

Catalogue of American Amphibians and Reptiles.

NELSON, CRAIG E. 1972. *Gastrophryne olivacea*.***Gastrophryne olivacea* (Hallowell)
Western narrow-mouthed toad**

Engystoma olivaceum Hallowell, 1856:252. Type-locality not designated; description in: "Notice of a collection . . . from Kansas and Nebraska, . . ." Type locality restricted to "Kansas, Geary Co., Fort Riley" by Smith and Taylor (1950) (and to "vicinity of Lawrence, [Douglas Co.] Kansas" by Schmidt, 1953). Type obtained by Dr. Hammond. No type designated, but Acad. Nat. Sci. Philadelphia 2745, a female from Kansas collected by Hammond, probably is the type (examined by author).

Engystoma rugosum Günther, 1859:52 (part).

Engystoma texense Girard, 1860:169-170. Type-locality stated only as "procured in Texas," but listed as "Rio Seco, Texas" by Strecker (1908). Syntypes by museum records: U. S. Natl. Mus. 2644, two juveniles (examined by author) from "Rio Seco, Mendina County, Texas," collected by Captain John Pope.

Engystoma carolinense: Boulenger, 1882:162.

Engystoma areolata Strecker, 1909:118-119. Type-locality "Guadalupe River bottom, Victoria County, Texas." "Type" by original designation, J. D. Mitchell 501 (now U. S. Natl. Mus. 38,999), juvenile (examined by author), collected in January, 1909. The type may be a *G. olivacea* (Burt, 1938) or a hybrid with *G. carolinensis* (Hecht and Matalas, 1946). Strecker (1909:118) also designated Baylor Univ. 4086 as "cotype." A series (U. S. Natl. Mus. 42317-23), labeled "probably paratypes," contains 6 *G. olivacea* and 1 possible hybrid.

Gastrophryne areolata: Stejneger, 1910:166.

Gastrophryne texana: Stejneger, 1910:166.

Gastrophryne texensis: Strecker, 1915:47.

Engystoma texensis: Nieden, 1926:64, 65.

Engystoma areolata: Nieden, 1926:64, 65.

Gastrophryne olivacea: H. M. Smith, 1934:217.

Microhyla areolata: Parker, 1934:147-148.

Microhyla olivacea: Parker, 1934:201.

Microhyla mazatlanensis Taylor, 1943:355-357. Type-locality "two miles east of Mazatlán, Sinaloa, Mexico." Type by original designation, E. H. Taylor-H. M. Smith 1236 (now Field Mus. Nat. Hist. 100040), a female (examined by author). Collected by E. H. Taylor, July 20, 1934.

Microhyla carolinensis olivacea: Hecht and Matalas, 1946:5-7.

Microhyla carolinensis mazatlanensis: Hecht and Matalas, 1946:5-7.

Gastrophryne carolinensis olivacea: Carvalho, 1954:13.

Gastrophryne carolinensis mazatlanensis: Carvalho, 1954:13.

Gastrophryne mazatlanensis: Chrapliwy, 1956:89.

Gastrophryne olivacea olivacea: Chrapliwy, 1956:85, 88-89.

Microhyla olivacea mazatlanensis: Langebartel and Smith, 1954:126.

Gastrophryne olivacea mazatlanensis: Chrapliwy, Williams, and Smith, 1961:81.

Gastrophryne carolinensis: Lowe, 1964:167 (in part).

- CONTENT. The species is monotypic.

