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دراسات على العضلات خلف الجمجمة

لثعبان ابو السيور : بساموفيس سيبيلانس رتبة : أوفيديا ـ عائلة : كولبريدى

١ـ العضلات المحصوره بين حاجزى النسيج الضام الأول والثاني

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هذا هو البحث الأول من سلسلة من الابحاث المتعلقة بدراسة الجهاز العضلي خلف الجمجمة للثعبان المصرى ابو السيور·

ويتناول هذا البحث الأول العضلات المحصوره بين حاجزى النسيج الضام الأول والثاني ، وتتكون هذه المجموعة من أربع عضلات هي:

١ـ العضله الجمجمة الشوكية (١١)·
٢ـ العضله النصف الشوكية الداخلية (٢)
٣ـ العضلة النصف الشوكية الخارجية (١٥)·
٤ـ العضلات بين الفقارية ورقمها (١) في الثعابين وليست ممثلة في السحالي ·

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STUDIES ON THE POST-CRANIAL MYOLOGY OF PSAMMOPHIS SIBILANS (LINNAEUS), ORDER, OPHIDIA, FAHILY: COLUBRIDAE I- MUSCLES ENCLOSED BETWEEN RADIAL CONNECTIVE TISSUE SEPTA (1) & (2)

(With 16 Figs.)

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SUMMARY

In the present series of papers, the post-cranial muscles of Psammophis sibilans are dealt with according to their position between connective tissue septa radiating from the vertebral column to the inner side of the skin. Four of those septa are present and are numbered CS1,2,3 & 4 respectively. In general, the muscles of the snake in question which are homologous with those of lizards are numbered following the same system of nomenclature of KHALIL, et al. (1977), while muscles which have no homolgues in lizards were given new numbers preceded by op letters (ophidian). The first group of muscles enclosed between the first and second connective tissue septa (CS1 & CS2) are: cranio-spinal (1), inner semispinal (2), outer semispinal (15) and intervertebral (op la & b).

INTRODUCTION

In 1977 KHALIL, et al. introduced a comperhensive work in which they enlisted the whole system of post-cranial muscles of Uromastyx aegyptia. They depended on both their experience in lacertillian osteology and the major works in the field of tetrapod myology to suggest a system of names and numbers for each muscle, which system bears a comparative anatomical point of view. That system of names and numbers is adopted in the present work. However, some of the muscles of the sanke in question which have no homologues in Uromastyx, as far as best thought, are given new numbers preceded by the letters op (ophidian). Connective tissue septa radiate from the vertebral column to the skin, those septa separate the different groups of the longitudinally extending muscles. Each of the present papers will deal with a group of muscles enclosed between two successive tissue septa. However, the last papers of the present series are devoted to groups of muscles which were found better to be dealt with together.

MATERIAL and METHODS

Psammophis sibilans (Linnaeus) F. Colubridae is a common snake in Egypt. The specimens used in the present investigation are collected from Abou-Roash, Giza Destrict during the period

of 1979 to 1980. Muscles were exposed and photographs were taken for any part being dissected, then the photographs were accurately copied on drawing papers. Hand sections were also done and were microscopically examined.

RESULTS and DISCUSSION

Similar to the case of lizards, when one cuts a transverse hand section (Fig. 5), at any part of the trunk, one could notice the presence of a vertical, longitudinally extending connective tissue septum (C.S.1), which arises from the neural spines of the whole of the vertebvral column. That septum when reaches the subcutaneous connective tissue branches into two lateral sheets which wrap the whole body and fuse in the mid-ventral line. On each side of the median vertical septum there are found three similar vertical connective tissue septa that extend from the vertebral column to the connective tissue sheet warpping the body. The first of those (C.S. 2), counting from the median side outwards, arises from the vertebral postzygapophyses. The second (C.S.3), arises from the vertebvral prezygapophyses, while the third (C.S.4), arises from the middle portions of the body ribs. It should be noticed that the above described connective tissue septa (Figs. 8,10,15 & 16) are much thicker and stronger than those in the case of lizards to offer good places for axial muscle attachments.

