornithorhynchus paradoxus*," Phil. Trans. 1802, p. 67.

³ *Ornithorhynchi paradoxii descriptio anatomica*.

⁴ "On the Young of the *Ornithorhynchus paradoxus*, Blum.," Tr. Z. S. vol. i. p. 221

⁵ 'Traité général d'Anatomie Comparée,' Trad. Fr. (Paris, 1838), vol. viii. p. 539.

⁶ 'Comparative Anatomy of Vertebrates' (London, 1868), vol. iii. p. 410.

Fig. 1.

Stomach and commencement of duodenum of *Ornithorhynchus*.*æs*, œsophagus.

|

p, pylorus.

reading the current descriptions of the gut. Though they are not, as Owen remarks, nearly so close together in the posterior as in the anterior part of the gut, I could detect no oblique disposition of the folds. The Peyer's patches are very slightly developed in this animal; I only found one about 2 feet from the cæcum and a second one just below the origin of the cæcum.

The spleen in the animal dissected by myself was not bifid as it has been described. It was a flat band lying diagonally across the body-cavity and looked almost exactly like a coil of intestine.

§ *Male Generative Organs.*

Meckel's figure of these organs, which is copied by Sir Richard Owen, does not appear to me to be accurate in every particular. The testis is of a loose texture and is enveloped in a tough membrane which can be readily dissected off. This is continuous with a sheet of mesentery which supports the anterior convoluted portion of the sperm-duct. It is not, however, only attached to one side and to only a portion of that, as shown in the drawing of Meckel, but is disposed as in the accompanying drawing (fig. 2, p. 720), an inspection of which will render a detailed description unnecessary. The appearances presented are chiefly due to the fact that the mesorchium is attached to the sperm-duct, not along a straight, but a curved line. This brings about the formation of a pocket which is faint comparable to a similar pocket which is usually found between the ovary and the Fallopian tube in female Mammalia. The convoluted character of the sperm-duct is well illustrated in Meckel's figure referred to. It could be readily injected with coloured fluid.

§ *The Heart.*

The heart of *Ornithorhynchus* has been so recently described, with a full account of the previous memoirs relating to the matter, by Prof. Lankester¹, that I need not trouble the Society with any general description. There are, however, some new facts to record concerning the right auriculo-ventricular valve (fig. 3, p. 721). I have thought it worth while to have a drawing prepared of one of the two hearts in my possession, which differ from each other to some extent. Prof. Lankester found in the hearts examined by himself that the "septal flap" of the valve in the half of the collar which borders the septal side of the ostium was either entirely wanting or but slightly represented by a small flap on the right side. This statement was contrary to that of Gegenbaur, who asserted the existence of a complete circular valve like that of other Mammalia. It appeared to Prof. Lankester that the absence or rudimentary character of the septal flap was of greater import-

¹ "On the Valves of the Heart of *Ornithorhynchus*, &c.," P. Z. S. 1882, p. 549; and "On the Right Cardiac Valve of *Echidna* and of *Ornithorhynchus*," P. Z. S. 1883, p. 8.

ance as diagnostic of the Monotreme heart than the fact of the greater muscularity of the valve.

This conclusion was obviously warranted by the facts discovered by Prof. Lankester; but the heart of *Ornithorhynchus* is more variable, apparently, as regards this valve than would be inferred

Fig. 2.

Testis and vas deferens of *Ornithorhynchus*.

t, remains of testis.

s, sac in which it is enclosed.

m, membrane attaching this sac to vas deferens (*Sp*).

n, membrane attaching sperm-duct to body-wall.

from Prof. Lankester's paper. The first of the two hearts which I dissected was, at first sight, almost exactly like that figured by Prof. Lankester in fig. 14 of plate xl. of his memoir. The muscle "b" was single and there was a small membranous septal flap

"bc." But between the apparent end of this flap and the muscle "e" was a slight thickening, ligamentous in texture, of the interventricular wall of the heart. I hardly noticed this until I had examined the second heart. In the latter *the septal flap of the*

Fig. 3.

Heart of *Ornithorhynchus*, with right ventricle opened.

sp, septal flap of valve. | a, a', severed muscles of outer valve-flap.

right auriculo-ventricular valve was completely developed. It was tied down to the interventricular septum by two slight papillary muscles, which, however, did not, as in the case of the other half of the valve, at all invade the tendinous tissue of the valve. They were attached to its edge merely by the tendons. This septal half of the valve lay close to the interventricular wall, as, indeed, is generally the case among mammals; in the first of the two hearts it was so little detached from the ventricular wall as almost to suggest a case of cardiac disease rather than a normal structure. But the state of affairs in the second heart showed plainly how it was necessary to interpret the first heart. It will be noticed that my observations agree entirely with those of Gegenbaur, particularly in the case of the first heart, in which (to quote from Prof. Lankester's translation of Gegenbaur's paper) "no trabeculæ pass

to its (the septal half of the valve's) free margin, and, moreover, no muscular fibres can be detected in its substance."

It is very desirable that more hearts of *Ornithorhynchus* should be examined. At present it is uncertain whether the hearts described by Prof. Lankester or those described by Prof. Gegenbaur and myself have the stronger claim to be regarded as the normal.

Postscript, added Dec. 31.—Since writing the above I have seen, through the kindness of Prof. Weldon, another specimen of *Echidna*. There was, as he pointed out to me, an epigastric vein turgid with blood, supported by a fold of membrane in parts at least an inch deep.

