THE MYOLOGY OF EMERGES OBSOLETUS

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INTRODUCTION

The body of available literature dealing with the myology of the lizards is surprisingly small and fragmentary. Only in a very few of the genera and families have the muscles been worked on. These works in a majority of cases have been on the more specialized forms.

There is a very definite need for a comprehensive and correlated series of studies dealing with the myology of the less specialized forms as a basis for interpretation of greater variation occurring in the more specialized.

My purpose in this paper has been to present a study of the muscles of the common scinc, *Eumeces obsoletus*, and to note relationships and dissimilarities with the musculature of other lizards occurring in literature.

Dissections were made on a series of preserved specimens belonging to the zoology department of the University of Kansas, and collected near Lawrence. All dissections and observations were made with the aid of a Spencer stereoscopic binocular using 9X oculars and 48 mm. objectives.

I have prepared thirteen plates of drawings with thirty-six figures of my dissections, since figures showing direction of fibres, relative size, shape, and position of muscles serve more readily for comparison than word descriptions. Drawings were made free-hand with the aid of careful measurements, and therefore must be considered semi-diagrammatic.
Mycological terminology has reached its greatest degree of standardization in the mammals.\textsuperscript{1} Mammalian names of muscles have been applied, in greater part, to the muscles of the lizards. Wherever possible the reptilian names used by Camp, Gregory, and Romer\textsuperscript{2} have been made use of.

Appreciation is gratefully extended to Dr. E. H. Taylor of the university staff, who supplied me with specimens, and at whose suggestion and under whose direction this problem was undertaken.

\textsuperscript{1} E. N. A. system of nomenclature.
\textsuperscript{2} Camp 1923, Gregory and Camp 1918, Romer 1922.
REVIEW OF LITERATURE

As stated above there is no great body of literature dealing with the myology of lizards. Of particular value to this work, for identification and comparison of muscles, are the older works of Mivart (1867) describing in detail the muscles of the common iguanid, Iguana tuberculata, and the large chamaeleon of Madagascar, Chamaeleon personii (Mivart 1870); and the similar works of Sanders (1870) on Platydactylus japonicus, Lioloea belli (Sanders 1872), and Phryno-roma coronatum (Sanders 1874). The work on P. japonicus is unaccompanied by plates, thereby decreasing its usefulness. Both Mivart and Sanders use mammalian names for the muscles. The part of Camp's paper (1923) on the "Classification of the Lizards", dealing with the muscles of the throat and body thought to reveal relationship has been most helpful. The works of Gregory and Camp (1918) and Romer (1922) homologising the muscles of tetrapod limbs have been referred to for reptilian myological terminology.
DESCRIPTIONS OF MUSCLES

Muscles of the throat region

CONSTRICCTOR COLLI (a c) Fig. 1

A broad flat muscle (superficial) of throat extending from the basihyoid, its anterior limit, to region of the clavicle, its posterior limit. It attaches to the superficial dorsal fascia of the neck. Fibres of one side are separated from those of the other along the ventro-median line by a longitudinal raphe.

GENIOGLOSSUS (gls) Figs. 1, 2

Arises on inferior surface of mandible lateral to symphysis, passes backward ventral and lateral to insertion of hyoglossus to insert on ventral surface of tongue lateral to that of the former muscle. A ventro-median slip of genioglossus inserts on the median edge of hyoglossus before it reaches the tongue.

GENIOHYOIDEUS (ghs) Figs. 1, 2

Arises on inner surface of dentary part of mandible except anterior one-third. It inserts on the posterior part of copula and the median two-thirds of first branchial arch.

HYOGLOSSUS (hgs) Fig. 2

Lies dorsal to geniohyoideus, arises on first branchial arch lateral to its articulation with copula; converging slightly, it inserts on ventral posterior part of tongue lateral to median line; convergence
and insertion continues forward to a point 1/3 the distance from the tip. Throughout insertion this muscle is united with its fellow of other side by raphe which envelops the anterior part of copula.

**MYLOHYOIDEUS ANTERIOR PRINCIPALIS (m a p) Fig. 1**

A superficial muscle of the throat attached on the inner surface of the dentary piece of mandible except anterior 1/3. Near the region of attachment this muscle makes five interdigitations with geniohyoides.

**MYLOHYOIDEUS ANTERIOR SUPERFICIALIS (m a s) Fig. 1**

A small muscle attached on the dentary piece in front of mylohyoideus anterior principalis posterior to origin of genioglossus.

**MYLOHYOIDEUS POSTERIOR (m p) Fig. 1**

A flat superficial muscle, extends between and is attached on the sides of mandible posterior to the dentary piece. It is slightly overlapped posteriorly by anterior edge of constrictor colli.

**PTERYGOIDEUS EXTERNUS (pts ex) Figs. 2, 3**

A short heavy muscle, arises from the pterygoid and is inserted on the posterior ventral part of mandible.

**PTERYGOIDEUS INTERNUS**

Arises fleshy from entire length of epipterygoid and exoccipital in region where epipterygoid makes contact with that bone. It inserts on inner surface of coronoid process of mandible and posteriorly on inner surface to almost point of articulation.
STERNOCLEIDOMASTOIDEUS (sem) Figs. 1, 4

Arises from the posterior edge of lateral process of inter-clavicle and is connected to anterior edge of sternum by a strong membrane. It passes forward latero-dorsally over the most dorsal point of clavicle as a strong flat muscle becoming more spindle shaped to insert on the extremity of the exoccipital back of its articulation with the os quadratum.

STERNOHYOIDEUS (sha) Fig. 1

Arises broadly, a lateral part from the anterior edge of the scapular 1/2 of clavicle, a medial part from the anterior edge of cross-bar of interclavicle; passing forward, this part joins the lateral part to insert on the posterior edge of 1 st. br. arch and copula. At the anterior median line this muscle is united by facia to its fellow of the other side.

STERNOTHYROIDEUS (sts) Fig. 2

Lies dorsal to sternohyoides. Arises broadly from the anterior edge of cross bar of interclavicle, passes anteriorly to insert broadly to posterior edge of first branchial arch.

CERATO-MANDIBULARIS (c mad) Fig. 2

A small muscle, arises from the inferior side of the mandible lateral to gla, passes posteriorly to insert to the anterior edge of the distal piece of the hyoid lateral to its articulation with the medial piece.
Muscles of the head and neck

MASSETER-TEMPORALIS (ma tm) Figs. 3, 10

These two muscles seem to be united into a very compact muscle of the side of the head. Masseter arises from the entire infra temporal arcade; temporalis arises from the posterior lateral parietal ridge, passes antero-medially, then through the temporal fossa to unite with the former. Insertion is made on the supra angular and coronoid pieces of mandible.

CERVICO-MANDIBULARIS (cv md) Fig. 4

Arises broadly from dorsal fascia posteriorly in the region of third thoracic vertebra and anteriorly near the skull; passes antero-ventrally, converging to insert by two divisions: a medial joins the mylohyoid post. A lateral inserts by fascia over (m p) to the posterior part of mandible. The most anterior fibres insert by strong heavy tendon to posterior part of mandible. Deeper than this a small slip-like muscle passes in the same direction from posterior edge of parietal to insert by a long aponeurosis to the same part of mandible and probably represents the digastric.

TRAPEZIUS ANTERIOR (tp a) Fig. 4

Arises broadly from dorsal fascia lateral to complexus major and posterior to skull; passes postero-ventrally to insert narrowly, part to the middle 1/3 of clavicle and part to aponeurosis between ep-icoracoid end scapula.

TRAPEZIUS POSTERIOR (tp p) Fig. 4

Arises broadly from the general dorsal fascia; inserts narrowly
to the anterior part of scapula and suprascapula in region of contact with the clavicle. Insertion is covered by trapezius anterior, while the anterior 2/3 of origin is covered by cervico mandibularis.

COMPLEXUS MAJOR (c m) Figs. 4, 8, 10

Arises by tendon from neural spines of last cervical and first dorsal vertebrae, from the antero superficial fibres of spinalis colli and longissimus dorsi. It is inserted into the supra occipital and parietal process.