The inner and outer semispinal (2 & 15) as well as the ophidian intervertebral muscles (OP. la & b) are located between the (C.S.1) and the (C.S.2) vertical connective tissue septa (Figs. 8 & 10). The dermo-costal (16) as well as the ophidian intervertebro-articular muscles (OP.2 & OP.3) are located between the vertical septa (C.S.2) and (C.S.3). Finally, the ilio-costal (17) and the ophidian dorsal costo-vertebral muscle (OP.4) are located between the vertical septa (C.S.3) and (C.S.4).

It should be noticed that in the case of lizards (KHALIL, et al. 1977) the units of the muscles described above extend all along the trunk region and an anterior part of the caudal region, but in the case of the snake studied those units extend all over the caudal region.

The Cranio-spinal muscle (Muscle numbered 1 in lizards and snakes) (Figs. 1,4,6,7,9 & 14):

In lizards it originates on the posterior edge of the parietal bone of the skull, while in the snake examined, it originates on the dorsal surface of the supraccipital (Figs. 1 & 14). However, the anatomy and mode of origin and insertion of that muscle differ from those found in lizards. In the case of the snake in question the muscle is feather shaped (Fig. 7), in as much as a median tendon forms an axis from which sides arise groups of muscle fibres resembling the barbs of a feather. On the median side (a) (Fig. 9), the anterior muscle fibres form a sort of six distinct bundles each of which terminates by a short tendon. Those six terminal tendons become inserted on the postero-lateral side of the neural spines of the first six cervical vertebrae. Posterior to those six distinct muscle bundles, the more posterior fibres are directly inserted on the lateral sides of the neural spines of the seventh cervical vertebra up to the fifth dorsal vertebra. On the lateral side (b) the muscle fibres are directly inserted on the second vertical connective tissue septum described above (C.S.2). Some posterior fibres of the median side of the cranio-spinal, extend posteriorly to become fused with the lateral first branch of the first unit of the outer semispinal (muscle numbered 15 of lizards and snakes). It appears as in the case of lizards that the cranio-spinal is a good levator of the skull.

The Outer semispinal muscle (Muscle numbered 15 in lizards and snakes) (Figs. 3b,d & f, 7,8,10,11, 15 & 16)

It consists of sucessive units. Each unit arises from four or five successive vertebvrae in the trunk region, or, two or three vertebrae in the caudal region (Figs. 8 & 10). Four thick branches (Fig. 11) originate on the lateral sides of four successive neural spines. Similar but much thinner branches originate on the second vertical connective tissue spetum (C.S.2). Each of those branches extends anteriorly along two to three vertebrae. The branches of both sides fuse in the middle to form a median trunk which extends anteriorly to end by a fine and long ligament which becomes inserted on the postero-lateral surface of the neural spine of a vertebra infront.

In the case of the first unit (Fig. 7), the branches originate on the ninth to sixth neural spines and the ligament of insertion is attached to the neural spine of the axis. The anterior extension of that ligament of insertion passes above the posterior muscle fibres of the median part of the craniospinal and is directed below the anterior six distinct bundles of the same muscle. In other words, that first outer semispinal unit covers sixteen body vertebrae, while the second unit covers nineteen body vertebrae (from the third cervical vertebra to the thirteenth dorsal vertebra).

The posterior most lateral branches of a semispinal unit is connected by few muscle fibres with the anterior most lateral branch of the unit next behind. Such connections between muscle units are an ophidian character (AUFFENBERG, 1961 & 1962).

Some authors called the median branches "spinalis" (since they originate on neural spines), and called the lateral branches "semispinalis" (AUFFENBERG, 1961 and GASC, 1967).