3. Second Report on Additions to the Lizard Collection in the Natural-History Museum¹. By G. A. BOULENGER, F.R.S.

[Received November 20, 1894.]

(Plates XLVII.—XLIX.)

I. *List of the Species, new or previously unrepresented, added to the Collection since February 1890.*

(An asterisk indicates type specimens.)

1. *Tropicolotes tripolitanus*, Ptrs.—Tunisia (*Lataste*); Egypt (*Anderson*).
- *2. *Gymnodactylus peguensis*, Blgr. Ann. Mus. Genova, (2) xiii. 1823, p. 314.—Pegu (*Fea*).
- *3. *Gymnodactylus baluensis*, Mocq. Le Natur. 1890, p. 144.—Kina Baloo, N. Borneo (*Paris Mus.*, *Everett*).
4. *Phyllodactylus androyensis*, Grand.—Madagascar.
5. *Phyllodactylus julieni*, Cope.—Curaçao (*Hartert*).
- *6. *Ædura nivaria*, Blgr., *infra*.—Natal (*Lewis*).
7. *Hemidactylus greeffii*, Bocage.—S. Thomé (*Bocage*).
- *8. *Bunocnemis modesta*, Gthr. P. Z. S. 1894, p. 85.—Ngatana, E. Africa (*Gregory*).
9. *Phyllopezus goyazensis*, Ptrs.—N. Paraguay (*Turin Mus.*).
- *10. *Lygodactylus miops*, Gthr. Ann. N. H. (6) viii. 1891, p. 287.—Madagascar (*Majastre*).
- *11. *Lygodactylus angularis*, Gthr. P. Z. S. 1892, p. 555.—Shiré Highlands (*Johnston*).
- *12. *Geckolepis polylepis*, Bttgr. Kat. Senck. p. 35 (1893).—Madagascar (*Senckenb. Mus.*).
13. *Eurydactylus vieillardii*, Bavay.—New Caledonia.

¹ Cf. P. Z. S. 1890, p. 77.

14. *Phelsuma dubium*, Bttgr.—Madagascar (*Senckenb. Mus.*).
- *15. *Elasmodactylus tuberculosus*, Blgr., *infra.*—Lower Congo (*Pinnock*).
- *16. *Sphaerodactylus vincenti*, Blgr. P. Z. S. 1891, p. 354.—St. Vincent, W.I. (*Godman*).
17. *Delma impar*, Fisch.—S. Australia (*Stirling*).
- *18. *Draco quadrasi*, Bttgr. Katal. Senck. p. 41 (1893).—Sibuyan Island, Philippines (*Senckenb. Mus.*).
- *19. *Draco walkeri*, Blgr. Ann. N. H. (6) vii. 1891, p. 279.—Timor (*Walker*).
- *20. *Draco modiglianii*, Vincig. Ann. Mus. Genova, (2) xii. 1892, p. 523.—Engano (*Modigliani*).
- *21. *Draco microlepis*, Blgr. P. Z. S. 1893, p. 523.—N. Borneo (*Everett*).
- *22. *Draco maximus*, Blgr. P. Z. S. 1893, p. 522.—Sarawak (*Hose*).
23. *Gonycephalus boydii*, Macleay.—Herbert R. (*Boyd*).
24. *Acanthosaura kakhienensis*, And.—S. Shan States (*Oates*); Karin hills (*Fea*).
25. *Japalura ornata*, v. Lidth de Jeude, Notes Leyd. Mus. xv. 1893, p. 251.—Kina Baloo, N. Borneo (*Everett*).
- *26. *Agama gregorii*, Gthr. P. Z. S. 1894, p. 86.—Mkonumbi, E. Africa (*Gregory*).
27. *Phrynocephalus vlangalii*, Strauch.—Swan Sje (*St. Petersburg Mus.*); E. Turkestan and W. China (*Littledale*).
28. *Phrynocephalus przewalskii*, Strauch.—S. Aljarchan (*St. Petersburg Mus.*).
- *29. *Phrynocephalus arabicus*, Anders. Ann. N. H. (6) xiv. 1894, p. 377.—Hadramut (*Anderson*).
30. *Amphibolurus decresii*, D. & B.—Australia (*Christiania Mus.*).
- *31. *Aporoscelis bentii*, Anders. Ann. N. H. (6) xiv. 1894, p. 376.—Hadramut (*Anderson*).
- *32. *Anolis watsii*, Blgr. Ann. N. H. (6) xiv. 1894, p. 375.—Antigua, W.I. (*Watts*).
33. *Anolis limifrons*, Cope.—Nicaragua (*Rix*).
- *34. *Anolis rixi*, Blgr., *infra.*—Nicaragua (*Rix*).
- *35. *Anolis rhombifer*, Blgr., *infra.*—Nicaragua (*Rix*).
36. *Polychrus gutturosus*, Berth.—Nicaragua (*Rix*); Panama (*Christiania Mus.*); Ecuador (*Gunter*).
- *37. *Anisolepis grilli*, Blgr. Ann. Mus. Genova, (2) x. 1891, p. 909.—Parana (*Grillo*); S. Paulo (*Ihering*).
- *38. *Aptycholemus longicauda*, Blgr. Ann. N. H. (6) viii. 1891, p. 85.—Riacho del Oro, Argentina (*Copenhagen Mus.*).
- *39. *Ctenoblepharis jamesii*, Blgr. P. Z. S. 1891, p. 3.—Tarapaca, Chili (*James*).
- *40. *Urocentrum guentheri*, Blgr., *infra.*—Yquitos, Peru.
- *41. *Sceloporus bulleri*, Blgr., *infra.*—Jalisco, Mexico (*Buller*).
42. *Sceloporus melanorhinus*, Bocourt.—S. Domingo de Guzman, Mexico (*Buller*).