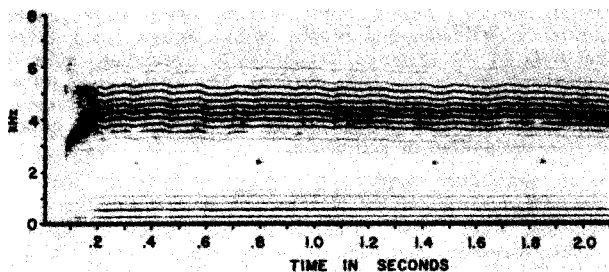
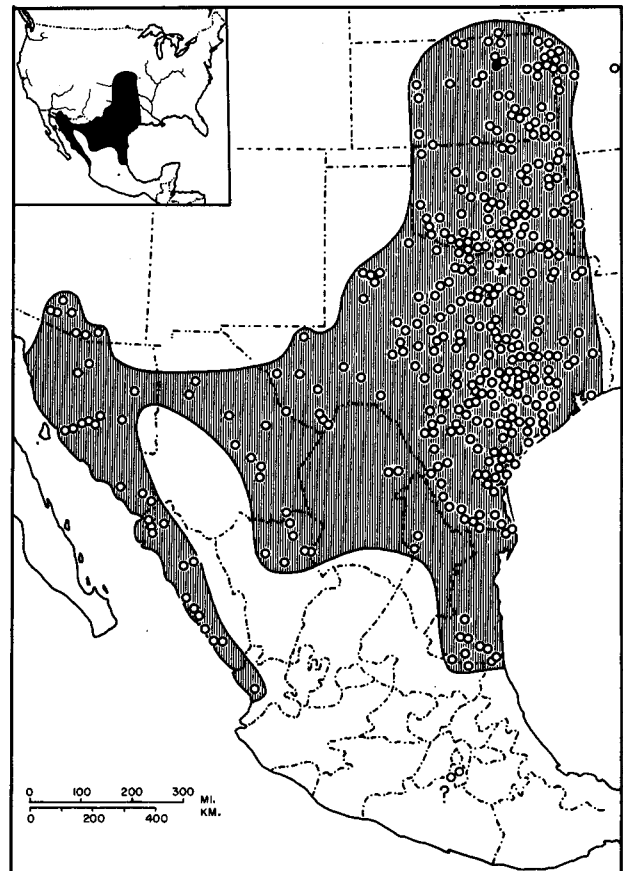


FIGURE. Audiospectrogram (narrow band, 45 Hz) of mating call of *Gastrophryne olivacea*: Hermosillo, Sonora, Mexico, 22 July 1958 (Amer. Mus. Nat. Hist. Dept. Herpetology tape library).

- DEFINITION AND DIAGNOSIS. *Gastrophryne olivacea* differs from *G. carolinensis* in coloration and from other species in coloration and foot structure. The abdomen is not mottled (the throat, chest, and lower sides may be mottled). The dorsum is olive or tan and either plain or marked with scattered small black spots. There is a single metatarsal tubercle on each hind foot. The tips of the toes are rounded and tapered. The toes are not webbed.

- DESCRIPTIONS. For the better descriptions of adults, see Nieden (1926, as *E. texensis*), Parker (1934, as *M. texensis*), Taylor (1940), Wright and Wright (1949), Smith (1934, 1950, 1956), Stebbins (1951, 1954, 1966, Arizona specimens), and Conant (1958). Reese (1953) erroneously cites the toe tips as expanded. The tadpoles are described by Wright (1929), Wright and Wright (1949), Bragg (1950a, b, 1957), and Stebbins (1951, 1954, as *G. carolinensis*; 1966). The differences between the tadpoles of *G. olivacea* and *G. carolinensis* cited by Wright (1929, etc.) and Altig (1970) will not satisfactorily separate all specimens (Bragg, 1950a, 1957; Orton, 1952; Stebbins, 1954). The most satisfactory description of *G. olivacea* eggs is Salthe's (1963) figure. Stebbins (1951, 1954) gives the best verbal description. Both authors cite a truncate outer jelly. However, Wright's description (1929, repeated in Livezey and Wright, 1947; and Wright and Wright, 1949) based on material in which the outer jelly is "indistinct," cites the jelly as not truncate, an observation apparently confirmed by Bragg (1950b). For quantitative descriptions of the call, see Bragg (1950a, f), W. F. Blair (1955b), Bogert (1958), Fouquette and Rossman (1963), Awbrey (1965), and Nelson (ms.). Average body size and minimum adult size vary geographically (Nelson, ms.).

- ILLUSTRATIONS. Photographs of adult *G. olivacea* appear in Strecker (1910, "worked over photograph" of "cotype" of *E. areolata*), Dickerson (1906, *E. texensis*), H. M. Smith (1934, 1950, 1956), Hecht and Matalas (1946, *M. carolinensis*



MAP. The solid circle marks the restricted type-locality; open circles indicate other records. The star marks a fossil locality.

olivacea and *M. c. mazatlanensis*, Wright and Wright (1949), Bogert (1958), Conant (1958, color), Bustard (1962, *M. carolinensis*) and Cochran and Goin (1970, color). Drawings appear, under various names, in Hecht and Matalas (1946), Stebbins (1951, 1954, 1966, color), Fitch (1956a, juvenile pattern) and Zweifel (1961, specimen from Hermosillo, Sonora; R. Zweifel, personal communication). Tadpoles are figured by Wright (1929), Stebbins (1951) and Zweifel (1961, as *G. mazatlanensis*; specimen from 25 mi. E. Mazatán, Sonora, R. Zweifel, personal communication); eggs by Livezey and Wright (1947), Wright and Wright (1949; photo), Stebbins (1951), and Salthe (1963) and the ilium by Holman (1963). W. F. Blair (1955b) presents an audiospectrogram.