The Inner semispinal muscle (Muscle numbered 2 in lizards and snakes) (Figs. 1,2,3,7,8,10,12 & 13)

Again, this muscle consists of successive units. Each of those units is more or les triangular in form. It originates by its base on the postzygapophysis of one vertebra and a vertical line of the neural arch of the vertebra behind. The posterior tapering end of that unit is inserted by a ribbon-like tendon on the postero-lateral side of the neural spine of the second vertebra behind, just anterior to the point of insertion of a posterior unit of the outer semispinal (15). That means that the unit covers four successive vertebrae. However, the first unit has two places of origin on the occipital ring of the skull (Figs. 2 & 7), and is inserted on the neural spine of the axis, while the second, third and fourth units originate on the second vertical connective tissue septum (C.S.2) and are inserted on the third to fifth cervical neural spines successively (Fig. 7). The fifth unit (Fig. 13) originates on the postzygapophysis of the third cervical vertebra and is inserted on the neural spine of the sixth cervical vertebra.

The Intervertebral muscle (OP. 1 a&b) (Figs. 3c,d,e & f, 8,10,12 and 16)

That muscle is represented by a median and lateral series of thick units. A unit of the median series (a) is in the form of a broad sheet which runs on the dorsal surface of the neural arch, just lateral to the neural spine. Each unit originates on the transverse line located on the posterior most region of the neural arch, covers the greater length of the neural arch next behind to be finally inserted on that arch. A unit of the lateral series (b) of the intervertebral muscle originates on a point on the postzygapophysis of a vertebra and is inserted on a longitudinal line located on the lateral side of the vertebra behind. The intervertebral muscle

units are found all over the whole of the vertebral column (Figs. 8 & 10), and most probably they serve a binding function.

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EXPLANATION OF LETTERING

ANT. = anterior; AT. = atlas. AX. = axis; CEN. = centrum; C.M. = cranial muscles; C.S.(1-6): first to sixth connective tissue septa; C.SH. = connective tissue sheet wrapping the body; C.V.(3-8) = third to eigth cervical vertebrae; D.R. = dorsal rib. D.S. = dorsal scale; D.V. = dorsal vertebra; D.V.2 = second dorsal vertebra; E.OC. = exoccipital; FO.MAG. = foramen magnum; FR. = frontal; HYP. = hypapophysis; L.16 = ligament of origin of muscle numbered sixteen.; MAS.1 = masticatory one; MAS.2 = masticatory two; M.D.L. = mid-dorsal line; N.A. = neural arch.; N.S. = neural spine; OD.P. = odontoid process; OC.CO. = occipital condyle; OP.1-OP.8 = first to eighth ophidian muscles.; P.OC.P. = paroccipital process; PR. = parietal; PR.Z. = prezygapophysis; PT. = pterygoid; PT.Z. = postzygapophysis; QU. = quadrate; S.OC. = supraccipital; S.TM. = supratemporal; T.15 = tendon of insertion of muscle numbered fifteen; T.16 = tendon of insertion of muscle numbered sixteen; T.17 = tendon of insertion of muscle numbered seventeen; T.P. = transverse process; 1st. 15 = first unit of muscle numbered fifteen; 2nd.15 = second unit of muscle numbered fifteen; 5th.2-7th.2 = fifth to seventh units of muscle numbered two.

EXPLANATION OF FIGURES

Fig. (1): Dorsal view of the skull (after Kamal and Hammouda 1967) showing the attachments of muscles numbered (Mas.1, 1,2,8 & 16).

Fig. (2): Posterior view of the skull (after Kamal and Hammouda 1967) showing muscles attachments on that region.

Fig. (3): **A.** Lateral view of the atlas showing the attachments of muscles numbered (1,9,10 & 13).

B. Lateral view of the axis showing the attachments of muscles numbered (1,2,9,13 & 15).

C. Dorsal view of a trunk vertebra showing the attachments of muscles numbered. (2,16, OP.1, OP.2, OP.3 & OP.4).

D. Lateral view of a trunk vertebra showing the attachments of muscles numbered (2,13,15,16, OP.1, OP.2, OP.3, OP.4 & OP.7).

E. Dorsal view of a caudal vertebra showing the attachments of muscles numbered (2,16,17, OP.1, OP.2, OP.3 & OP.4).

F. Lateral view of a caudal vertebra showing the attachments of muscles numbered (2,15,16,17, OP.2, OP.4 & OP.7).

Fig. (4): Dorsal view of the head, neck and the anterior part of the trunk region showing the topology of muscles numbered (Mas.1, Mas.2, 1,8,16,17 & OP.5).

