

Catalogue of American Amphibians and Reptiles.

NELSON, CRAIG E. 1973. *Gastrophryne*.*Gastrophryne* Fitzinger
Narrow-mouthed toads*Engystoma*: Holbrook, 1836:38.*Gastrophryne* Fitzinger 1843:33. Type species by original designation *Engystoma rugosum* Duméril and Bibron (1841), a synonym of *G. carolinensis* (Holbrook, 1836).*Systoma*: Cope, 1867:194 (part).*Euphemphix*: Boulenger, 1903:532.*Microhyla*: Parker, 1934:123 (part).

• **CONTENT.** The five species are: *Gastrophryne carolinensis* (Holbrook, 1836), *G. olivacea* (Hallowell, 1856), *G. elegans* (Boulenger, 1882), *G. pictiventris* (Cope, 1886), and *G. usta* (Cope, 1866).

• **DEFINITION AND DIAGNOSIS.** *Gastrophryne* is a typical member of the family Microhylidae as defined by Parker (1934) and Griffiths (1963). It is distinguished from other genera by a combination of external and osteological characters of the adult and external characters of the larvae. The tympanum is concealed. There is a transverse postorbital dermal groove. No digital disks are present. The terminal phalanges are simple. The pectoral girdle has neither clavicles nor procoracoids. Palatines and post-choanal prevomers are absent. The maxillaries are in contact with the quadratojugals. The premaxillaries are notched. The tadpole spiracle and anus are juxtaposed. The tadpole's flap-like upper lip is notched medially and overlaps the simple lower lip; the margins of the upper lip are usually smooth. A median longitudinal plica divides the lumen of the tadpole esophagus. (Tadpoles are not known for *G. pictiventris* and are only tentatively known for *G. elegans*.) The outer jelly of the egg of *G. carolinensis* and (?) *G. olivacea* is flat on one side. (The eggs of the other species are not known.) The mating call is a prolonged baa or buzz. The only known karyotype has 22 chromosomes (*G. carolinensis*; Morescalchi, Gargulio, and Ulmo, 1970).

Gastrophryne seems most closely allied to *Hypopachus*. *Hypopachus* agrees with *Gastrophryne* in all of the preceding characters except: clavicles and procoracoids are present; the margins of the tadpole upper lip are usually papillate or scalloped. *Hypopachus* usually have distinct toe webs; these are absent or very rudimentary in *Gastrophryne*. *Gastrophryne* has been confused by the Asiatic genus *Microhyla*; see NOMENCLATURAL HISTORY and COMMENT.

• **DESCRIPTIONS.** The genus is characterized by Carvalho (1954), A. P. Blair (1968) and Nelson (1972e). A. P. Blair's (1968) characterization as "without 2 ridges across palate" is misleading. These ridges occur on most specimens of *Gastrophryne* but the anterior one is very faint in some specimens (Nelson, 1972e).

Adults are terrestrial, cryptozoic, and largely myrmecophageous (ant eating). Intrageneric differentiation includes adaptations to aridity (2 metatarsal tubercles in *G. usta*, depressed body in *G. olivacea*) and to forest litter (expanded terminal phalanges in *G. elegans* and *G. pictiventris*).

• **ILLUSTRATIONS.** Illustrations of the external features of adults and tadpoles and of sonograms of the mating calls are cited by Nelson (1972a-d). Parker (1881) figures the skull. The other diagnostic features of osteology have not been figured but Parker (1927, 1934) and Carvalho (1954) figure some of them for related genera.

• **DISTRIBUTION.** The range of *Gastrophryne* includes the lowlands of Middle America from Costa Rica and El Salvador to Mexico, the northern Mexican Plateau (into southern Arizona), and the southeastern United States from Maryland and Florida west to Nebraska and Texas.

• **FOSSIL RECORD.** Fossil records are all within the present range. The earliest record is a fragmental ilium from the Florida Miocene assigned to "*Microhyla* sp." by Auffenberg (1956). The other records are all Pleistocene ilia of *G. olivacea* and *G. carolinensis*.