COMPLEXUS MINOR (c mi) Figs. 3, 10

This muscle is a continuation forward of longissimus dorsi. It inserts into the inner posterior edge of os quadratum and posterior region of the paraoccipital. It gives off from its side and under surface a division which inserts on to the tip of the exoccipital process.

SPINALIS COLLI (s c) Figs. 8, 10

This muscle seems to be a continuation forward of spinalis dorsi. It arises from the neural spines of the third to sixth incl. cervical vertebrae and inserts onto the paraoccipital inside and above complexus minor.

RECTUS POSTICUS (r p) Figs. 8, 10

Arises from neural spine of axis. Inserts onto supraoccipital.

RECTUS ANTERICUS CAPITIS MAJOR (r a c m) Fig. 8

Arises from the ventro lateral aspect of the centre of all the cervical and the first thoracic vertebra. It inserts from the posterior process of the exoccipital backwards to the posterior end of the basis-occipital.
LONGUS COLLI

Arises from the ventral surfaces of the central and lateral processes of the second and third cervicals and inserts to the same aspects of the next four cervicals.

A SMALL MUSCLE

Arises from the under surface of anterior part of parietal and post orbital regions; passes downward and forward to insert into inner facia of pterygoideus internus before its insertion to the coronoid process of mandible.

A SMALL MUSCLE

Extending dorso-ventrally from the basipterygoid inside its articulation with the epipterygoid to the membrane enclosing the brain at the outer edge of the exoccipital.

Muscles of the trunk region

RECTUS ABDOMINIS PROFUNDUS (r a p) Fig. 6

Is most median and deepest of rectus abdominus muscles.

Arises from the posterior ridge of ischium and inserts to the posterior edge of sternum.

RECTUS ABDOMINIS MEDIANUS (r a m) Figs. 6, 7

Lies lateral to rectus abdominis profundus and slightly overlaps its adjacent edge. It arises from the posterior ridge of ischium and inserts on posterior surfaces of last and next to last sternal ribs where some of its fibres continue into pectoralis. It is closely connected with rectus lateralis on the outer edge.
RECTUS ABDOMINIS LATERALIS (r a l) Figs. 6, 7

Arises with the former muscles from the posterior ridge of ischiium and ischio pubic ligament. It lies lateral to rectus abdominis medians. The deeper fibres are continuous with those of the former passing antero-laterally; when reaching the lateral border they turn ventrally, run antero-medially to insert to the lateral facia of rectus abdominis medians. Fibres continue forward surrounding the lateral edge of pectoralis to insert most anteriorly by thin superficial facia to region of antero-medium origin of pectoralis.

OBLIQUUS ABDOMINIS EXTERNUS SUPERFICIALIS (o a e s) Figs. 6, 7

This muscle is composed of two parts. Part one arises by tendinous interdigitations with the sacro-lumbalis from the last cervical and all the thoracic ribs. Its fibres pass obliquely backwards and ventrally to insert on the edge of rectus medians. Part two arises from the posterior edge of the last thoracic rib and the lumbar facia. It inserts by tendon on the spine of the pubis.

OBLIQUUS ABDOMINIS EXTERNUS PROFUNDUS (o a e p) Figs. 6, 7

Arises beneath obliquus abdominis externus superficialis by less pronounced interdigitations from all the thoracic and the last cervical rib. Its fibres pass postero-ventrally to insert most anteriorly on the second thoracic rib at its junction with the sternal rib, and on each thoracic rib posterior to the second near its ventral extremity.

OBLIQUUS ABDOMINIS INTERNUS (o a i) Fig. 6

Arises from all the thoracic ribs by a tendinous aponeurosis which is attached internally along a line to correspond to the outer
edge of the sacro-lumbalis. Posteriorly it arises from the lumbar
fascia. It inserts by thin aponurosis on the edge of rectus abdominus
profundus and to the internal lateral edge of the sternum.

TRANSVERSALIS ABDOMINIS (t a) Fig. 6

Lines the ventral body cavity internal to the above muscle
(o a i). The origin and insertion is the same as the above except that
transversalis extends to the last but two cervical rib and the fascia
continues anteriorly into the neck.

INTERNAL INTERCOSTALS (i i) Fig. 6

Extend between the sternal-thoracic ribs.

EXTERNAL INTERCOSTALS (e i) Fig. 6

Extend between the cervical ribs as well as those of the trunk.
They lie between the external and internal oblique muscles and extend
ventrally to the sternal-thoracic ribs.

SACRO-LUMBALIS (sa lu) Figs. 7, 9

Is a superficial muscle of the latero-dorsal surface. It
arises from the posterior crest of the ilium and the supra caudal mass
of the tail and is attached to all the ribs including the cervicals
between the points corresponding to the angles and the fascia marking the
insertion of longissimus dorsi. This muscle interdigitates with the ex-
ternal oblique muscles along its lateral edge.

LONGISSIMUS DORSI (lo d) Figs. 9, 10

Arises posteriorly from the transverse process of the fourth
caudal vertebra where it interdigitates with the caudal conical mass. It
is attached to the crest of the ilium, to the zygopophyses of the vertebrae and to the fascia separating it from spinalis dorsi. It is inserted on the base of all the ribs by long fascia. It extends forward to its continuation into the neck muscles.

**SPINALIS DORSI (s d) Figs. 9, 10**

Lies next to the dorso-median line. It arises posteriorly from the first to the fifth caudal vertebrae, as it continues forward from the neural spines of the vertebrae and from the fascia separating it from longissimus dorsi occupying the space between the crests of the spines and the zygopophyses. It inserts on the crests of the vertebrae two or three ahead of the region of origin by long flat tendons. Anteriorly it continues into the neck muscles.

**RETRAHENTES COSTARUM (r c)**

Lines the interior dorsal part of body cavity. It arises anteriorly from the centrum of the first thoracic vertebra and the sixteen following it. Its insertion interdigitates with the origin of the transversalis and internal oblique muscles to the last but one cervical rib and the eighteen following it.

**QUADRATUS LUMBORUM (q l)**

Arises from the anterior edge of the sacrum, the antero-dorsal part of the ilium, and from all the ribs interdigitating with obliquus internus. It inserts on the ventro lateral aspect of all the vertebrae and on the ribs near their attachment to the vertebrae. This muscle lies dorsal to retrahentes costarum.
LATISSEUS DORSI (l d) Figs. 7, 9

A flat superficial muscle arising from the dorsal fascia over the region occupied by the last three cervical and the first eight thoracic vertebrae. Its fibres converge to insert by strong tendon to the inner surface of humerus distal to insertion of subcoracocapularis.

Muscles attached to the pectoral girdle

PECTORALIS (p) Fig. 6

Arises from posterior edge of cross bar of interclavicle posteriorly along the ventro-median line of sternum, the anterior part of fifth sternal rib, and from rectus medius as far as the eighth thoracic rib. It converges to insert by tendon on the median ventral process of the humerus just back of its scapular articulation.

SUPRACORACOIDEUS (sc) Fig. 5

Arises from the ventral surface of the anterior part of the coracoid. Its fibres converge to insert by tendon on the head of humerus anterior to insertion of pectoralis.

CLAVICODELTOIDES (cd) Fig. 6

Arises from the deeper and superficial surfaces of the sternal 1/3 of clavicle. Fibres from the superficial surface pass forward, curve dorsally over the clavicle, join the fibres from deeper surface, and pass backward to insert on the head of the humerus between the insertions of pectoralis and deltoideus scapularis.

DELTOIDES SCAPULARIS (d sc) Figs. 15, 19

A triangular shaped muscle, it arises from the outer surface of
the supra scapula except dorsal and anterior margins, and from the posterior point surface of clavicle. It inserts at the apex on the under side of head of humerus in front of clavicodeltoides.

LEVATOR SCAPULARIS (l sc) Figs. 15, 6

Is divided into a superficial and a deeper part. Both arise from the ventro-lateral process of the first cervical vertebra. The superficial part inserts on the antero-dorsal region of the outer surface of supra scapula. The deeper part inserts onto the anterior outer surface of supra scapula in region of its contact with point of clavicle; some of its fibres insert on the point and to the facio of deltoïdes scapularis where it inserts in that region.