43. *Sceloporus orcutti*, Stejn. N. Am. Faun. no. 7, pt. 2, p. 181 (1893).—California (*Gilbert*).
- *44. *Sceloporus heterolepis*, Blgr., *infra*.—Jalisco (*Buller*).
45. *Phrynosoma coronatum*, Blainv.¹—California (*Christiania Mus.*).
46. *Zonurus vittifer*, Reichen. Zool. Anz. 1887, p. 372.—Zulu-land (*Christiania Mus.*).
- *47. *Zonurus jonesii*, Blgr. Ann. N. H. (6) vii. 1891, p. 417.—Transvaal (*Jones*).
- *48. *Chamaesaura miopropus*, Blgr., *infra*.—Brit. C. Africa (*Carson*).
- *49. *Diploglossus bivittatus*, Blgr., *infra*.—Nicaragua (*Rothschuh*).
- *50. *Ophiodes intermedius*, Blgr. Ann. N. H. (6) xiii. 1894, p. 343.—Paraguay (*Bohls*).
- *51. *Varanus heteropholis*, Blgr. P. Z. S. 1892, p. 506.—Sarawak (*Hose*).
52. *Varanus togianus*, Ptrs.—Macassar (*M. Weber*).
- *53. *Centropyx viridistriga*, Blgr. Ann. N. H. (6) xiii. 1894, p. 343.—Paraguay (*Bohls*).
54. *Cnemidophorus arubensis*, v. Lidth de Jeude, Notes Leyd. Mus. ix. 1887, p. 132.—Aruba (*Hartert*).
- *55. *Amphisbæna bohlsii*, Blgr. Ann. N. H. (6) xiii. 1894, p. 344.—Paraguay (*Bohls*).
56. *Amphisbæna camura*, Cope.—Paraguay (*Bohls*).
57. *Amphisbæna quadrifrons*, Ptrs.—Kalahari (*Cunninghame*).
- *58. *Lepidosternum latifrontale*, Blgr. Ann. N. H. (6) xiii. 1894, p. 345.—Paraguay (*Bohls*).
- *59. *Tachydromus holsti*, Blgr., *infra*.—Chimabara, Japan (*Holst*).
- *60. *Tachydromus formosanus*, Blgr. Ann. N. H. (6) xiv. 1894, p. 462.—Formosa (*Holst*).
61. *Lacerta simonyi*, Steind. Anz. Ak. Wien, 1889, p. 260.—Zalmor, near Hierro, Canary Islands (*Tristram*).
62. *Algiroides moreoticus*, Bibr.—Morea (*Douglass*); Cephalonia (*Werner*).
63. *Eremias sextæniata*, Stejneger, Proc. U. S. Nat. Mus. xvi. 1894, p. 718.—Lamu, E. Africa (*Jackson*).
- *64. *Eremias erythrosticta*, Blgr. Ann. Mus. Genova, (2) xii. 1891, p. 10.—Somaliland (*Robecchi*).
65. *Mabuia pulchra*, Matschie, Sitzb. Ges. nat. Fr. 1893, p. 29.—S. Arabia (*Anderson*).
66. *Mabuia hildebrandtii*, Ptrs.—Somaliland (*Robecchi*).
67. *Lygosoma sanctum*, D. & B.—Java (*M. Weber*).
- *68. *Lygosoma florense*, M. Weber, Zool. Ergebn. p. 173 (1890).—Flores (*M. Weber*).
69. *Lygosoma striolatum*, M. Weber, L. c. p. 172.—Damma Island (*Walker*).

¹ The specimens referred to *P. coronatum* in the Catalogue belong to a distinct species, *P. blainvillii*, Gray, as pointed out by Stejneger, N. Am. Faun. no. 7, pt. 2, p. 187 (1893), and Vanderburgh, Proc. Cal. Ac. (2) iv. 1894, p. 296.

