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The Levator anguli scapulae in *Necturus*

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Professor St.-George Jackson Mivart first described the *M. levator anguli scapulae* in *Necturus* in 1869. He noted an origin of the long, slender muscle on the occiput, and an insertion on "the inner side of the dorsum of the scapula." Mivart, earlier in the same year, had used the same name for a homologous muscle in the hell-bender; in this, he apparently adapted Funk's (1827) and Rüdinger's (1868) earlier name. Kingsley (1907) used the name *M. levator scapulae* for the same muscle, following an earlier pattern set by Carus (1828), Schmidt, Goddard, & van der Hoeven (1864), Humphry (1871) and Osawa (1902).

Kingsbury & Reed (1908, 1909a, 1909b), and Reed (1914, 1920) studied the sound-transmitting apparatus in urodele amphibia. They described in *Ambystoma* a muscle extending from the opercular cartilage of the otic capsule to the dorsum of the scapula, and named it "*M. opercularis*", following Gaupp (1898). They stated that this muscle was absent in most larval urodeles, but that it developed in most Caudata at the time of their transformation. Specifically, they said the *M. opercularis* was absent in larval *Ambystoma* and in *Necturus*, among others. As a result of their investigations, Kingsbury and Reed concluded that there is a difference in the method by which aquatic and terrestrial salamanders transmit sounds to the otic capsule. Terrestrial salamanders, with the body raised from the ground, they believed to receive vibrations through the foreleg to the

scapula and suprascapula; and vibrations from the suprascapula transmitted to the operculum of the otic capsule through the *M. opercularis*. In aquatic salamanders, lacking the *M. opercularis* (according to Kingsbury and Reed), vibrations were transmitted through the mandible, to the quadrate, to the columella of the ear, or through the mandible and hyoid arch to the columella. Reed (1920) believed that the relationships of the sound-transmitting apparatus in urodeles indicate their origin in a terrestrial environment; and that therefore all present-day aquatic salamanders are secondarily aquatic.

Rylkoff (1924) and Adams (1926) described the muscle as the *M. levator scapulae*.

Francis (1934) followed Kingsbury and Reed in their interpretations of the sound transmitting apparatus, described in some detail the *M. opercularis* in *Salamandra*, and listed the *M. levator anguli scapulae* and *M. levator scapulae* among the synonyms for the *M. opercularis*. Francis believed that his *M. opercularis* was absent in *Necturus*.

Dunn (1941) recognized that the *M. opercularis* of Francis was the same as the *M. levator scapulae* named by Adams (1926). He noted several variations in the opercularis muscle in several genera of salamanders, and concluded that at least two muscles were involved in the confusion; these two he listed as the *M. levator scapulae* and the *M. cucullaris* (trapezius). Why the *M. cucullaris* could ever be mistaken for the muscle that levates the scapula, I cannot understand. It is true that in some salamanders the *M. cucullaris* has its origin in part from fascia on the base of the skull; but its principal origin is on dorsal fascia of the trunk, and its insertion is always on the pectoral girdle near the glenoid fossa. This fact of the area of insertion would make it hardly possible to confuse the *M. cucullaris* with the *M. levator scapulae*, even in those forms in which the *M. cucullaris* originates in part on the base of the skull.

Walker (1954) and Weichert (1954) in two recent manuals of comparative anatomy, name the *M. levator scapulae* in *Necturus*. Walker says "It is this muscle which becomes the opercularis in terrestrial vertebrates". I agree with this statement. The opercularis and levator anguli

scapuli are one and the same muscle, with slightly different points of origin in different salamanders. A nearly complete list of synonyms for the muscle is given by Francis (1934).

The *M. levator anguli scapulae* in *Necturus* originates on the ventral surface of the opisthotic bone, just lateral to the occipital condyle. A few connective tissue strands may attach it to the parasphenoid. The muscle extends as a very slender tendon about half the distance from the base of the skull to the suprascapula, then the muscle gradually widens to its insertion on the suprascapula. The tendon of origin is anchored by several slender strands of connective tissue to the submucosa in the roof of the pharynx. Insertion of the muscle is on the anterodorso-medial surface of the suprascapula. The muscle is relatively flat at its insertion, and much wider than is the tendon by which it originates on the base of the skull. The fibers of insertion appear to blend with the anterior fibers of the *M. serratus anterior*. (The *serratus anterior* originates on dorsal fascia posterior to the suprascapula and inserts on the posterodorso-medial surface of the suprascapula.)

The first spinal nerve gives branches, some to the *M. levator anguli scapulae*.

The function of the *M. levator anguli scapulae* in *Necturus* is probably primarily that indicated by its name. If the functions attributed to it by Kingsbury and Reed in *Ambystoma*, and Francis in *Salamandra*, are correct, then it would appear that in *Necturus* the function of transmission of vibrations to the ear must also be served. The only report published to date on the ability of *Necturus* to hear (Dye, 1921) shows rather clearly reception of low-frequency vibrations through the lateral line system, but does not rule out the possibility of transmission of vibrations either through the mandible-quadrante-columella, or the foreleg-suprascapula-levator anguli scapulae-opisthotic.

One small point remains to be mentioned. In a larval *Ambystoma* provided by Mr. Ottys Sanders of Southwestern Biological Supply Co., I found the *M. levator anguli scapulae* as well developed as in the adult *Ambystoma*, fitting exactly the description given by Francis (1934) for this muscle in *Salamandra*.

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Biological Notes

STATUS OF THE WOOD THRUSH IN DALLAS COUNTY, TEXAS.—In his Check List of Birds of Dallas County, Texas, Stillwell (1939) designated the Wood Thrush, *Hylocichla mustelina* (Gmelin), a rare transient. He states: "We rarely see, never hear, the Wood Thrush in Dallas . . .", and gives May 25 as the latest record of its occurrence in the County. Local bird enthusiasts, however, tell me that although the Wood Thrush is not a common spring migrant here, it is certainly not rare.

Mr. Edward C. Fritz informed me (June 15, 1954) that he had seen and heard Wood Thrushes at his home near the northern limits of the city of Dallas (4144 Cochran Chapel Road) since April 23 of this year, and that he had heard the song of a Wood Thrush that very morning. On June 20, Mr. Fritz observed the bird at close range and made a positive identification of it as a Wood Thrush. On June 22, Mr. Fritz and I visited the area in which this bird had been seen. Although we did not see the bird, we heard its song—unmistakably that of a Wood Thrush.

Egg dates recorded by Bent (*Bull. 196 U.S. Nat. Mus.*, p. 123, 1949) indicate that the height of the nesting season for this bird, over most of its range, occurs between mid-May and mid-June. As the breeding range of the Wood Thrush is known to include the areas of Tyler and Marshall, Texas (Bent, *op. cit.*, p. 121) approximately 100 miles east of Dallas, the possibility of this bird's nesting in our area must not be excluded. No nest has, however, yet been found. — William B. Stallcup.