SCAPULOHUMERALIS ANTERIOR (sch a) Figs. 5, 16

Arises from the outer surface of the spinous process of the scapula, the outer surface of the anterior upper spine of coracoid, the origin continuing almost to the glenoid cavity. These unite and pass by tendon under a ligament binding the head of the humerus to the scapula dorsal to the articulation, to insert on the upper head of humerus just beyond its articulation.

BICEPS (b) Figs. 20, 6

Arises by single head from the coracoid just inside the sternal margin extending anterior to it and not quite to its posterior end. Biceps is divided longitudinally near the head of the humerus by a raphe. It inserts by tendon on the proximal part of radius and ulna with branchialisenticus.
CORACO-BRANCHIALIS BREVIS (c b b) Fig. 6

A broad flat muscle arises from the posterior surface of coracoïd inside the insertion of biceps. It inserts on the inferior surface of humerus from the head to about 2/3 the distance on the shaft.

CORACO-BRANCHIALIS LONGUS (c b l) Figs. 24, 6, 20, 25

This muscle is divisible into three parts; the ventral arises from the ventral surface of posterior end of sternal border of coracoïd; the medial from the edge of same; the dorsal from the internal posterior surface of coracoïd. All insert on the internal condyle of humerus. The dorsal part becomes a long tendon before insertion.

SUPRACOSTALIS (supo) Fig. 6

A thin flat muscle which arises from the anterior surface of the sternal ends of the fourth and fifth sternal ribs, passing anterodorsally to insert on the free ends of the last two cervical ribs posterior to serratus magnus superficialis and profundus. The insertion on last cervical extends farther dorsally than insertion of serratus superficialis.

SERRATI COSTALIS (se c) Fig. 19

A small dip-like muscle attached to end of next to last cervical rib, passes ventral to the end of last cervical and over the first sternal rib to insert on the anterior edge of second sternal rib.

SUBCORACO-SCAPULARIS (s sc) Fig. 19

Is a somewhat complex muscle on the inner surface of the scapula and coracoïd. It arises in two parts, the first from the inner surface of the anterior part of coracoïd and membrane of fenestra, and
from the inner surface of spine and anterior part of scapula. The second part arises from the inner posterior surface of the scapula and posterior edge of same. These fibres unite with the variously converged fibres of the first part to insert by tendon on the ulnar tuberosity of humerus and capsular ligament.

SUBCORACOIDEUS (sbc) Fig. 19

Arises from inner surface of coracoid, its anterior fibres underlapping the posterior fibres of part one of subcoraco scapularis. Its fibres converge to insert by tendon on ulnar tuberosity of humerus just deeper than the insertion of the above muscle.

COSTO-CORACOID (co co) Fig. 19

Arises from the anterior edge of the first sternal rib, passes forward and inserts by long tendon to inner surface of scapula half-way between glenoid cavity and union with suprascapula. Its insertion is united with a strong ligament connecting the inner surfaces of scapula and sternum.

STERNO-CORACOIDEUS INTERNUS (s c i) Fig. 19

Arises from the posterior inner surface of sternum, passes forward covering the entire medial portion of that bone to insert on the middle of the inner surface of the coracoid near the ventro-median line.

STERNO-CORACOIDEUS EXTERNUS (s c e) Fig. 19

A smaller muscle than the above which overlaps it when viewed from the inner side of the scapular arch. It arises from the inner edge
of the groove of the sternum that receives the coracoid and inserts on coracoid in same region as above.

SERRATUS SUPERFICIALIS (s s) Fig. 15

Arises from the outer surface of the last cervical rib near its free end and inserts on the lower posterior border of the suprascapula.

SERRATUS PROFUNUS (s p) Figs. 15, 19

Deeper than the above, arises from the outer surface of the last but one cervical rib near its free end and inserts on the extreme lower posterior margin of suprascapula near its attachment to the scapula.

SERRATUS 3 (s 3) Fig. 17

A thin slip-like muscle arises from the ventral edge of the first three cervical ribs near their free ends. It passes dorsally and slightly posteriorly to insert on the inner dorsal surface of the suprascapula.

SERRATUS 4 (s 4) Fig. 18

Arises from ventral tip of free end of third cervical rib deeper and anterior to serratus profundus. It inserts near the inner anterior edge of the suprascapula.

SERRATUS 5 (s 5) Fig. 18

Deeper and anterior to part 4. Arises from the outer ventral tip of second cervical rib, inserts on the inner surface of suprascapula anterior to insertion of part 4.
Muscles of the Pectoral Limb

BRANCHIALIS ALTICUS (b a) Fig. 20

Arises from the head of humerus just beyond the insertion of deltoideus and from the shaft through its length. It unites in insertion by tendon with biceps on inferior proximal ends of radius and ulna.

TRICERPS (t) Figs. 20, 24

A large extensor muscle of the upper arm which arises by four heads. (1) The first or external long head arises by strong tendon from head of humerus just beyond the insertion of scapulohumeralis anterior. (2) The second or internal long head takes origin by a flat tendon from the posterior edge of the scapula just above the glenoid cavity. The origins of the above heads are not distinctly separated although the flat tendon is present, the tendency seems to be to insert to the aponeurosis covering the head of the humerus to which the tendon is connected. (3) This part arises to the entire outer surface of the humerus distal to the head. (4) This part arises from the entire inner surface of the humerus distal to the head. Latissimus dorsi inserts to humerus between T 4 and T 2. These heads unite to insert on the ulna by a broad tendon covering the outer surface of the elbow.

EXTENSOR CARPI ULMARIS (e a u) Figs. 20, 24

A flat superficial muscle arises from the summit of the external condyle. It inserts on the distal adjacent surface of flexor carpi ulnaris and also on metacarpal articulating with ulna.
EXTENSOR CARPI RADIALIS (e o r) Fig. 20

A flat superficial muscle arises from the summit of the external condyle beside the above. It inserts by broad tendon on the proximal outer ends of the second, third and fourth metacarpals.

SUPINATOR LONGUS (s l) Figs. 20, 26

A large muscle of the foreleg. It arises by three heads, the most anterior from the humeral shaft just proximal to the external condyle by a long tendon; this part is loosely joined with the others until it reaches the distal end of the radius. The second and third parts are larger and arise one anterior to the other from the external condyle; they soon unite and with the first part insert on the entire extensor surface of the radius.

EXTENSOR-OSsis METACARPI POLLICIS (e o m p) Fig. 26

A triangular muscle arises broadly from the distal 2/3 of the extensor surface of the ulna. Its fibres converge so that the apex inserts on the metacarpal of the pollex.

FLEXOR CARPI RADIALIS (f o r) Figs 21, 24

Arises by a flat tendon from internal condyle of humerus; it inserts by tendon on the carpal which articulates with the radius.

FLEXOR CARPI ULNARIS (f o u) Figs. 20, 21, 24

A large superficial muscle on flexor surface of foreleg. It arises by a broad tendon from the internal condyle. It inserts on the carpal articulating with the ulna and by longer tendon to one of the palmar ossicles.
FLEXOR PROFUNDUS DIGITORUM (f p d) Figs. 21, 22

Arises by three heads, the first by long tendon from the internal condyle just deeper than the above, the second from the entire flexor surface of the ulna; these two parts unite to form a broad flat tendon in which are two palmar ossicles. This tendon which covers the entire extent of the palm receives muscular fibres on its deeper surface from the carpus which constitutes the third part. From the distal margin of this tendon smaller tendons pass into the digits.

PRONATOR TERES (pr t) Fig. 22

Arises by tendon from the summit of the internal condyle and inserts on the distal 1/2 of the radial margin of radius.

SUPINATOR ACCESSORIUS (s a) Fig. 24

A small muscle arises from the inner condyle immediately below but somewhat superficial to pronatoreaccessorius. It spreads out to insert on the proximal 1/3 of the ulnar margin of ulna.

PRONATOR ACCESSORIUS (p a) Fig. 23

Arises from the inner condyle deeper than the tendinous origin of flexor profundus digitorum and inserts on the flexor surface of the radius between insertion of pronator teres and pronator quadratus.

