The Musculus Depressor Mandibulae in Necturus

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A small amount of confusion appears in the literature on the cranial myology of Necturus, and the Urodela generally, by the use, among divers anatomists, of the same name for two different muscles. Both of these muscles function as depressors of the lower jaw. On occasion, both muscles have been named "digastric," and "depressor mandibulae"; and other names have also been used. In order to clarify the use of the terms "M. depressor mandibulae" and "M. branchio-mandibularis," I have inserted tables of the synonymy for these two muscles in the Urodela, with brief descriptions of these muscles in *Necturus*.

M. Depressor Mandibulae

Abaisseur de la mâchoire inférieure, Meckel 1821-33.
Depressor maxillae inferioris, v. Siebold 1828.
Témpore-angulaire, Dugès 1834.
Digastricus, Fischer 1843; Stannius 1854-56; Osawa 1902.
Digastrique, Cuvier 1835; Rusconi 1854.
Occipito-mandibularis s. Digastricus, Owen 1866.
Digastric, Mivart 1869; Wilder 1891, 1892; Platt 1897.
Digastric et Depressor mandibulae, Humphry 1872.
Cephalo-dorso-maxillaris s. Digastricus-maxillae, Hoffman 1873-78.
C_2md, Ruge 1897.
Cephalo-dorso-mandibularis, Drüner 1901.
Cephalo-hyo-mandibularis, Drüner 1903, 1904.
M. depressor maxillae inferioris, Houghton 1903.
Depressor mandibulae, Francis 1934; Edgeworth 1935, 1911.
Depressor mandibulae, Piatt 1938, 1939.

Origin: on the opisthotic bone, the otic capsule, and along the length of the squamosal bone.

Insertion: on the posterior ventral angle (angulare) of the lower jaw, immediately anterior to the point of insertion of the M. branchio-mandibularis. The muscle is superficially "digastric." Some of the dorsal fibers insert directly on the angulare. Most of the fibers from the more posterior, ventral portion course cranio-ventrad, merging into a stout fibrous tendon which inserts on the angulare. The stout tendon crosses the expanded distal tip of the ceratohyal cartilage, and so forms part of the tendon by which mandibular and hyoid arches are tied together. It is apparent from this description that the M. depressor mandibulae is a deep muscle of the head. Before it can be seen, portions of the M. levator mandibulae must be removed.

Function: to depress the mandible and (through the tendinous connection) the hyoid arch, opposing the Mm. levatores mandibulae.

Innervation: by a ramus of the Facialis (cranial nerve VII); the ramus was called the hyomandibularis by Edgeworth (1935), and jugularis by Francis (1934) and Piatt 1938).

M. branchio-mandibularis

Superficial portion of C_2md, Ruge 1897.
Digastricus, pars posterior, Drüner 1903, 1904.
Cerato-mandibularis, Drüner 1904.
Branchio-mandibularis, Drüner 1904.
Portion of Cephalo-cerato-mandibularis, Drüner 1904.
Hyo- or Branchio-mandibularis, Edgeworth 1935.
Ceratomandibularis, Piatt 1938, 1939.
Depressor mandibulae, Eaton 1936.

Origin: on the dorsal portion of the expanded distal end of the first epibranchial.

Insertion: on the posterior, ventral angle (angulare) of the lower jaw, immediately posterior to the point of insertion of the M. depressor mandibulae. The M. branchio-mandibularis in *Necturus* is a superficial muscle, intimately associated with the well-known M. branchio-hyoideus (ceratohyoideus externus).

Function: to depress the mandible, opposing the Mm. levatores mandibulae. Necturus swallows with sudden gulping action; this large muscle, aided by the M. depressor mandibulae, the M. genio-hyoideus and the M. branchio-hyoideus externus produces the sudden opening of the mouth. If the large and powerful Mm. levatores mandibulae should be held in contraction, then contraction of the M. branchio-mandibularis would produce a spasmodic forward toss of the branchial arches and external gills.

Innervation: by a ramus of the Facialis, cranial nerve VII. The ramus was called the hyomandibularis by Edgeworth (1935), and jugularis by Piatt (1938).