• **PERTINENT LITERATURE.** Nieden (1926) and Parker (1934) include descriptions of most microhylids. Parker (1927), Dunn (1949), and Carvalho (1954) compare New World species of this family. Parker (1927, 1934) and Carvalho (1954) discuss osteology and intergeneric affinities. Nelson

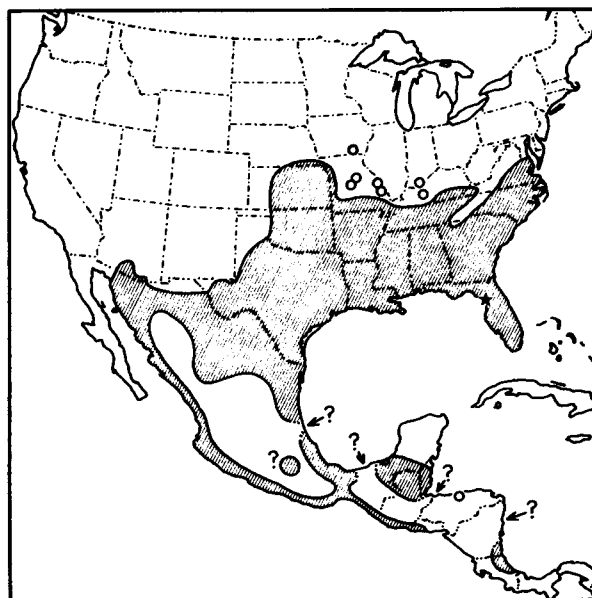
(1972e) discusses generic status, anatomy, body size, sexual dimorphism, tadpoles, mating calls, serum proteins, specific distinctions, distribution, habitats, geographic variation, infra-specific taxa, adaptations for myrmecophagy (ant eating), predators, ectoparasites and skin disease, reproductive capacity, premating isolating mechanisms and affinities. Stebbins (1966) notes that tough skin probably protects *Gastrophryne* from ants. Microhylid tadpoles lack keratinized teeth and beaks and are predominantly microphagous (Parker, 1934). Savage (1953, 1955) and Griffiths (1961) suggest *Hypopachus* tadpoles feed by trapping particles in gill mucus. *Gastrophryne* tadpoles resemble *Hypopachus* and may feed similarly (Nelson and Cuellar, 1968).

• **NOMENCLATURAL HISTORY.** Most species and synonyms were described as *Engystoma*. When Fitzinger erected *Engystoma* he stated that it was based on *Rana gibbosa* and that *Breviceps* was already based on this species, but that he preferred his own genus (Stejneger, 1910). Duméril and Bibron (1841) then described *Engystoma rugosum* (= *E. carolinensis*). Fitzinger then, in a catalogue list and without comment, based *Gastrophryne* on *E. rugosum*. This change was first noted by Stejneger (1910).

Parker (1927) restricted *Gastrophryne* to New World microhylids that lack clavicles. Noble (1931) then stated that no character separated *Gastrophryne* from the Asiatic genus *Microhyla*. Parker subsequently (1934) combined these genera as *Microhyla*. Stejneger and Barbour (1939) proposed using *Gastrophryne* for American *Microhyla*-like frogs which have completely lost the webs. Dunn, Trapido, and Evans (1948) noted that this splits the American forms. Carvalho (1954) revised New World microhylids and distributed the New World forms that Parker (1934) placed in *Microhyla* among four genera. He restricted *Gastrophryne* to North American species and suggested that *Gastrophryne* is closest to *Hypopachus*.

• **KEY TO SPECIES** (metamorphosed individuals only). A parenthetical number following the name of a species is the page number of the account for that species in this Catalogue.