Fig. (5): Transverse hand section in the middle of the trunk region showing the vertical connective tissue septa (C.S.1-C.S.4).

Fig. (6): Lateral view of the head and neck regions showing the topology of muscles numbered (Mas.1, Mas.2, 1,8,16,17,18 & OP.5a).

Fig. (7): Dorsal view of the anterior part of the vertebral column showing muscles numbered (1,2 & 15).

Fig. (8): Dorsal view of some trunk vertebrae showing muscles numbered (2,15,16,17,18, OP.1, OP.2, OP.3, OP.4 & OP.5).

Fig. (9): Lateral view of the anterior part of the vertebral column showing nuscle numbered (1a).

Fig. (10): Dorsal view of some caudal vertebrae showing muscles numbered (2,15,16,17,18, OP.1, OP.2, OP.3 & OP.4).

Fig. (11): Dorsal view of some trunk vertebrae showing muscle numbered (15).

Fig. (12): Dorsal view of some trunk vertebrae showing muscles numbered (2, OP.1 & OP.2).

Fig. (13): Lateral view of the anterior part of the vertebral column showing muscle numbered (2).

Fig. (14): Ventro-lateral view of the neck and the anterior part of the trunk region showing the topology of muscles numbered (1,10,13a,16,17 & 18).

Fig. (15): Dorso-lateral view of some trunk vertebrae showign muscles numbered (15,16,17,18 & OP.5), and the relation between muscles numbered (15,16 & 17) via the vertical connective tissue septa (C.S. 2 & C.S. 3).

Fig. (16): Dorso-lateral view of the trunk musculature showing muscles numbered (2,15,16,17,18, 24, OP.1, OP.2, OP.3, OP.4, OP.5, & OP.8).