Discussion: It is possible that some of the confusion relating to the names of the two muscles of *Necturus* being discussed here is more apparent than real, generated by the authors of comparative anatomy laboratory manuals. The M. branchio-mandibularis was by Adams (1926) and Breland (1953) named the digastric, and by Hyman (1949), Walker (1954) and Weichert (1954), the depressor mandibulae; the more internal M. depressor mandibulae was not

described by them. The M. depressor mandibulae was by Senning (1937), Kent (1948) and Atwood (1949) named as the depressor mandibulae or digastric; the more superficial M. branchio-mandibularis was not described. What is written here should not be construed as an indictment of the manuals, for all are very good; in fact, the various authors may have known all that has been presented here.

It is also pertinent to observe that more has been published on the cranial myology of terrestrial than of aquatic urodela. In terrestrial urodeles, the M. depressor mandibulae is a relatively large, superficial muscle, situated immediately behind the M. levator mandibulae. In aquatic larvae of Urodela, the M. depressor mandibulae has the same position, but is overlaid laterally by the M. branchio-mandibularis and M. branchio-hyoideus externus, which two large external muscles are developed in relation to the external gills. *Necturus* is a paedomorphic form (Harris 1956) whose cranial myology corresponds to that of larval Urodela.

The embryology of the M. depressor mandibulae and M. branchio-mandibularis has been studied by Edgeworth (1911, 1935) in Urodela (principally *Cryptobranchus,* but including considerable work on Necturus) and by Piatt (1938) using *Ambystoma.* The embryonic hyoid muscle plate separates into a dorsal levator hyoideus, an intermediate branchio-hyoideus externus, and a ventral interhyoideus. Early in development the levator hyoideus passes from the auditory capsule to the ceratohyal; later, the insertion on the ceratohyal is released, and a new insertion on Meckel's cartilage is developed (Edgeworth 1935, Piatt, 1938), producing the M. depressor mandibulae. Edgeworth concluded that the M. depressor mandibulae has no homologue in mammals, for in mammals (he said) the levator hyoidei never gives rise to the depressor mandibulae as it does in Urodela. The name digastric is accordingly considered not appropriate for urodelan use. The intermediate branchio-hyoideus externus is subdivided by an oblique line of separation into ventral and dorsal portions. The ventral portion continues as the M. branchio-hyoideus externus; the dorsal portion sends some fibers to the mandible, forming the M. branchio-mandibularis (Piatt 1938). The M. branchio-hyoideus externus and M. branchio-mandibularis

are characteristically larval, disappearing at (or shortly after) metamorphosis in *Ambystoma* (Piatt 1938) and other metamorphic Urodela. The origin of the muscles from the hyoid muscle plate explains their innervation by the facial nerve.

The selection of the names M. depressor mandibulae and M. branchio-hyoideus is after Edgeworth (1935).

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William H. von Streeruwitz (1833-1916), Geologist on the Dumble Survey of Texas

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Forty-one years ago, there died in abject poverty in the city of Houston, a Bohemian man of science, former Geologist for West Texas on the Dumble geological survey. Tucked away in the probate records of Harris County is the pitiful story of the administration of his estate: appraised assets of $398.00, and claims against the estate of $1,313.31. Among the assets were $24.79 which was on his person at the time of his decease, and a bank account of $3.80. This was WILHELM H., RITTER VON STREERUWITZ. He had been a resident of Houston intermittently for forty years, having first come to that city in 1876, when its population numbered about 40,000 persons. An erect old Bohemian noble of more than six feet, well-built in proportion, and wearing an "imperial," he was a striking figure in any company. Born in July of 1833 at Mies [present Stříbo], in the Pilsener *Kreis* of Bohemia, he later attended mining-courses at the University of Prague, did his "turn" in the Austrian army in the Second Sardinian War, and was in the Battle of Solferino (his brother being Chief-of-staff of the Emperor Franz Josef, who led the army in person in that disastrous engagement). After that battle, which terminated the war and led to the Peace of Zurich, von Streeruwitz returned to his native town, bore with hardly-restrained impatience the chaos of the 'fifties and 'sixties in the Dual Monarchy, and finally came to America in 1863. He settled at or near Pittsburgh, Pennsylvania, then well-