- *70. *Lygosoma amabile*, F. Müll. Verh. nat. Ges. Basel, x. 1894, p. 385.—Celebes (*Sarasin*).
- *71. *Lygosoma subcæruleum*, Blgr. Ann. N. H. (6) viii. 1891, p. 289.—Travancore (*Ferguson*).
- 72. *Lygosoma variabile*, Bavay.—New Caledonia.
- 73. *Lygosoma delicatum*, De Vis, Proc. Linn. Soc. N. S. W. (2) ii. 1888, p. 820.—Queensland (*Boyd*).
- 74. *Lygosoma pectorale*, De Vis.—N.W. Australia (*Walker*).
- *75. *Lygosoma maccoeyi*, Rams. & D. Ogilby, Rec. Austral. Mus. i. 1890, p. 8.—Brawlin, N. S. Wales (*Australian Mus.*).
- *76. *Lygosoma spenceri*, Lucas, Proc. R. Soc. Vict. (2) vi. 1894, p. 81.—Victoria (*Lucas*).
- 77. *Lygosoma whiteheadi*, Mocq. Le Natur. 1890, p. 144.—Labuan (*Everett*).
- *78. *Lygosoma luzonense*, Blgr., *infra*.—N. Luzon (*Whitehead*).
- *79. *Lygosoma decipiens*, Blgr., *infra*.—N. Luzon (*Whitehead*).
- 80. *Lygosoma anchietæ*, Bocage.—Angola (*Bocage*).
- *81. *Lygosoma relictum*, Vincig. Ann. Mus. Genova, (2) xii. 1892, p. 524.—Engano (*Modigliani*).
- *82. *Lygosoma maccoyi*, Lucas, Proc. R. Soc. Vict. (2) vi. 1894, p. 85.—Victoria (*Lucas*).
- *83. *Lygosoma walkeri*, Blgr. Ann. N. H. (6) viii. 1891, p. 405.—N.W. Australia (*Walker*).
- *84. *Ablepharus boulengeri*, D. Ogilby, Rec. Austral. Mus. i. 1890, p. 10.—Brawlin, N. S. Wales (*Australian Mus.*).
- *85. *Ablepharus carsonii*, Blgr., *infra*.—Brit. C. Africa (*Carson*).
- *86. *Ablepharus festæ*, Peracca, Bull. Mus. Torin. ix. 1894, no. 167, p. 8.—Syria (*Festa*).
- *87. *Tropidophorus mocquardii*, Blgr., *infra*.—N. Borneo (*Everett*).
- 88. *Eumeces schwartzii*, Fisch.—W. Indies (*Christiania Mus.*).
- 89. *Scincopus fasciatus*, Ptrs.—Suakin (*Penton, Anderson*).
- 90. *Ophiomorus brevipes*, Blanf.—Transcaspia (*Eylandt*).
- *91. *Chalcides boulengeri*, Anders. P. Z. S. 1892, p. 17.—Tunisia (*Anderson*).
- 92. *Chalcides delislii*, Lataste.—Suakin (*Anderson*).
- 93. *Scelotes astrolabi*, D. & B.—Madagascar.
- 94. *Sepsina tetradactyla*, Ptrs.—Nyassaland (*Johnston*).
- *95. *Chamaeleon longicauda*, Gthr. Ann. N. H. (6) viii. 1891, p. 287.—Madagascar.
- 96. *Chamaeleon tavetensis*, Steind. Sitzb. Ak. Wien, c. 1891, p. 310.—Taveta, E. Africa (*Anstruther*).
- *97. *Brookesia stumpffii*, Bttgr. Zool. Anz. 1894, p. 182.—Nossi Bé (*Senckenberg Mus.*).
- *98. *Rhampholeon platyceps*, Gthr. P. Z. S. 1892, p. 556.—Nyassaland (*Johnston*).
- *99. *Rhampholeon brachyurus*, Gthr. l. c. p. 557.—Nyassaland (*Johnston*).

II. *Descriptions of new Species.*

CEDURA NIVARIA. (Plate XLVII. fig. 1.)

Head moderate, much depressed, oviform; snout as long as the distance between the eye and the ear-opening, once and a half the diameter of the orbit; ear-opening small, oval, oblique. Head covered with small, round, convex granules, largest on the snout; rostral twice as broad as deep, without cleft; nostril between five scales, the upper largest and separated from its fellow by a granule; eight or nine upper and as many lower labials; mental and anterior lower labials followed by small flat shields, gradually passing into the small granules of the throat. Back covered with uniform granules, as large as those on the snout; ventral scales larger, subimbricate, smooth. Digits strongly dilated, the basal portion not quite so broad as the distal expansion; two pairs of large plates at the extremity of the basal portion, followed by smaller single plates. Male with a curved series of 15 præanal pores. Tail slightly longer than head and body, depressed, tapering to a fine point, its basal portion divided into distinct segments composed of six transverse series of scales above and five beneath. Pale brown above, mottled with darker and with undulous dark brown transverse bands; tail above with blackish transverse spots and with whitish annuli in its distal half.

	millim.		millim.
Total length.....	118	Fore limb.....	20
Head	15	Hind limb	25
Width of head....	13	Tail	62
Body	41		

A single male specimen, captured on the snow on the Drakensberg Range, Natal (see above, p. 608). Presented by Mr. R. T. Lewis.

ELASMODACTYLUS, g. n. Geckonidarum.

Digits strongly dilated, free, with transverse undivided lamellæ below; all digits with a minute claw fitting in a notch of the distal lamella. Body covered with unequal-sized juxtaposed tubercles. Pupil vertical.

In its digital structure this new form approaches *Rhoptropus*, Peters (= *Dactychilikion*, Thominot¹), and to a certain extent bridges over the gap separating the latter from *Gecko*. But it is well distinguished from *Rhoptropus* by the shorter digits expanding more gradually towards the end, the incomplete palpebral ring, and the dorsal lepidosis.

¹ One of the principal characters on which *Dactychilikion* was founded, viz. the hair-like fringe of the subdigital lamellæ, is common to all Geckos and more or less easily visible when the outer layer of the epidermis has been removed. These cuticular hairs were first noticed in the Geckos by Cartier, Arb. Zool. Inst. Würzb. i. 1872, p. 86, in the Anoles by M. Braun, *op. cit.* v. 1879, p. 31.