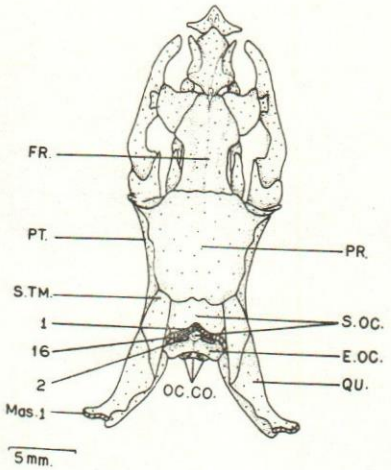


Fig. 1

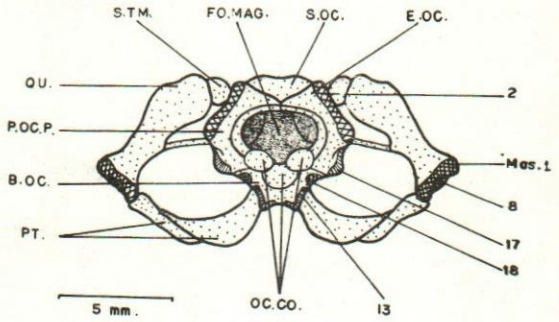


Fig. 2

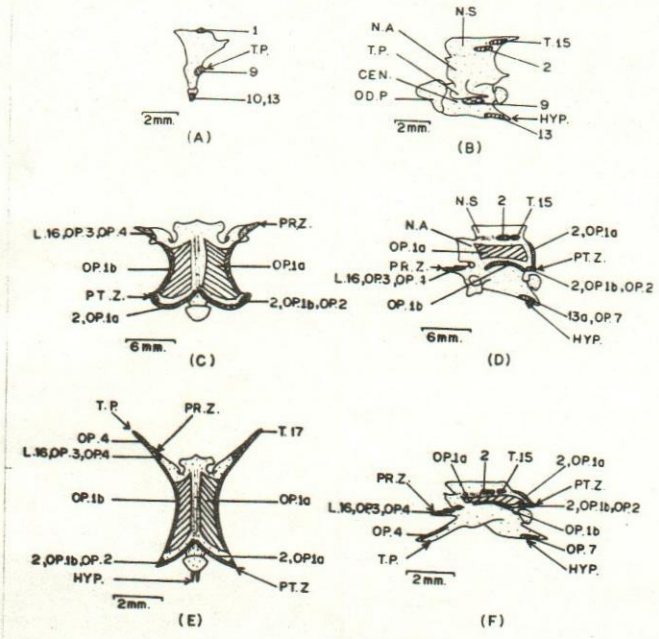


Fig. 3

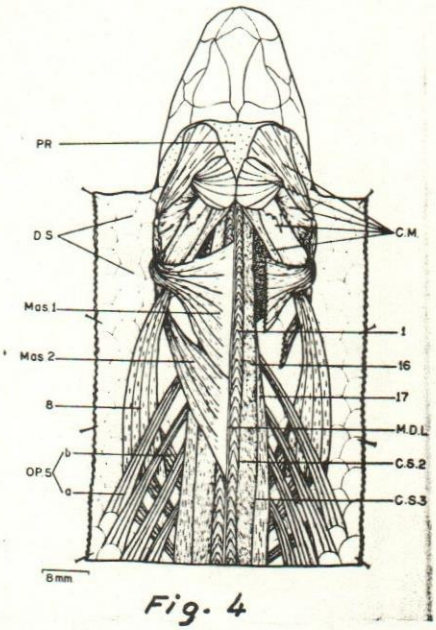


Fig. 4

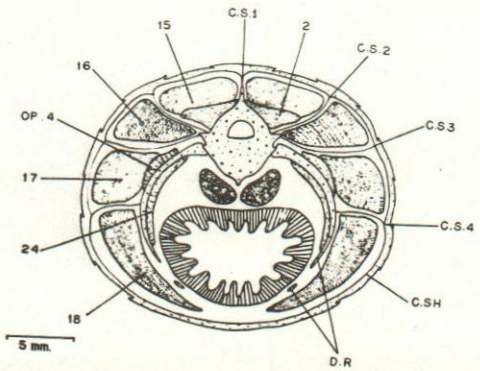


Fig. 5

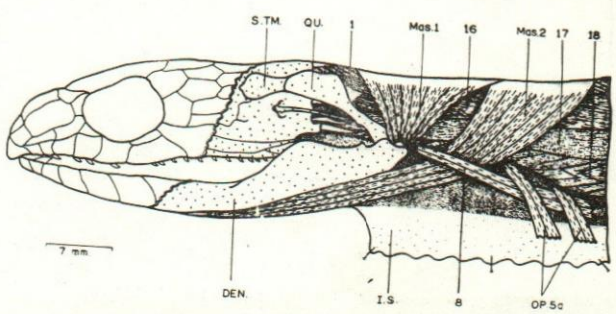