PRONATOR QUADRATUS (p q) Fig. 23

Arises from the radial edge of ulna and inserts on the distal 2/3 of ulnar edge of radius. A number of fibres insert on the ventral surface of distal end of radius.
Muscles of the pelvic region

RECTUS ABDOMINIS INTERNUS (r a i) Fig. 27

Arises from the ischio-pubic ligament and inserts broadly by facia along the ventro-median line on the rectus abdominus profundus muscle.

PECTINEUS (pe) Fig. 28

(1) Arises from the posterior surface of pubis from acetabulum to symphysis. It inserts on lower summit of trochanter of femur.
(2) Arises deeper than (1) from the posterior surface of pubis from pubic spine to symphysis. It inserts deeper than (1) on summit of trochanter. (3) Arises deepest from posterior surface of anterior half of pubis and backwards from symphysis to the middle of obturator foramen. It inserts on summit of trochanter behind (2).

OBTURATOR EXTERNUS (o e) Fig. 28

Arises from the entire ventral surface of ischium and posterior part of obturator foramen. It inserts partly on summit of trochanter behind pectineus (3) and partly into trochanteric fossa.

OBTURATOR INTERNUS (o i) Fig. 28

Arises from the posterior lateral edge of the ischium anterior to spine. It inserts into the trochanteric fossa deeper than the above muscle.

ILIACUS (1) Figs. 27, 28, 29, 30, 31

(1) Arises from the anterior surface of the symphysis pubis; the origin continues backward on the inner side of pelvis by raphe to
to its fellow on the other side. It passes latero-ventrally over the anterior surface of pubis to insert on ventral surface of head of femur.

(2) Arises by raphe to its fellow of other side just posterior to insertion of (1). It inserts with (1) on head of femur. (3) Arises by two separate parts; the anterior lies hidden by the (1 1 and 2) muscles. It arises from the inner surface of the pubis on the opposite side to that of insertion. The posterior part arises from dorsal median line of ischium and with anterior part outwards and over the posterior end of pubis to insert by tendon on femur head. (4) Arises from the inner posterior surface of pubis on the side opposite to that of insertion. It is partially hidden by the posterior part of (1 3). Some of its fibres insert to the dorsal surface of the antero-median process of ischium, and continue across ventral to antero-lateral part of ischium to insert on inner surface of trochanter.

ILIO ISCHIO CLOACUS (1 i c) Fig. 30

A small muscle arises from the posterior surface of ilium and ischium at region of articulation. It inserts on the side of the cloaca near the termination at the anus.

TRANSVERSUS PERINEI (tr pe) Fig. 27

Arises from the posterior edge of ischium and ventro-median facia. Inserts on the tuber ischii.

Muscles of the pelvic limb

PUBO ISCHIO TIBIALIS (p i t) Figs 27, 32

A superficial muscle covering postero-ventral part of thigh. It
arises from the end of the spine of the pubis, from the ischio-pubic ligament, from the postero-lateral ridge of ischium, and from the ventral part of the tuber ischii, a ligament connecting the crest of the ilium with the postero-lateral process of the ischium. It inserts near the proximal end of the tibia.

RECTUS FEMORIS 1 (r f 1) Figs. 27, 32

Arises by tendon from pubis posterior to spine. It unites with other extensors of the thigh and inserts with the aponeurosis of insertion of rectus femoris 2.

PUBO TIBIALIS (pu ti) Figs. 27, 32

Arises in part from the outside of the pubis posterior to the spine and anterior to origin of above, and from the first part of iliacus. It is inserted on the proximal peroneal side of the head of the tibia at articular region.

ADDUCTOR MAGNUS (a m) Fig. 32

A small muscle arises from the ischio-pubic ligament. It inserts on the ventral surface of the femur just distal to the head.

SEMMEMEMBRANOSIS (sem) Fig. 32

Is divided into three parts that are quite separate in origin and insertion. The first and largest arises from the ligament tuber ischii and inserts fleshy on the flexor proximal surface of the tibia. The second arises from the posterior lateral process of the ischium and inserts by long tendon on the summit of the inner surface of the tibia. The third arises in common with the first and inserts by long tendon in common with biceps femoris on the outer peroneal surface of the tibia.
RECTUS FEMORIS 2 (r f 2) Fig. 33

Arises by tendon from the ventral part of ilium just dorso-anterior to acetabulum. It is closely united both with rectus femoris 1 and vastus externus in insertion to the broad flat tendon covering the knee.

ILIO FEMORALIS (i f)

Arises from the outer surface of the ilium. Is covered by the tendous origin of rectus femoris 2. It inserts on the dorso-posterior surface of femur shaft on the proximal 1/2 of its length.

VASTUS EXTERNUS (v e) Fig. 33

It arises from the entire antero-dorsal surface of the femur. It inserts with rectus femoris 2 on the patella and surrounding tendon.

VASTUS INTERNUS (v i) Fig. 32

Arises from the ventral surface of femur except the proximal 1/4 and inserts on the capsular tendon ventral to the insertion of the above.

ILIO PERONEAL (i p) Fig. 33

Arises from the outer surface of the ilium posterior to ilio femoralis. It is inserted on the outer surface of the fibula near its summit.

ILIO TIBIALIS (i t) Fig. 33

Arises posterior to caudi ilio femoris in common with semimembranosus l from the ligament tuber ischii. It inserts on the outer peroneal surface of tibia slightly below its summit. It gives off a
strong tendon that unites and passes distally with gastrocnemius.

SEMITENDINOSIS (se t) Fig. 33

Arises from the tuber ischii dorsal to semimembranosus and inserts in common with semimembranosus (first part) on the inside of the upper part of tibia.

TIBIALIS ANTECUTUS (ti an) Figs. 32, 33

Arises from the extensor surface of the tibia starting at the proximal end. It inserts on the tibial surface of the metatarsal of the hallux.

GASTROCNEMIUS (g) Fig. 32

(1) Of these two flexor muscles of the foreleg, the first arises by two heads from the inner surface of the tibia and inner condyle surrounding the point of insertion of the flexor muscles of the upper leg. It becomes aponeurotic at the distal end, forming the most superficial of plantar fascia. (2) The second arises from the outer edge of external condyle and is larger and partially overlapped by the first. It becomes aponeurotic under the third, fourth, and fifth metatarsals.

EXTENSOR LONGUS DIGITORUM (e l d) Fig. 33

Arises by tendon from the external condyle of the femur. It is inserted by two tendons on the second and third metatarsals near their proximal ends.

PERONEUS (per) Fig. 33

Is not divided. It arises by tendon from the external condyle
of femur and fleshy from the entire extensor surface of the fibula. It inserts on the peroneal surface of the fifth metatarsal and on outer surface of astragalus by tendineous fascia.

**FLEXOR LONGUS DIGITORUS (f 1 d) Fig. 34**

A large muscle of the foreleg. Arises by tendon from the external condyle, fleshy from flexor surface of upper end of fibula, and fleshy from the superficial surface of popliteus. It terminates in a flat tendon which branches to each of the five digits. In the tibial half of this tendon is found a circular flat sesamoid bone.

**POPLITEUS (pop) Figs. 34, 36**

Arises from the tibial proximal aspect of the fibula and inserts on the entire flexor and peroneal surfaces of the tibia.

**TIBIALIS POSTICUS (t p) Fig. 36**

Arises from the flexor surface of the lower 3/4 of the fibula. It converges to insert by tendon on the distal under surface of astragalus.

**FLEXOR ACCESSORIUS (f a) Fig. 36**

A very small muscle. Arises from the os calcis and inserts on the dorsal surface of sesamoid in the tendon of flexor longus digitorum.

**PERONEO TIBIAL (p t) Fig. 35**

Connects the tibia and fibula through their entire extent. The muscle is attached to the extensor adjacent surfaces.
Caudal muscles

CAUDI ILIO FEMORALIS (o i f) Fig. 33

Arises from the ventral aspect of the first four caudal vertebrae, and inserts on the strong ligament connecting the crest of ilium with the ischial spine. Taking fresh origin from this ligament, it inserts on the ventral aspect of the trochanter back of the insertion of femoro caudalis.