ELASMODACTYLUS TUBERCULOSUS. (Plate XLVII. fig. 2.)

Body stout, limbs short. Head longer than broad, moderately depressed, distinct from neck; snout obtusely pointed, a little longer than the distance from the eye to the ear-opening, once and a half the diameter of the orbit; ear-opening oval-subtriangular, its greatest diameter not quite half that of the orbit. Upper surface of head covered with small granules, which are intermixed with larger ones behind; nostril pierced between the rostral and four scales; rostral once and a half as broad as deep, with median cleft above; ten upper labials; nine lower labials; mental large, posterior border rounded; no chin-shields; throat finely granulate. Body and limbs above with granules and tubercles of unequal sizes, the largest of which are subconical and concentrically striated; the vertebral line with uniform small granules; belly covered with very small, subimbricate, cycloid, smooth scales. Digits moderately elongate, not very unequal in length, depressed at the base, dilated into an elongate ovate disk in the distal half; 20 lamellæ under the median toe. Uniform dark grey-brown above, dirty white beneath.

From snout to vent	70 millim.
Head	20 "
Width of head	15 "
Fore limb	22 "
Hind limb	27 "

The only specimen, collected by the Rev. J. Pinnock in the district of the Lower Congo, is a female with the tail in an early stage of regeneration.

ANOLIS RIXI. (Plate XLVIII. fig. 1.)

Head once and two-thirds as long as broad, slightly longer than the tibia; forehead concave; frontal ridges strong, divergent; upper head-scales mostly keeled, very small on the snout; scales of the supraorbital semicircles strongly enlarged, strongly keeled, separated by one series of small scales; five or six large, strongly keeled supraoculars; occipital small, separated from the supraorbital semicircles by two series of rather large scales; canthal scales three; loreal rows nine; nine upper labials to below centre of eye; ear-opening large, vertically oval. Gular appendage moderately large; gular scales keeled. Body slightly compressed; no dorso-nuchal fold. Dorsal scales large, larger than the ventrals, irregular, and rather unequal in size, feebly imbricate, feebly keeled; flanks covered with small granular scales; ventrals subrhomboidal, scarcely imbricate, keeled. The adpressed hind limb reaches the centre of the eye; digits very feebly dilated; 14 lamellæ under phalanges II. and III. of the fourth toe. Tail slightly compressed, once and a half length of head and body. No enlarged postanal scales. Coppery brown above, with a dark brown lateral stripe proceeding from the eye; a pale stripe from the shoulder to the groin, edged

below by a dark brown line; upper lip white, crossed by two oblique brown streaks on each side of the snout; limbs with brown cross-bars; lower parts white, the gular appendage greyish on the sides.

	millim.		millim.
Total length.....	147	Fore limb.....	23
Head	15	Hind limb	44
Width of head....	9	Tail	88
Body	44		

A single male specimen from Chontales, Nicaragua, collected by Mr. R. A. Rix. Presented to the British Museum by Mr. W. M. Crowfoot.

ANOLIS RHOMBIFER. (Plate XLVIII. fig. 2.)

Head nearly once and two-thirds as long as broad, longer than the tibia; forehead concave; frontal ridges feebly marked; upper head-scales feebly keeled; scales of the supraorbital semicircles strongly enlarged, separated by one or two series of small scales; twelve to fourteen enlarged supraoculars, separated from the supraorbital scales by a series of very small scales; occipital as large as the ear-opening, separated from the supraorbitals by three or four series of scales; canthal scales four; loreal rows seven; six upper labials to below centre of eye; ear-opening large, vertically oval. Gular appendage moderately large; gular scales keeled. Body slightly compressed; no dorso-nuchal fold. Dorsal scales small, subimbricate, strongly keeled, much smaller than ventrals; flanks covered with minute, granular scales; ventrals imbricate and strongly keeled. The adpressed hind limb reaches the centre or the anterior border of the eye; digits moderately dilated; 14 or 15 lamellæ under phalanges II. and III. of the fourth toe. Tail scarcely compressed, once and one-fourth to once and one-third length of head and body. No enlarged postanal scales. Pale greenish golden above, with two brown stripes originating on the nape above and behind the ears; between these stripes five large rhomboidal brown spots, the last between the hind limbs; a small blackish ring on the base of the tail; lower parts whitish.

	♂. millim.	♀. millim.
Total length	90	128
Head	12	15
Width of head	7.5	9
Body	28	40
Fore limb.....	19	24
Hind limb	34	44
Tail	50	73

Two specimens, male and female, from Chontales, Nicaragua, collected by Mr. R. A. Rix. Presented to the British Museum by Mr. W. M. Crowfoot.

UROCENTRUM GUENTHERI. (Plate XLVII. fig. 3.)

Snout short, rounded; nostril directed upwards; upper head-scales with small granular asperities; a series of four or five large transverse band-like supraoculars, separated from the supraciliaries by a single series of very small scales; occipital longer than broad, narrower than the supraocular region; four or five upper and five lower labials; ear-opening as large as the eye-opening, without denticulation on its anterior border. Sides of head plicate; second gular fold strongest. Lateral and anterior dorsal scales very small, granular, smooth; posterior dorsal scales larger, smooth or very obtusely keeled; ventrals larger, squarish, feebly imbricate, smooth. Digits slender. The adpressed hind limb reaches the axilla. Tail shorter and narrower than the body, flat inferiorly, twice as broad as deep, with whorls of very large, obtusely keeled, spinose scales, the spines strongest on the sides. Head and nape bluish grey, back and limbs pale olive; head spotted with black; nape and anterior part of back with curved black cross-bands; posterior half of body with a wide-meshed black network; belly greenish white.

	millim.		millim.
Total length.....	122	Fore limb.....	32
Head	18	Hind limb	38
Width of head....	11	Tail	34
Body	70		

A single female specimen from Yquitos, Peru.