Fig.6

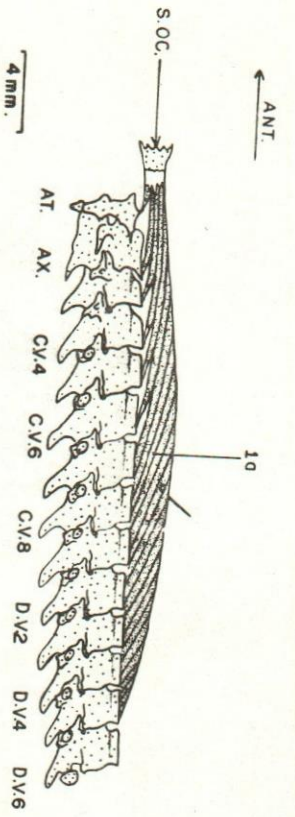


Fig. 9

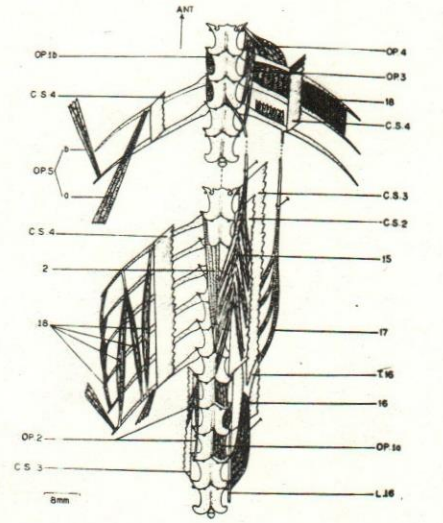


Fig. 8

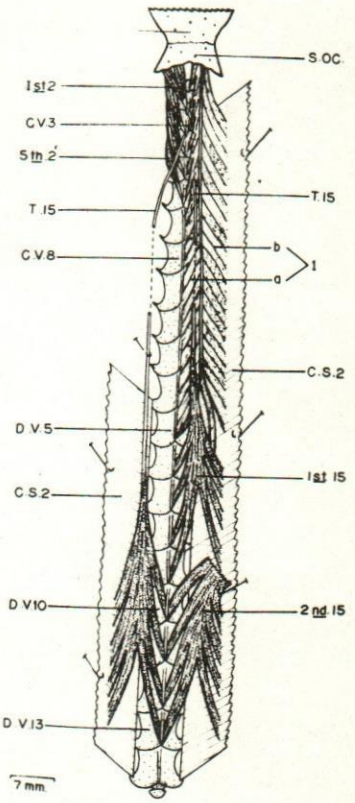
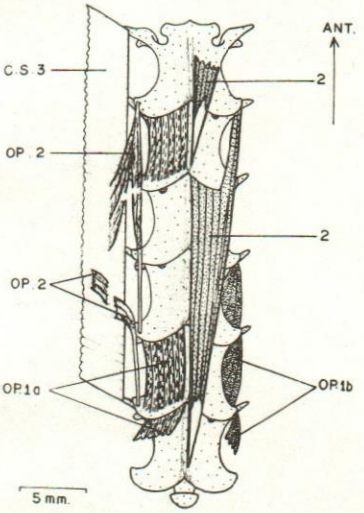


Fig. 7



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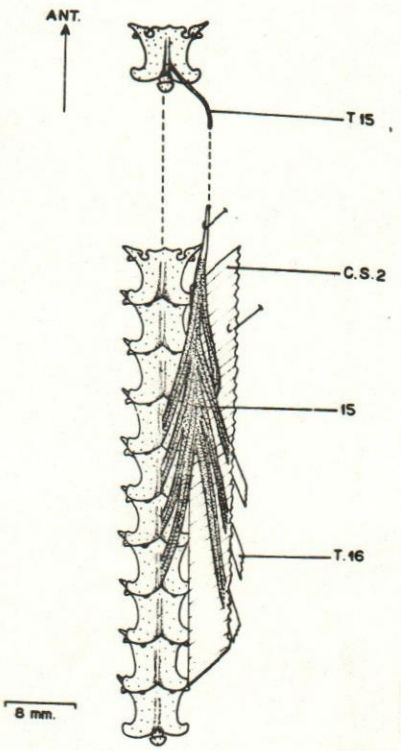