• DISTRIBUTION. *Gastrophryne olivacea* occurs from extreme southern Nebraska and western Missouri, south through most of Kansas, Oklahoma, and Texas to the Mexican Plateau with marginal populations in southern Arizona, San Luis Potosí and along the Pacific lowlands of Mexico south to Nayarit. It reaches an elevation of about 4100 feet in Arizona. Distribution records are summarized by Nelson (ms.). Earlier important records include: *Nebraska* (Loomis, 1945); *Missouri* (Anderson, 1942; Metter, et al., 1970); *Arkansas* (Bragg 1946, 1950b); *Kansas* (H. M. Smith, 1934, 1956); *Oklahoma* (Bragg, 1943, 1946, 1950e, 1955); *Texas* (Brown, 1950; Minton, 1960; Tinkle and Knopf, 1964; Redell, 1967, caves); *Arizona* (Williams and Chrapliwy, 1959; Wake, 1961); *San Luis Potosí* (Chrapliwy, 1956; Martin, 1958), *Durango* (Webb, 1960), *Sinaloa* (Hardy and McDiarmid, 1969) and *Nayarit* (Stebbins, 1966). A record (Field Mus. Nat. Hist. 104897) for *Morelos* is ignored by the collector (Taylor, in Smith and Taylor, 1948) and may be spurious. However, tadpoles from Morelos reported as *Hypopachus* by Taylor (1942) may be *Gastrophryne* (Nelson, ms.).

• FOSSIL RECORD. Holman (1963, 1969) reports *Gastrophryne olivacea* from the Sangamon Interglacial (Pleistocene) of Denton Co., Texas, an area it presently inhabits.

• PERTINENT LITERATURE. Fitch (1956a, 1956b, 1956c) provides the most extensive account of the ecology of *Gastrophryne olivacea* (activity in relation to temperature and moisture, movement, growth, food, predators, chorusing, secondary sexual characters, and nuptial adhesion). He later (1960, 1965) cites additional examples of predation. Wright and Wright (1949) summarize much literature and include original observations. Campbell (1934) and Stebbins (1951, 1954) describe habitat, activity, chorusing, and secondary sexual characters in Arizona. Bragg (1950a to f) discusses habitat, breeding behavior and interactions with *G. carolinensis*. Two characters that are too variable for taxonomic use are pustularity of skin (Burt, 1938; Nelson, 1971b), and presence or absence of a fold behind the head (Dickerson 1906, photos with and without fold). Taylor (1940) notes that males have small pustules on the chin and fingers and that females have more perianal pustules than males. Freiburg (1951) notes buffy fingers in males. Freiburg (1951) and Henderson (1961) discuss reproductive potential. Developmental temperature range (17°C to above 32.6°C) is given by Hubbs and coworkers (1961, 1963) and by Ballinger and McKinney (1966). Bragg discusses hatching (1940) and tadpole behavior (1947, float at surface) and reports tadpoles living at 35°C and metamorphosing in 28 days (1950a). Nelson and Cuellar (1968) describe the internal anatomy of the tadpole. Bogert and Oliver (1945) suggest *G. olivacea* is excluded from California by desert. Brattstrom (1968) reports a critical thermal minimum of 2.5°C (as *G. mazatlanensis*). Jameson (1956) discusses survival in central Texas. Fitch (1956a) and Awbrey (1965) best describe breeding behavior. Calling season in Texas extends from March to September (Jameson, 1950; W. F. Blair, 1961) but is more restricted further north (Bragg, 1950c; Fitch, 1956c). Minimum activity temperatures are 16°C for movement (Fitch, 1956a), 14°C and 19.5°C for calling (W. F. Blair, 1961, and Fitch, 1956c, respectively) and 16°C for clasping (W. F. Blair, 1961). Brattstrom (1963) reports body and environmental temperatures for two specimens. W. F. Blair (1955a), Bogert (1958), Awbrey (1965) and Nelson (ms.) discuss geographic variation in mating call. W. F. Blair (1955b) and Nelson (ms.) analyze geographic variation in body size. Bragg (1957) cites ecological influences on tadpole coloration.