FEMORO CAUDALIS (f o) Figs. 12, 13, 28

A large muscle. Arises from the inferior lateral aspect of the vertebra in the region of the tenth caudal. It inserts by long tendon to the trochanter in connection with pyriformis. Before insertion to femur it gives off a long tendon which passes at right angles down thigh and inserts onto the articular cartilage between femur and tibia on flexor side.

ILIO CAUDALIS (i o) Fig. 13

Takes origin from the posterior and outer surface of the ilium and from the sacro lumbalis. It inserts to the supra lateral aspect of the vertebra in the region of the sixth caudal.

CAUDAL CONES (ca c) Fig. 9, 11, 12, 13, 14.

The tail muscles are roughly divided into four muscular masses to correspond to the quadrants of a circle. Dividing fissures are located on the dorsal, ventral, and lateral median lines. Across these fissures the muscle structures, the cones, connect to each other by facia at intervals corresponding to the vertebrae. The muscular masses
are myotomic in structure. A close scrutiny of the surface reveals zig-zag lines of fascia, indicating the superficial outlines of the cones. Most noticeable in this species is the mass of intruded fat tissue lying next to the vertebra in each quadrant. This tissue is metemeric in structure and is found throughout the tail. From the intrusion of the femore caudalis and ilio caudalis muscles in the region of the tenth and sixth caudal vertebra respectively to the base of the tail the fat gradually decreases and disappears as these muscles become larger. At the base of the tail the dorso-lateral cones continue forward into longissimus dorsi. The ilio caudalis is in part a continuation backwards of the sacrolumbalis. The two lateral cones more or less unite and insert to the transverse processes of the first caudal vertebra. The ventro-lateral cones form the ischio caudalis and insert on the inner anterior edge of the ischium.
DISCUSSION

The following series of measurements will serve to give an idea of the general body contour and relative extent of parts in P. obsoletus. Measurements are taken from a preserved adult specimen whose total length, 238 mm., and body length, 95 mm., are within the "mode" as given by Burt for Kansas specimens.

Width—of head at auditory openings 16 mm., of neck 15 mm., of body posterior to fore leg 16.4 mm., of body at middle 19 mm., of body anterior to hind leg 17 mm., of tail posterior to hind leg 11.5 mm., of tail middle 7 mm.

Thickness dorso-ventrally of—neck 16 mm., body middle 18 mm., tail posterior to hind leg 11.5 mm., tail middle 8 mm.

Length of—head from snout to ear 20 mm., neck from ear to foreleg 16 mm., body from fore to hind limb 56 mm., hind leg 36 mm., foreleg 26 mm.

From the above measurements is evident an evenly elongate cylindrical body slightly greater in width and depth at middle of body than at the neck or anterior to the hind legs, and gradually tapering throughout the length of the tail. The head is not distinct from the neck. The length of the hind leg is contained a little over one and one-half times in the distance between fore and hind limb. The length of the foreleg is contained a little less than one and one-half times in the distance from snout to foreleg.

A superficial examination of the muscles in this form impresses one with the relative extensiveness of the axial as compared with the appendicular muscles. The axial muscles have retained evidence of myotomic structure. This condition being most primitive in the tail. In the region of the pectoral and pelvic girdles the axial muscles are covered by those attached to the girdles and limbs.

**Dorsal Trunk Muscles (spinal)**

This group includes the spinalis and longissimus dorsi and the sacro-lumbal muscles (plate 5) on the outside, and the retrahentes costarum, and quadratus lumborum on the inside of the vertebrae and ribs. The first two and last have retained the original longitudinal direction of the fibres. While in the other two the fibres have shifted to a lateral direction. The origin and insertion successively on the ribs and vertebrae indicate their myotomic nature. Posteriorly the dorsal mass continues into the ilio caudalis and dorso-lateral cones of the tail; anteriorly into the dorsal neck muscles, complexus major and minor, cervicis ascendens, rectus posticus, and spinalis colli; and on the ventral side of the neck vertebrae the rectus anticus capitis and longus colli.

The quadratus lumborum in *E. obsoletus* is extensive, extending from the sacrum forward to all the ribs and rib vertebrae. In the iguanid *I. tuberculata* and the gecko *P. japonicus* it extends to "almost all the thoracic ribs" and to the last thoracic rib respectively.

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In *E. obsoletus* and *E. japonicus* it differs only in extent. In *E. tuberculata* it arises from the ilium only and apparently inserts only to the ribs having no insertion onto the vertebrae as in the other two forms.

**Ventral Trunk Muscles (hypaxial)**

In this group of muscles including the obliques and transversalis none shows more interesting variations than the rectus abdominis. In *E. obsoletus* it is composed of four parts. The rectus abdominis profundus along the ventro-median line is connected by a barely detectable linea alba to its fellow of the other side. Lateral to it is the rectus abdominis medius slightly underlapping it on the adjacent edge. These two muscles are not distinguishable on the superficial surface. On the inner surface the division is indicated by the insertion of the internal oblique. The insertions are quite different, the former passing dorsal to the xiphisternum to insert to the posterior edge of the sternum, while the lateral inserts to the last and next to the last sternal ribs, some of its fibres continuing into pectoralis. These two rectus abdominis muscles show some evidence of segmentation. Dissection with the magnification of the binocular reveals the myocommata which are not evident in a superficial examination with the unaided eye. Lateral to medius and connected to it is the unsegmented lateralis division, a muscle found only in lizards. It lies between the internal and external obliques. Anteriorly it inserts superficial to pectoralis by broad thin fascia to skin below the girdle and to the edge of interclavicle (plate 3).

The fourth part, rectus internus also unsegmented, lies dorsal to the posterior part of profundus and mediamus. Anteriorly it joins by facia the dorsal surface of profundus about one-third the distance to the sternum.

In L. tuberculata, no mention is made of any variation in the rectus abdominis. Because of its insertion and fibres continuous with pectoralis it compares most closely with mediamus in E. obsoletus.

In the gecko P. japonicus this muscle contains six transverse tendinous intersections not present in either E. obsoletus or L. tuberculata.

Rectus internus is present in the above two species as pyramidalis and is very similar to the same muscle in E. obsoletus.

The external oblique muscles, superficialis and profundus, are well developed. The former inserting fleshly to the edge of rectus mediamus, while the latter inserts to the ends of the ribs.

The well developed body muscles and the moderately developed limb muscles characteristic of E. obsoletus correlates with its "slinking", close to the ground method of locomotion. Quoting Camp, "It seems clear that the method of locomotion attained by the Autarchoglossa preserves a key system of highly developed body muscles opening up a treasure chest of possibilities, when opportunity for preservation of a worm-like burrowing, or snake-like, limbless, grass-living habitus is afforded by the environment. Time and again in various parts of the world scincs, teiids, and anguids have gone off on such a course.

8 Nivart, P Z S, 1867, p. 770.
9 Sanders, P Z S, 1870, p. 420.
developing even more highly and in a number of different ways, sets of muscles present in their more normal ancestors."

Camp goes on to say in effect that the Ascalabota have not and seemingly cannot develop limbless burrowing forms because of the specialization and reduction of the locomotory muscular. If for any reason the limbs should degenerate in the geckos or iguanids they would be helpless. However, if such a thing happened, as it seems to be, in a scincoid or anguimorph, the creature is still capable of locomotion, and if the habitat is grassland or humus soil such reduction may become favorable.

**Caudal Muscles**

In specimens of *E. obsoletus* dissected, a relatively large mass of fatty tissue enveloped the caudal vertebra (plate 6). This mass is segmented and extends throughout the length of the tail. It is probable that it serves as a larder during hibernation. It is known that the gila monster makes such use of its tail.