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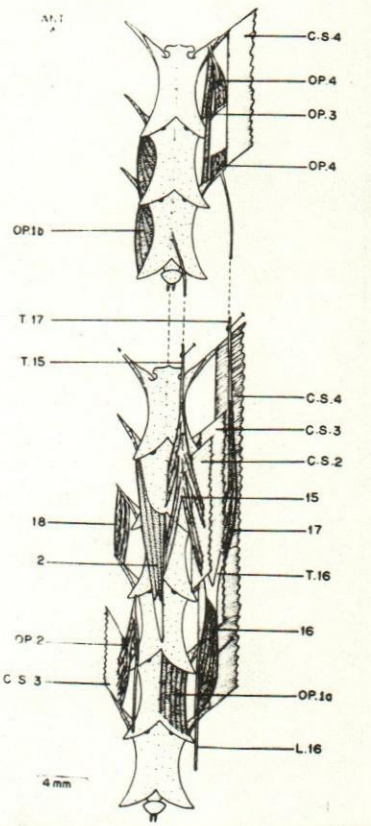
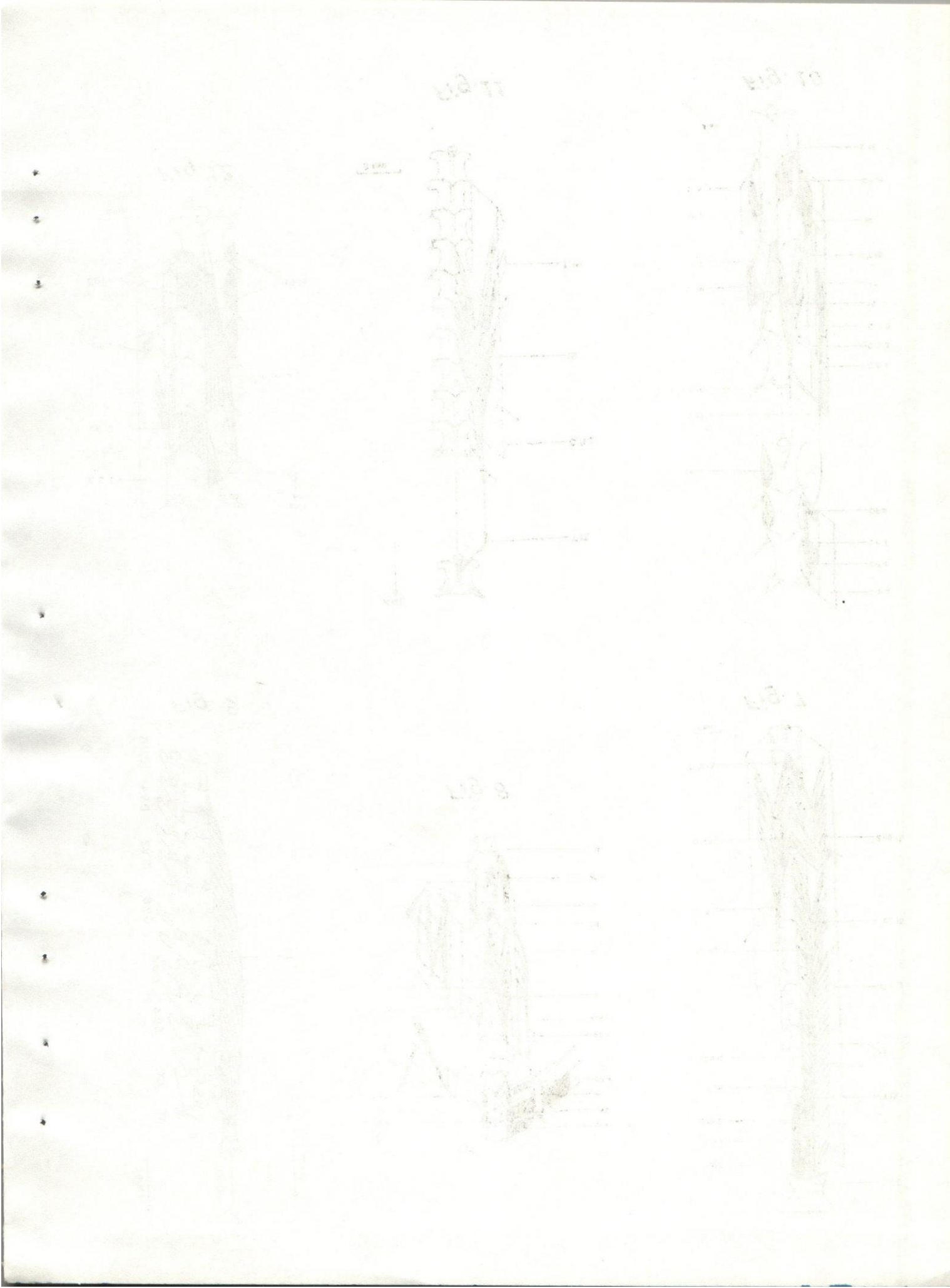