SCELOPORUS BULLERI. (Plate XLVIII. fig. 3.)

Head moderate; snout much flattened. Head-shields smooth; a series of four large, transversely enlarged supraoculars, bordered inwards by one series of small scales; two canthal scales; occipital (interparietal) as long as broad or longer than broad, much larger than the parietals; four or five pointed scales form a denticulation on the anterior border of the ear. Dorsal scales much larger than ventrals, a little broader than long, keeled, mucronate and denticulate, converging towards the median line; 36 to 39 scales between the occipital shield and the base of the tail; 8 or 9 scales correspond to the length of the shielded part of the head; lateral scales graduating into the dorsals and ventrals, directed obliquely upwards and backwards; ventrals smooth, bi- or tricuspid; 41 or 44 scales round the middle of the body. The adpressed hind limb reaches the shoulder or the ear; tibia as long as the shielded part of the head; the distance between the base of the fifth toe and the extremity of the fourth equals the distance between the end of the snout and the ear. 15 to 18 femoral pores on each side. Caudal scales as large as dorsals. Male with enlarged postanal scales. Dark olive above, with a black uninterrupted collar, which may be more or less distinctly edged with yellowish or greenish; sides of belly dark blue, black-edged, in both sexes; a patch of blue may be present on the throat, the greater part of which is black or dark olive.

	♂. millim.	♀. millim.
Total length.....	231	194
Head	26	22
Width of head.....	22	18
Body	70	69
Fore limb.....	42	38
Hind limb	64	55
Tail	135	103 (reproduced)

This species appears to be nearest allied to *S. dugesii*, Bocourt. Several specimens were obtained in the State of Jalisco, at Colonia Brizuela and at La Cumbre de los Arrastrados, 8500 feet altitude, by Dr. A. C. Buller.

Among the Reptiles brought home by Dr. Buller from the Isthmus of Tehuantepec there are specimens which I refer to *S. melanorhinus*, Bocourt. As that species is still very imperfectly known, and as the specimens I have referred to it differ in a few points from Bocourt's diagnosis, I append the following description:—

SCELOPORUS MELANORHINUS, Bocourt, Journ. de Zool. v. 1876, p. 401.

Head large; snout much flattened. Head-shields smooth; a series of four large transverse supraoculars, separated from the frontal and from the supraciliaries by one series of small scales, the fourth in contact with the parietal; occipital (interparietal) a little broader than long, as broad as or broader than the parietals, which are large and broader than long; ear-opening nearly hidden under the large pointed scales in front of it. Dorsal scales much larger than ventrals, as broad as long, strongly keeled and mucronate, entire or feebly denticulate, forming parallel longitudinal series; 26 or 27 scales between the occipital scale and the base of the tail; 6 or 7 scales correspond to the length of the shielded part of the head; lateral scales keeled, directed upwards and backwards, graduating into the dorsals and ventrals; latter smooth, bicuspid; 36 to 40 scales round the middle of the body. The adpressed hind limb reaches the shoulder or the ear; tibia a little shorter than the shielded part of the head; the distance between the base of the fifth toe and the extremity of the fourth equals the distance between the end of the snout or the nostril and the ear. 19 or 20 femoral pores on each side. Caudal scales nearly as large as dorsals. Male with enlarged postanal scales. Yellowish or greyish olive above; a yellowish, black-edged cross-bar between the eyes; a yellowish band from behind the eye to above the axilla, between which a blackish blotch or bar extends across the scapular region; some less distinct dark cross-bars may follow on the back; male with the lower surface of the head black and white in front, pale blue behind, yellowish green on the sides; the breast and median line of belly salmon-red; the belly pale blue near the median line, yellowish green on the sides.

	♂. millim.	♀. millim.
Total length	208	193
Head	25	28
Width of head	22	28
Body	73	77
Fore limb	43	46
Hind limb	57	63
Tail.....	110	95

Three specimens (male, female, and half-grown) obtained at Santo Domingo de Guzman, Mexico, by Dr. A. C. Buller.

SCELOPORUS HETEROLEPIS. (Plate XLVIII. fig. 4.)

Head small. Head-shields smooth; one or two more or less irregular series of transversely enlarged supraoculars; two canthal scales; occipital large, as long as broad or broader than long; parietals small, sometimes indistinct; anterior border of ear with a denticulation formed by three or four pointed scales. Dorsal scales very unequal in size, irregular, some nearly smooth, others strongly keeled; a pair of vertebral and a latero-dorsal series of large strongly keeled scales form sorts of crests along the body; ventral scales smooth, mostly bicuspid. The adpressed hind limb reaches the shoulder or the ear; tibia as long as the shielded part of the head; the distance between the base of the fifth toe and the extremity of the fourth exceeds the distance between the end of the snout and the posterior border of the ear. 14 to 19 femoral pores on each side. Caudal scales as large as largest dorsals, strongly keeled, spinose. Male with strongly enlarged postanal scales. Coloration very much as in *S. microlepis*. Greyish or pale brown above, with indistinct darker and lighter blotches and symmetrical blackish markings in the form of transverse or angular lines, the first of which crosses the frontal and supraocular regions; male with a black bar (sometimes interrupted) across the throat and with a large pale blue blotch on each side of the belly, broadly edged with blackish blue on the median ventral line.