1. A single metatarsal tubercle; coloration variable 2
 - Two metatarsal tubercles; venter light with pepper-fine dark spots forming a darker reticulum (may be evident only with magnification); Mexico to El Salvador *G. usta* (123).
2. Tips of outer toes flattened and distinctly wider than remainder of digit; usually a distinct rudiment of webbing between toes; venter black or dark brown with white spots; southern Mexico to Costa Rica 3
 - Tips of toes not flattened and not wider than remainder



MAP. Range of the genus *Gastrophryne*. Circles indicate localities disjunct from main range; star marks only Pleistocene (Miocene) fossil locality.

- of digits; no webs; venter faintly mottled or white. United States and northern Mexico 4
3. A dark inguinal spot; ventral white spots separated by much less than their diameter; southeastern Mexico to Honduras *G. elegans* (121).
—No inguinal spot; ventral white spots separated by more than their least diameter; Nicaragua and Costa Rica *G. pictiventris* (135).
4. Venter mottled; dorsum typically with a dark median wedge (broadest posteriorly); dorsum brown or tan. Southeastern United States *G. carolinensis* (120).
—Middle of abdomen (usually entire venter) white; dorsum olive or gray, unmarked or with scattered dark spots; Nebraska, Missouri, and southern Arizona south to San Luis Potosí and Nayarit *G. olivacea* (122).

• ETYMOLOGY. *Gastrophryne* is from the Greek *Gaster* (belly) and *phryne* (toad). It presumably refers to the pot-bellied habitus. "Narrow-mouthed" is an English rendition of *Engystoma*.

COMMENT

Alternative arrangements of species are discussed in the species accounts. Dunn's (1949) comment that these species (*G. usta* excluded) and *Glossostoma aequatoriale* "could all be races of a single species" is refuted by Carvalho (1954), W. F. Blair (1955), and Nelson (1972e).

The only character in which *Gastrophryne* and *Microhyla* agree and differ from *Hypopachus* is the absence of a procoracoid-clavicle arch; this arch has been convergently lost in several lines of microhylid evolution (Parker, 1927, 1931, 1934; Carvalho, 1954) and consequently cannot be considered diagnostic.

Gastrophryne differs from *Microhyla*, with which it has been confused, in several features (Nelson, 1972e; see also Littlejohn, 1959; W. F. Blair, 1962; Carvalho, 1954; and Nelson and Cuellar, 1968). *Microhyla* species (compare with DEFINITION AND DIAGNOSIS) frequently have no postorbital dermal groove, frequently have t-shaped terminal phalanges and toe discs, some have palatines, and none has the maxillary and quadratojugal in contact (Carvalho, 1954; not independently confirmed); as tadpoles they have the spiracle distinctly separated from the anus, never have a (ventrally-directed) flap-like upper lip, often have expanded lower lips and a terminal flagellum on the tail, and those examined do not have a longitudinal esophageal plica; they have mating calls that are short notes or trills but not prolonged baas; and the single karyotyped species has 26 chromosomes. In each of these features *Gastrophryne* and *Hypopachus* agree and differ from *Microhyla*. Plasma protein electrophoresis (Nelson, 1972e) and hybridization (Littlejohn, 1959) also indicate *Gastrophryne* and *Hypopachus* are closely allied but a direct comparison with *Microhyla* is not available. *Gastrophryne* and *Hypopachus* are much more closely allied to each other than either is to *Microhyla*. Hence, *Gastrophryne*, rather than *Microhyla*, is the appropriate name for these five New World species.

Note added in proof: Omissions from *G. carolinensis* account: Guibe (1949. Cat. types amph. Mus. Nat. Hist. Nat., Paris) states that the type of *Engystoma rugosum* Duméril and Bibron has data indicating it originated at "Nouvelle-Orleans" (New Orleans). Although this is compatible with its present placement as a synonym of *Gastrophryne carolinensis* it conflicts with Schmidt's (1953. Checklist N. Amer. Amphib. Rept. 6th ed.) restriction of the type locality to "vicinity of Charleston."

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