Surrounding this fatty mass are the muscles, a series of muscular cones with the apaxes pointing anteriorly. The apex of each cone extends into the base of the one in front of it. In each lateral half of the tail are four rows of such cones, one dorsal lateral, two median lateral and one ventral lateral. This arrangement of these muscles probably facilitates the loss of a part of the tail, a protective adaptation so characteristic of these scincs. Near the base of the tail this arrangement is varied by the intrusion of muscles attached to the femur, the femora-caudalis, caudililio-femoralis, and the ilio-caudalis.
Axial Throat Muscles

The geniophyoides, sterno and thyro hyoideus, and the sterno coracoideus muscles form with the rectus abdominis an interrupted series from the mandible to the pelvis, originating from the single pubo-thoracicus of urodelens. These throat muscles are extremely heavy in E. obsoletus. Especially is this true of the sternohyoides which arises from the inter-clavicle and dorsal one half of clavicle. It corresponds to the omohyoid in P. japonicus\(^{11}\) and L. tuberculata.\(^{12}\) In the former it takes origin only from the clavicle and in the latter from the clavicle and the deep anterior part of the deltoid.

Included in this group are the genio and hyo glossus muscles. In P. japonicus\(^{13}\) the genio-hyo-glossus sends superficial fibres into the mandible, deeper ones into the tongue. I have separated this muscle into two in E. obsoletus, hyo-glossus since all its fibres enter the tongue, and genio-glossus whose fibres enter the tongue lateral to the above. The latter also inserts a few fibres to the median edge of the hyoglossus posterior to its insertion. The submentalis\(^{14}\) of Sanders is not present in E. obsoletus unless it corresponds to genio-glossus. Mivart fails to mention either of these muscles in L. tuberculata and C. parsonii.

Extrinsic Appendicular Muscles of the Pectoral Girdle and Limb

In this group the trapezius and sterno-cleido-mastoides are of branchiomeric origin.

Trapezius is divided into anterior and posterior portions.

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\(^{11}\) Sanders, P Z S, 1870, p. 414.
\(^{12}\) Mivart, P Z S, 1867, p. 780.
\(^{13}\) Sanders, P Z S, 1870, p. 414.
\(^{14}\) Ibid.
Its anterior part inserts partly to the clavicle and partly to the
epomeurosis between the coracoid and scapula. Mivart in *L. tuberculata*
records only one part inserted to the clavicle. In *P. japonicus* San-
ers mentions two portions but no insertion is made to the superficial
shoulder facia as in *P. obsoletus*.

The serratus series shows considerable variation. There are
five distinct slips. Four of these, the serratus superficialis, pro-
fundus, 4, and 5, arise from the ends of the fifth, fourth, third, and
second cervical ribs respectively. Insertion is made to the posterior
edge and inner surface of the scapula and suprascapula (plate 7). In
serratus 3 the fibres pass doro-co-ventrally instead of antero-dorsally
as in the above parts, from the dorsal posterior edge of the first
three cervical ribs to insert near the dorsal inner edge of the supra-
scapula.

In *P. japonicus* Sanders (1870) has this muscle, the serratus,
divided into two parts. The first corresponding to serratus 3 in *E*
*obsoletus*, and the second to superficialis and profundus.

Extending postero-ventrally from the ends of the ribs of
origin of serratus superficialis and profundus, to the sternal ends of
the fourth and fifth sternal ribs is a flat muscle. Mivart (1870) in
*C. parsonii*\(^1\) names this muscle the supracostalis. In connection with
the serratus it is mentioned by Sanders (1872 and 1870) as being
present in *Lilepura bellii*\(^2\) and *P. japonicus*. It is evidently absent
in *L. tuberculata*.

\(^1\) Mivart, P Z S, 1870, p. 361.
\(^2\) Sanders, P Z S, 1872, p. 159.
A similar but smaller and deeper muscle arises from the second sternal rib near its union with the thoracic. It passes over the first sternal and ventral to the end of the last cervical to insert to the extremity of the next to last cervical rib. This muscle has been named the serrati costalis (plate 7).

Intrinsic Appendicular Muscles of Pectoral Girdle and Limb

Arising from the superficial surface of the coracoid and scapula are the coraco-brachialis longus and brevis, biceps, supra-coracoidea, scapulo-humeralis-anterior, deltoideus, and from the clavicle the clavico-deltoides. Biceps arises broad and fleshy in E. obsoletus as in P. japonicus and unlike L. tuberculata in which it arises by a broad tendon. In the above scinc and gecko this muscle demonstrates the primitive condition in which the proximal belly is simple, undivided, and fleshy throughout.

The coraco-brachialis-longus in E. obsoletus varies considerably from the same in P. japonicus and L. tuberculata where it is undivided and arises from the posterior part of the coracoid. In E. obsoletus it is divided into three parts, two of which arise from the posterior part of the coracoid as in the above species, but the third has shifted and arises fleshy from the inner surface of the coracoid (plate 9) just anterior to the sternal border. It soon becomes tendinous to insert with the other parts to the humeral condyle.

Arising from the inner surface of the coracoid and scapula is the complex subcoraco scapularis, and a muscle I have named sub-}

coracoides corresponding in position to the supracoracoideus on the outer surface. It arises from the coracoid between the origin of the third part of coraco branchialis longus and the middle of the coracoid fenestra. Its anterior fibres underlap the posterior fibres of sub-coraco scapularis.

Other muscles of the upper arm are the complex extensor, triceps, and the branchialis anticus, a flexor with biceps.

Muscles of the distal portions of the two limbs, because of their resemblance, may be grouped together. On the extensor surface in the fore arm are the extensor carpi radialis and ulnaris, and the supinator longus, in the hind leg the tibialis anticus, peroneus and extensor longus digitorum. On the flexor surface in the fore arm are the flexor carpi radialis and ulnaris, flexor profundus digitorum, pronator teres, and pronator quadratus. In the hind the two divisions of gastrocnemius, flexor longus digitorum, popliteus, and peroneo-tibial.

In the broad tendons of insertion of the flexor profundus digitorum, and flexor longus digitorum on the flexor surface of the hand and foot respectively are two flat circular calcareous sesamoids in the former and one in the latter. I have found no reference, in the literature to sesamoids in the hands or feet of lizards.

Muscles of the Thigh

The abductor extensor group, the complex quadriceps femoris of the anterior part of the thigh is composed of rectus femoris one and two, vastus internus and externus. Composing the posterior part of the thigh are the adductor flexors, pubo-ischio-tibialis, semimembranosus,
semitendinosus, ilio-femoralis, caudi-ilio femoralis, and femoro-caudalis; and the ventral side, the pubo-tibialis and adductor magnus, on the dorsal side the ilio-peroneal and ilio tibialis.

**Muscles of the Pubis and Ischium**

Muscles on the ventral surface of pubis and ischium include three divisions of pectineus arising from the posterior edge of pubis and from its fellow of the opposite side to include the anterior one-half of the obturator foramen, the obturator externus arising from ventral surface of ischium and posterior part of obturator foramen, and the obturator internus arising from the lateral edge of the ischium.

The dorsal surfaces of the pubis and ischium are covered by a complex muscle, the iliacus (plate 11) divided into four parts, inserting into the head of the femur. The first covers the anterior dorsal surface of the pubis. The second lies posterior to part one and inserts with it. The third arises part from the posterior surface of pubis near the symphysis and part from the median dorsal line of ischium. The fourth part arises from the posterior part of pubis near the acetabulum. Passing across the space between acetabulae some of its fibres attach to the anterior median point of the ischium and continue across to point of insertion. The tendons of insertion of the first three parts pass dorsal to the pubis near the acetabulum to insert to the head of the femur. The tendon of insertion of the fourth part passes ventral to the ischium near the acetabulum to insert to the trochanter.

A slip-like muscle arising from the posterior edge of the ilium and ischium at point of articulation and inserted into the side
of the closer near the anus has been named illo-ischio-cleacus.

**Branchiomeric Muscles**

The masseter, temporalis and pterygoideus muscles of the side of the head are extremely heavy. The first two are separate only in origin. Temporalis arises from the posterior inner edge of the parietal process. Its fibres curve antero-ventrally to enter and completely fill the temporal fossa where they become undistinguishable from those of masseter.

The pterygoideus internus in *E. obsoletus* arises from the epipterygoid and adjacent exoccipital region. It inserts on the inner surface of the exoccipital process and posteriorly on the mandible. This varies from the same in *L. tuberqueleate* where it arises from the pterygoid inside the origin of pterygoideus externus and inserts farther back on the mandible than in *E. obsoletus*. In *E. japonicus* it has no connection with the pterygoid arising from the prootic and columella.