	♂. millim.	♀. millim.
Total length	135	125
Head	16	14
Width of head	14	12
Body	44	46
Fore limb	29	26
Hind limb	39	37
Tail.....	75	65

Several specimens were collected by Dr. A. C. Buller at various localities in the State of Jalisco (La Cumbre de los Arrastrados, Real Alto, Riocho La Berberia, Sierra de Bolaños), at altitudes varying between 7800 and 8500 feet.

CHAMÆSAURA MIOPROPUS.

Fore limb reduced to a minute clawed vestige, no longer than a scale; hind limb much more developed, nearly half as long as the head, ending in a single claw, as in *C. anguina*. One femoral pore. Head-shields and scaling of the body as in *C. anguina*. Yellowish, with four pale brown stripes, the median pair edged with black on the outer side.

	millim.
Total length	550
Head	15
Tail	430
Fore limb	1
Hind limb	7

A single specimen from Fwambo, British Central Africa. Collected by Mr. A. Carson.

In the first Report I described a species (*C. didactyla*) intermediate between *C. ænea* and *C. anguina*. The one now established fills up the gap between *C. anguina* and *C. macrolepis*.

The five species of *Chamæsauro* may be distinguished as follows:—

A. Both pairs of limbs very distinct.

Limbs pentadactyle; 28 scales round the body	1. <i>ænea</i> , Wgm.
Limbs didactyle; 26 scales round the body	2. <i>didactyla</i> , Blgr.
Limbs monodactyle; 26 scales round the body	3. <i>anguina</i> , L.

B. Fore limb very minute or absent; hind limb monodactyle.

Fore limb distinct; 26 scales round the body	4. <i>miopropus</i> , Blgr.
No trace of fore limb externally; 22 scales round the body	5. <i>macrolepis</i> , Cope.

DIPLOGLOSSUS BIVITTATUS. (Plate XLVIII. fig. 5.)

Head slightly distinct from neck; snout moderate, with obtuse canthus; ear-opening small. A large azygous præfrontal, in contact with the frontal and the first and second supraoculars, in contact with the second loreal, and separated from the rostral by two pairs of shields; frontal twice as long as broad; parietal separated from the frontal and supraoculars by two shields; nasal in contact with the rostral, followed by two superposed postnasals, two loreals, and a præocular; rostral a little narrower than the symphysial; the suture between the sixth and seventh upper labials falls below the centre of the eye; three chin-shields on each side, first in contact with the second and third lower labials. Scales smooth, 33 round the middle of the body. Limbs short, not meeting when adpressed; digits moderate, claws exposed. Tail cylindrical, covered with smooth scales. Black above, with two greenish-white stripes from the end of the snout, where they unite, to the base of the tail, passing above the eye; lips and sides of neck whitish with black bars; throat whitish; belly greyish; tail salmon-pink.

	millim.		millim.
Total length.....	75	Fore limb.....	8
Head	9	Hind limb	10
Width of head....	5	Tail	43
Body.....	23		

A single young specimen from the Hacienda Rosa de Jericho, Nicaragua, 3250 feet; collected by Dr. E. Rothsuh.

TACHYDROMUS HOLSTI. (Plate XLIX. fig. 1.)

Head rather short. Rostral forming a suture with the fronto-nasal, entirely separating the nasals; supraoculars in contact with the supraciliaries; a small shield separates the large anterior supraocular from the loreal; temporal scales very small, obtusely keeled; three or four chin-shields on each side¹. Six longitudinal series of strongly keeled dorsal shields, the two median smaller; eight longitudinal series of keeled ventral shields; three series of smaller keeled shields on each side of the ventrals. Two inguinal pores on each side. Olive above, greenish white beneath; a white streak from the eye to the shoulder, passing through the tympanum.

	millim.		millim.
Total length.....	113	Fore limb.....	16
Head	10	Hind limb	22
Width of head ..	7	Tail (reproduced) .	58
Body.....	45		

Two specimens, from the Osen Mt., Shimabara, Japan; collected by Mr. Holst.

LYGOSOMA LUZONENSE. (Plate XLIX. fig. 2.)

Section *Hinulia*. Body elongate; limbs weak; the distance between the end of the snout and the fore limb is contained once and a half in the distance between axilla and groin. Snout short, obtusely pointed. Lower eyelid scaly. Nostril pierced in the nasal; no supranasal; frontonasal broader than long, forming a suture with the rostral; præfrontals in contact; frontal not quite so long as the frontoparietal, which is single, in contact with the first and second supraoculars; four supraoculars, first largest; seven supraciliaries; parietals forming a suture behind the interparietal; no enlarged nuchals; fourth to sixth upper labials below the eye. Ear-opening round, small, not larger than the pupil. 28 smooth scales round the middle of the body; dorsals as large as ventrals, laterals smaller. A pair of feebly enlarged præanals. The length of the hind limb equals the distance between the posterior border of the eye and the fore limb; fourth toe a little longer than third. Tail thick, once and one-fourth the length of

¹ The adult has three chin-shields on the right side and four on the left; the young has four shields on each side.

head and body. Pale reddish brown above, with small darker spots, a slightly undulous blackish line on each side, and a series of blackish spots forming an interrupted vertebral line; sides dark brown, with light dots; lower parts whitish.

	millim.		millim.
Total length.....	88	Fore limb.....	8
Head	8	Hind limb	10
Width of head	4.5	Tail	50
Body	30		

A single specimen from Mt. Benguet, N. Luzon, collected by Mr. Whitehead. Presented by the Subscribers to the Whitehead Exploration Fund.