Like many microhylids *G. olivacea* feeds primarily on ants (Brumwell, 1951; Freiburg, 1951; Fitch, 1956a). Tanner (1950), Carpenter (1956) and Fitch (1956a) report them living adjacent to ant colonies. Fitch (1956a) reports ant

heads imbedded in the skin. Protection from ants apparently includes tough skin (Stebbins, 1966), skin secretions (that may also reduce predation, Conant, 1958; Bragg, 1960), and a postorbital fold of skin (Nelson, ms.). W. F. Blair (1936) and Freiburg (1951) report *G. olivacea* from burrows of other animals (large spider, skinks, mole). Freiburg (1951) notes mutilated specimens. Although Freiburg (1951) and Loomis (1956) found no chiggers on *G. olivacea*, occasional individuals are infested (personal observation). Freiburg (1951) reports nematodes from this frog. Bragg (1962) notes relative resistance to *Saprolegnia* fungus. Licht (1967) describes inhibition in tadpole growth and even death produced by tadpoles of other genera. A. P. Blair (1950), W. F. Blair (1955a), Littlejohn (1959), and Wilks and Laughlin (1962) report viable artificial hybrids with other microhylids (*G. carolinensis*, *Chiasmocleis panamensis* and *Hypopachus variolosus*). Dunn (1949), W. F. Blair (1955a, 1955b, 1962, 1965) and Nelson (ms.) discuss evolutionary affinities. Dickerson (1906) and Mulaik and Sollberger (1938) note the occurrence of *G. olivacea* and *Hypopachus* in the same pools. Hardy and McDiarmid (1969) suggest ecological complementarity with *G. usta* in Sinaloa. Reasons for regarding *G. olivacea* and *G. carolinensis* as separate species are summarized by Blair (1956b) and Nelson (1971a; ms.).

• ETYMOLOGY. The specific name refers to the olivaceous dorsum characteristic of this species.

COMMENT

Lowe (1964) recognizes two species of *Gastrophryne* from Arizona: *G. carolinensis* from the Pajarito and Patagonia Mountains in oak-woodland and oak-grass habitats and *G. olivacea* from nearby "desert habitats and relictuall mesquite-grass habitats" but cites no evidence of distinctness other than the habitat differences. W. F. Blair previously (1955b) suggested that calls of montane Arizona *Gastrophryne* resemble those of *G. carolinensis* more than those of Texas *G. olivacea*. More extensive material fails to support this hypothesis: calls from montane Arizona resemble calls from Sonora and Tamaulipas in length and fundamental and calls from west Texas and Kansas in dominant (Nelson, ms.). Coloration in montane Arizona is similar to that in lowland Arizona and western Mexico (Nelson, ms.). Thus published evidence neither supports recognition of two *Gastrophryne* in Arizona nor indicates any special relationship between montane Arizona populations and *G. carolinensis*.

Taylor (1943) named *G. mazatlanensis* from Sinaloa. Hecht and Matalas (1946) regarded *G. olivacea* and *G. mazatlanensis* as subspecies of *G. carolinensis* separable on coloration. Smith and Taylor (1948), A. P. Blair (1957, 1968), and Wake (1961) regarded *G. olivacea* and *G. mazatlanensis* as distinct species. Taylor (1940); Hecht and Matalas (1946); Martin (1958); and Chrapliwy, Williams and Smith (1961) discussed the occurrence of diagnostic features of *G. mazatlanensis* in various parts of the range of *G. olivacea*. Hardy and McDiarmid (1969) compared the coloration in Sinaloa, Sonora, and Texas. Sonora specimens had the most ventral mottling and the most distinct inguinal and leg spots but "other characters are intermediate." They cited the Sinaloa populations as *G. o. mazatlanensis* and noted "those from . . . Sonora possibly represent a taxon distinct from that in Sinaloa." The range of variation cited is similar in all 3 samples. Furthermore, Chrapliwy, Williams, and Smith (1961) and Nelson (ms.) described Arizona and Chihuahua populations that are intermediate to Sinaloa-Sonora and Texas populations. Lateroventral mottling is also common in central and eastern Mexico (Taylor, 1940; Martin, 1958; Webb, 1960; Chrapliwy, Williams, and Smith, 1961). Nelson (ms.) found that none of the proposed morphological distinctions actually separates *mazatlanensis* from *olivacea*. The total pattern seems to be one of the broad clinal increase in pigmentation throughout the southern third of the range and is thus inappropriate for the recognition of subspecies.

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