The function of the digastric muscle in *E. obsoletus* has largely been taken over by the anterior part of cervico-mandibularis. The former persists under the latter as a small slip arising from the posterior edge of the parietal process and inserts to the posterior extremity of mandible by long thin tendon. This is covered by the heavy tendon of the anterior part of cervico-mandibularis. In *E. obsoletus* this muscle extends backwards from the head to the third thoracic vertebra. The extent in this species of this muscle correlates with its semi-burrowing habit. This muscle in certain burrowing forms is quite extensive in origin.18

The cerato mandibularis is a separate muscle extending from the hyoid branch to the inner surface of mandible. In *C. parascitii*\(^1\) it is considered a part of the genio-hyoid. In *I. tuberculata* it is the same as geniohyoid.

**Intercurrent Muscles of Throat**

These muscles are branchiomeric in origin but are considered under this head because of their close association with the skin. They include the mylohyoideus anterior and posterior, and constrictor colli, all running transversely across the superficial surface of the throat. The mylohyoideus anterior principalis makes five interdigitations with the geniohyoideus before inserting to the mandible. There is no separation between the anterior and posterior portions of the mylohyoid.

The primitive saurian condition of mylohyoideus is supposed to be\(^2\) eight or more small evenly spaced interdigitations with the geniohyoideus and scarcely any space between the anterior and posterior portions.

SUMMARY

1. A study of body measurements reveals an extensive development of the axial as compared with the appendicular muscles.

2. E. obsoletus has retained that type of abdominal musculature, as shown in the variations of rectus abdominis and the obliques, that makes easy the transition from the forms using the "slinking" method of locomotion to the wormlike, burrowing, and the snake-like, limbless forms.

3. The axial muscles have retained evidence of myotomic structure, either as typical myocommata or by their successive origin and insertion on ribs and vertebrae.

4. The tail muscles compose a sheath of myotomic nature surrounding a cylinder of fat tissue in the center of which are the vertebra.

5. The sterno hyoidous is extremely heavy and extensive, covering the entire ventral surface of throat between the hyoid and pectoral girdle.

6. The trapezius is divided distinctly into anterior and posterior parts.

7. The serratus muscle is composed of five distinct parts arising from the ends of the cervical ribs and inserting on the suprascapula.

8. A slip-like muscle extending from the end of the next to last cervical rib backwards to the second sternal rib, apparently absent in other forms, is named the serrati costalis.
9. The proximal belly of the biceps displays the primitive condition in that it is simple, undivided, and fleshy throughout.

10. The coraco-brachialis longus is divided into three parts. The third arises fleshy from the inner surface of the coracoid and is largely tendinous in conjunction with the other parts in the arm.

11. A muscle arising from the inner surface of the coracoid posterior to subcoraco-acetabularis and inserting to the head of the humerus, apparently absent or not distinctly separable in other forms is named the subcoracoides.

12. Two flat circular sesamoid bones are present in the tendon of insertion of flexor profundus digitorum, and one in flexor longus digitorum of hand and foot respectively.

13. The complex iliacus displays great variation in the origin and insertion of its components parts.

14. A muscle arising from the ilium and ischiium at point of articulation and inserted on the side of the cloaca is named ilio ischio cloacus.

15. The masseter and temporalis muscles are fused except in origin.

16. Pterygoideus internus differs in origin from the same in L. tuberoulata, and P. japonicus, and also differs in insertion in the former species.

17. The digastric has degenerated into a very small slip-like muscle. It function is taken by anterior part of cervico-mandibularis.

18. The extensive origin of the cervico-mandibularis is indicative of a burrowing form.

19. Corato-mandibularis is a separate muscle in R. obsoletus.
20. The mylohyoideus anterior approaches the primitive saurian condition by its five interdigitations with genio-hyoideus and the lack of separation from the posterior portion.
KEY TO MUSCLE NAMES

a m - adductor magnus
b - biceps
b a - branchialis anticus
c a - cervicalis ascendens
c o co - sosto coracoid
c p - carpo phlangei
c b b - coraco branchialis brevis
c b l - coraco branchialis longus
c d - clavicodeltoides
c v md - cervico mandibularis
c o o - constrictor colli
c o md - cerato mandibularis
c i f - caudi ilio femoralis
c m - complexus major
c mi - complexus minor
c a c - caudal cones
c lo - cloacus
d sc - deltoides scapularis
d l c c - dorsal lateral caudal cones
e l d - extensor longus digitorum
e o m p - extensor ossis metacarpi pollicis
e c r - extensor carpi radialis
e c u - extensor carpi ulnaris
e i - external intercostals
e b d - extensor brevis digitorum
f a - flexor accessorius
f l d - flexor longus digitorum
f p d - flexor profundus digitorum
f c u - flexor carpi ulnaris
f c r - flexor carpi radialis
f c - femoro caudalis

g - gastrocnemius

g s a - geniohyoideus

g ls - genioglossus

h g s - hyoglossus

i - iliacus

i i - internal intercostals

i i c - ilio ischio caudalis

i t - ilio tibialis

i f - ilio femoralis

i p - ilio peroneal

i o - ilio caudalis

i s c - ischio caudalis

m a p - mylohyoideus anterior principalis

m a s - mylohyoideus anterior superficialis

m a t m - masseter temporalis

m l o c - median lateral caudal cone

m p - mylohyoideus posterior

l d - latissimus dorsi

l o d - longissimus dorsi

l s c - levator scapularis
o a i - obliquus abdominis internus
o a e p - obliquus abdominis externus profundus
o a e s - obliquus abdominis externus superficialis
o i - obturator internus
o e - obturator externus
p - pectoralis
p a - pronator accessorius
pe - pectineus
per - peroneus
p i t - pubo ischio tibialis
pop - popliteus
p q - pronator quadratus
pr t - pronator teres
p t - peroneo tibial
pts cx - ptterygoideus externus
pu ti - pubo tibialis
pl - plantaris
r a c m - rectus anticus capitas major
r a i - rectus abdominis internus
r a l - rectus abdominis lateralis
r a m - rectus abdominis medianus
r a p - rectus abdominis profundus
r f - rectus femoris
r p - rectus posticus
s 3, 4, 5 - serratus 3, 4, 5
s a - supinator accessorius
sa lu - sacro lumbal is
sbo - subcoracoides
so - supracoracoides
sc - spinalis colli
sc e - sterno coracoides externus
sc i - sterno coracoides internus
sca a - scapulohumeralis anterior
sca - sternocleidomastoideus
sd - spinalis dorsi
sem - semimembranosus
se t - semitendinosus
se c - serrati costalis
shs - sternothyroides
sl - supinator longus
sp - serratus profundus
ss - serratus superficialis
ss c - subcoraco scapularis
sts - sternothyroideus
supc - supracostalis
t - triceps
t a - transversus abdominis
tia n - tibialis anticus
tp - tibialis posticus
tp a - trapezius anterior
tp p - trapezius posterior
tr pe - transversus perinei
tm - temporalis
ve - vastus externus
v 1 = vastus internus
v l o c = ventral lateral caudal conus
S A 1 = first branchial arch
C = capula
CL = clavicle
CO = coracoid
F = femur
FI = fibula
H = humerus
HY = hyoid
ICL = interclavicle
IL = ilium
IS = ischium
PU = pubis
R = radius
S = sternum
SE = sesamoid bones
TI = tibia
U = ulna
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Wilder, H. W., History of Human Body, Ch. 8.
PLATE 1

FIG. 1 Superficial and deeper muscles of throat (X 3.6)

FIG. 2 Deepest muscles of throat (X 3.6)

Key to Figures 1 and 2

Co - constrictor ocoli, cm - cerato mandibularis, gls - genic-glossus, ghg - geniohyoideus, hgs - hyoglossus, ma-p - mylohyoideus

anterior principalis, ma-s - mylohyoideus anterior superficialis,

mp - mylohyoideus posterior, pts - pterygoideus, som - sternocleido

mastoideus, shs - sternohyoideus, sts - sternothyroideus

BA 1 - 1st branchial arch, ch - copula, cl - clavicle, hy - hyoid,

icl - interclavicle
FIG. 3 Lateral view of head showing masseter and pterygoideus (X 2.7)