LYGOSOMA DECIPIENS. (Plate XLIX. fig. 3.)

This small Scink so much resembles the preceding in coloration and in the scaling of the head that one would at first be inclined to refer it to the same species. It differs, however, in several important characters. The ear-opening is much larger and oval, nearly two-thirds the size of the eye-opening. The rostral forms a much broader suture with the frontonasal; the frontal is slightly longer than the frontoparietal. The body is shorter, the distance between the end of the snout and the fore limb once and one-fourth to once and one-third in the distance between axilla and groin. The length of the hind limb equals the distance between the nostril and the fore limb. There are 36 scales round the middle of the body. The tail tapers gradually from the base. As stated above, the coloration is much the same as in *L. luzonense*; there are, however, no other dark spots on the back but those forming the interrupted vertebral line; a well-defined dark brown streak, continued as a dorso-lateral line, extends along each side of the head and neck, passing through the eye, and the temple and neck below it are white.

	millim.		millim.
Total length.....	80	Fore limb.....	10
Head	9	Hind limb	12
Width of head....	5	Tail	45
Body	26		

Both this species and the preceding connect the sections *Hinulia* and *Homolepida*, but should be referred to the former, as defined by me¹.

Two specimens were obtained by Mr. Whitehead on Isabella, N.E. Luzon.

¹ Through an oversight, the section *Hinulia* is stated in my Catalogue to be characterized by distinct frontoparietals; *L. acutum* forms an exception in having these shields fused.

ABLEPHARUS CARSONII. (Plate XLIX. fig. 4.)

Snout very short, obtuse. Eye entirely surrounded by a circle of granules. Rostral forming an extensive suture with the fronto-nasal, which is in contact with the frontal; no supranasal; frontal small, hardly one third the size of the single shield formed through fusion of the frontoparietals and interparietal; three supraoculars, first largest and in contact with the frontal; five or six supraciliaries; a pair of nuchals; four upper labials anterior to the subocular. Ear-opening roundish, as large as the pupil. 26 scales round the middle of the body, laterals a little smaller than dorsals or ventrals. Præanals scarcely enlarged. Limbs pentadactyle, narrowly separated when adpressed. Bronzy brown above, greenish white beneath; a black vertebral line; a black line edged above with yellow, on each side, from the end of the snout to the base of the tail.

	millim.		millim.
Total length.....	80	Fore limb	8
Head	6	Hind limb	10
Width of head....	4.5	Tail	46
Body	28		

A single specimen from Fwambo, British Central Africa. Collected by Mr. A. Carson.

TROPIDOPHORUS MOCQUARDII.

This species, specimens of which have been referred to *T. beccarii* by Dr. Mocquard in his paper on the reptiles of Kina Baloo (N. Arch. Mus. [3] ii. 1890, p. 135), agrees with *T. beccarii* in its smooth scales, with *T. brookii* in its smaller postmental, behind which two pairs of shields are in contact, and in its larger head, which is more swollen at the temples; it differs from both in the greater number of scales round the body, viz. 34. The coloration is the same as in *T. brookii*. From snout to vent 95 millim.

Two specimens, male and female, from Kina Baloo, N. Borneo, received from Mr. A. Everett.

The female contains four fully developed young, measuring 30 millim. from snout to vent.

EXPLANATION OF THE PLATES.

PLATE XLVII.

Fig. 1. *Edura nivaria*, Blgr., p. 726.

1 a. " " Lower surface of foot, $\times 2$.

2. *Elasmodactylus tuberculosus*, Blgr., p. 727.

2 a. " " Lower surface of foot, $\times 2$.

3. *Urocentrum guentheri*, Blgr., p. 729.

PLATE XLVIII.

- Fig. 1. *Anolis rixi*, Blgr., p. 727. Upper surface of head, $\times 2\frac{1}{2}$.
2. *Anolis rhombifer*, Blgr., p. 728. Upper surface of head, $\times 2\frac{1}{2}$.
3. *Sceloporus bulleri*, Blgr., p. 729. Head and anterior part of body.
4. *Sceloporus heterolepis*, Blgr., p. 731.
5. *Diploglossus bivittatus*, Blgr., p. 732.
5 a. " " Upper surface of head, $\times 2\frac{1}{2}$.

PLATE XLIX.

- Fig. 1. *Tachydromus holsti*, Blgr., p. 733.
1 a. " " Upper surface of head, $\times 3$.
1 b. " " Lower surface of head, $\times 3$.
2. *Lygosoma luzonense*, Blgr., p. 733.
2 a. " " Upper surface of head, $\times 3$.
3. *Lygosoma decipiens*, Blgr., p. 734.
3 a. " " Upper surface of head, $\times 3$.
4. *Ablepharus carsonii*, Blgr., p. 735.
4 a. " " Upper surface of head, $\times 3$.

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