Fig. 10



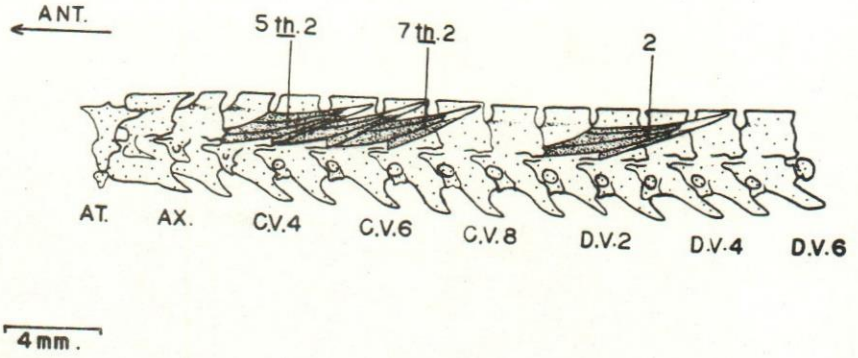
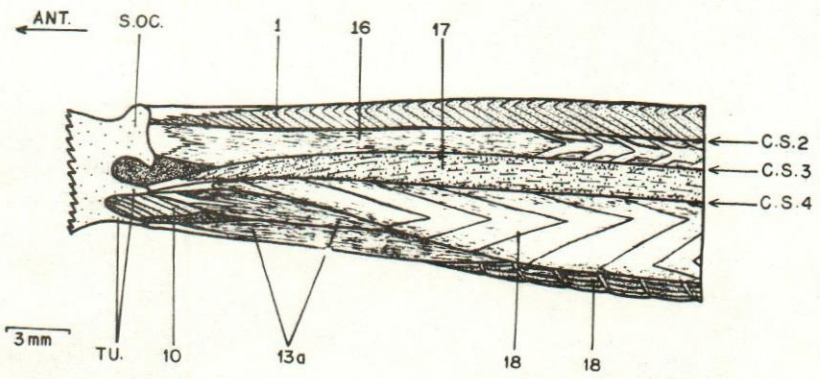


Fig. 13



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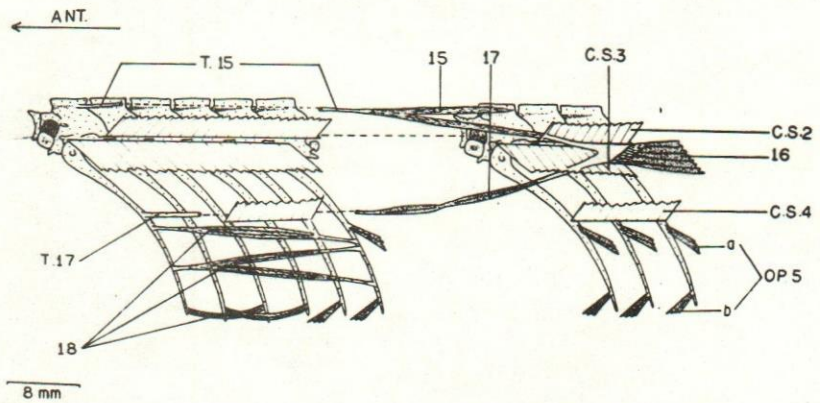

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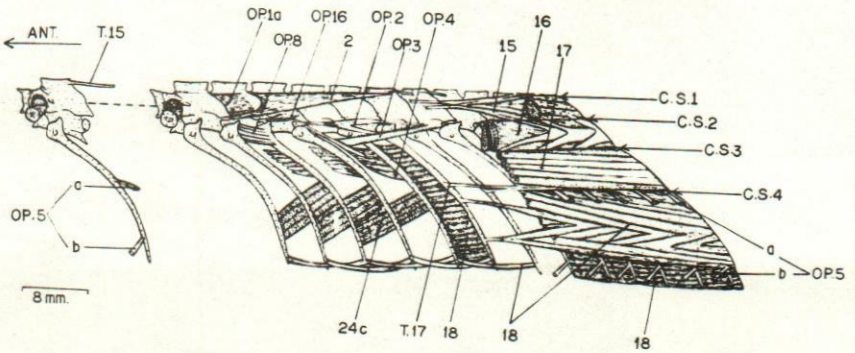

Fig. 16