FIG. 4 Superficial muscles of side of neck with constrictor coli removed (X 2.7)

Key to figures 3 and 4

oma - complexus major, cmmd - cervico-mandibularis, mats -
masseter - temporalis, mp - mylohyoid posterior, sm - sternocleido mastoides, pts ex - pterygoideus externus, tp a - trapezius
anterior, tp - trapezius posterior
PLATE 3

FIG. 5 Muscles of superficial surface of coracoid (X 2.7)
FIG. 6 Superficial and deeper muscles of the ventral trunk region (X 2.7)

Key to figures 5 and 6
b - biceps, c b b - coraco branchialis brevis, c b l - coraco branchialis longus, cd - clavodeltoides, e i - external intercostals, i i - internal intercostals, o a i - obliquus abdominis internus, o a e p - obliquus abdominis externus profundus, o a e s - obliquus abdominis externus superficialis, p - pectoralis, r a l - rectus abdominis lateralis, r a m - rectus abdominis medius, r a p - rectus abdominis profundus, s c - supracoracoides, sch a - scapulohumeralis anterior, super - supracostalis, t a - transversus abdominis

CL - clavicle, CO - coracoid, H - humerus, ICL - interclavicle, S - sternum
PLATE 4

FIG. 7 Superficial lateral trunk muscles (X 1.6)
FIG. 8 Deep muscles of the neck (X 1.8)

Key to figures

7. l d - latissimus dorsi, o a e s 1 and o a e s 2 - obliquus abdominis externus superficialis 1 and 2, o a e p - obliquus abdominis externus profundus, r a l - rectus abdominis lateralis, r a m - rectus abdominis medians, sa lu - sacro lumbalis

8. o a - cervicalis ascendens, c m - complexus major, c mi - complexus minor, l sc - levator scapulae, r a c m - rectus anticus capitis major, r p - rectus posticus, s c - spinalis colli, tm - temporalis, x - fasciculus of complexus minor
PLATE 5

FIG. 9  Dorsal muscles of the trunk and tail (X 1.8)
FIG. 10  Dorsal muscles of head and neck (X 1.8)

Key to figures

9. ca c - caudal cones, lo d - longissimus dorsi, sa lu - sacro
   lumbalis, s d - spinalis dorsi

10. cm - complexus major, cmi - complexus minor, rp - rectus
    posticus, sc - spinalis colli, tm - temporalis, x - fasciculus
    of complexus minor
FIG. 11 Cross section of the tail at about the beginning of the posterior one-third (X 4.5)

FIG. 12 Cross section of tail in the region that approximates the eighth caudal vertebra (X 4.5)

FIG. 13 Cross section of tail through third caudal vertebra (X 4.5)

FIG. 14 Muscular cones shown in break of tail (X 1.8)

Key to figures

11. ca c - caudal cones
12. f c - femoro-caudalis
13. clo - cloacus, c i f - caudi ilio femoralis, d l c c - dorsal lateral caudal cones, i c - ilio caudalis, is c - ischio caudalis, m l c c - medial lateral caudal cones
14. v l c c - ventral lateral caudal cones
PLATE 7

FIG. 15 Muscles attached to outer surface of suprascapula (X 2.7)

FIG. 16 Outer surface of scapula showing scapulo-humeralis anterior (X 2.7)

FIGS. 17 & 18 Muscles attached to inner surface of suprascapula (X 2.7)

FIG. 19 Muscles attached to the inner surface of scapula, coracoid, and sternum (X 9)

Key to figures

15. d sc. - deltoides scapularis, l sc. - levator scapularis, a p. - serratus profundus, a s. - serratus superficialis

16. l d. - latissimus dorsi, ach a. - scapulo humeralis anterior

17. s 3 - serratus 3

18. s 4 - serratus 4, s 5 - serratus 5

19. cd - clavico deltoideus, co co - costo coracoid, p - pectoralis, r. a p. - rectus abdominis profundus, sbc - subcoracoideus, sc - supra coracoideus, s c c - sterno coracoideus externus, s c i - sterno coracoideus internus, se c - serrati costalis, s sc - subcoraco scapularis
FIG. 20 Superficial muscles of right pectoral leg.
Outer or dorsal surface of upper arm, extensor surface of forearm (X 1.8)

FIG. 21 Superficial muscles of flexor surface of forearm (X 1.8)

FIG. 22 Deeper muscles of flexor surface of right forearm (X 1.8)

FIG. 23 Deepest muscles of flexor surface of right forearm (X 1.8)

Key to figures
20. b - biceps, b a - branchialis anticus, c b l - coraco branchialis longus, c p - carpo phlangei, e o r - extensor carpi radialis, e o u - extensor carpi ulnaris, f o u - flexor carpi radialis, e o u - extensor carpi ulnaris, s l - supinator longus, t l - triceps, first head, t 3 - triceps, third head

21. f c r - flexor carpi radialis, f p d - flexor profundus digitorum, SE - sesamoid bones

22. pr t - pronator teres
R - radius, U - ulna

23. pa - pronator accessorius, p q - pronator quadatus
PLATE 9

FIG. 24 Superficial muscles of the inside of the left front leg (X 1.8)

FIG. 25 Parts and origin of coraco-branchialis longus. Sternal border of coracoid is lifted. (X 1.8)

FIG. 26 Deep muscles of extensor surface of left front leg (X 1.8)

Key to figures

24. b - biceps, c b l - coraco branchialis longus, e c u - extensor carpi ulnaris, f c r - flexor carpi radialis, f c u - flexor carpi ulnaris, l d - latissimus dorsi, s a - supinator accessorius, t 1, t 2, t 4 - triceps first, second and fourth heads
Co - coracoid

26. br a - branchialis anticus, e c r - extensor carpi radialis, e c m p - extensor ossis metacarpi pollicis, s l - supinator longus
PLATE 10

FIG. 27 Superficial muscles of the pelvis and ventral surface of leg (X 1.8)

FIG. 28 Muscles of ventral surface of pelvis (X 1.9)

Key to figures

27. g - gastrocnemius 1 & 2, i 1 - iliacus 1, o a e s 2 - obliquus abdominis externus superficialis 2, p i t - pubo ischio tibialis, pu ti - pubo tibialis, r a i - rectus abdominis internus, r f l - rectus femoris 1, ti an - tibialis anticus, tr pe - transversus perinei

28. fa - femoro caudalis, o e - obturator externus, o i - obturator internus, p - pectineus 1, 2, 3; r f 2 - rectus femoralis 2

T - tendon
PLATE 11

FIGS. 29, 30 & 31  Muscles of the dorsal surface of the pelvis

Key to figures 29, 30 & 31
i - iliacus 1, 2, 3, 4; i i c - ilio ischio coccygeus
IS - ischiium, IL - ilium, PU - pubis
PLATE 12

FIG. 32 Muscles of the inner flexor surface of the right hind leg. Gracilis is cut away. (X 1.8)

FIG. 33 Muscles of the outer extensor surface of the right hind leg (X 1.8)

Key to Figures:

32. a m - adductor magnus, g - gastrocnemius 1, 2; p i t - puboischio tibialis, r f - rectus femoris 1, 2; t i a n - tibialis anticus, s e m - semimembranosus 1, 2; v i - vastus internus

33. c i f - caudi ilio femoralis, e l d - extensor longus digitorum, e b d - extensor brevis digitorum, i p - ilio peroneal, i t - ilio tibialis, p e r - peroneus, s e t - semitendinosis, v e - vastus externus
PLATE 13

FIG. 34 Deep muscles of flexor surface of the right foreleg (pelvic) (X 1.8)

FIG. 35 Extensor surface of right foreleg (pelvic) (X 1.8)

FIG. 36 Deepest muscles of flexor surface of right foreleg (pelvic) (X 1.8)

Key to figures

34. f l d - flexor longus digitorum, pop - popliteus
    SE - sesamoid bone, TI - tibia, F - femur, FI - fibula

35. pt - peroneo tibial

36. f a - flexor accessorius, t p - tibialis posticus