

Catalogue of American Amphibians and Reptiles.

FOUQUETTE, M. J., JR. 1970. *Bufo alvarius*.*Bufo alvarius* Girard
Colorado River toad

Bufo alvarius Girard, 1859:26. Type-locality, "Valley of Gila and Colorado," restricted (Schmidt, 1953:61) to, "Colorado River bottomlands below Yuma, Arizona;" modified (Fouquette, 1968) to "Fort Yuma, Imperial County, California." Lectotype (= cotype, Cochran 1961a), U. S. Natl. Mus. No. 2572, female; collected by Maj. G. H. Thomas, 1855 (examined by author).

Phrynooidis alvarius: Cope, 1862:358.

• CONTENT. No subspecies are recognized.

• DEFINITION. Adults usually exceed 110 mm snout-to-vent, to at least 187 mm (Heringhi, 1969; Alamos, Sonora). The smooth, leathery, olive skin has few low, rounded scattered tubercles. The length of each large parotoid equals the distance from nostril to tympanum; the width is a little less than half the length. Several enlarged glands on the dorsal surfaces of the limbs (usually one each on the thigh and forearm, and two on the shank) resemble the parotoids. There is at least one conspicuous, whitish, rounded tubercle just behind the angle of the jaws. A distinct cranial crest curves above each eye.

• DESCRIPTIONS. Many authors adequately describe the adult, notably Mocquard (1899), Dickerson (1906), Storer (1925), Wright and Wright (1949), and Stebbins (1951). Tihen (1962a) described skeletal features. Girard's (1859) original description is inadequate. Cope's (1889) redescription of the lectotype was corrected by Fouquette (1968); Mocquard (1899) also pointed out certain inconsistencies. The eggs were described by Livezey and Wright (1947), Wright and Wright (1949), and Savage and Schuierer (1961). The larva has not been described. Blair and Pettus (1954) described the mating call, briefly analyzed again by Bogert (1958). Bogert (1960) analyzed the male release call.

• ILLUSTRATIONS. Girard's (1859) description included a fair drawing, and Cope (1889) figured the head and feet of the lectotype. Photographs of adults were reproduced by Dickerson (1906), Storer (1925), Slevin (1928), Wright and

Wright (1949), Stebbins (1951, 1954, 1966), Bogert (1958), Blair (1959) and Cochran (1961b). Livezey and Wright (1947) and Savage and Schuierer (1961) figured the eggs. Sonograms of calls were reproduced by Blair and Pettus (1954) and Bogert (1960).

• DISTRIBUTION. *Bufo alvarius* ranges through southern Arizona and most of Sonora to at least seven miles west of Guamúchil, Sinaloa (Riemer, 1955). Hardy and McDiarmid (1969) cite a record 20 miles north of Culiacán but suggest this needs verification. Fouquette (1968) erred in reporting the species in Nayarit; his reference should read "Sinaloa." The westernmost record for central Sonora is 9.4 miles east of Huásabas (Wright, 1966). Malkin (1962) reported the toad from Tiburón Island. The only record for Baja California is 4.7 miles north of El Mayor (Brattstrom, 1951). California records are restricted to bottomlands and irrigated areas of the Colorado delta region in Imperial County (Grinnell and Camp, 1917; Storer, 1925; Slevin, 1928). Cole (1962) reported southwestern New Mexico records. Philip A. Medica (unpubl.) collected the northernmost definite records 31 and 16 miles northwest of the junction of Arizona Highway 71 on US Highway 93, Mohave and Yavapai counties, respectively (Ariz. State Univ. Nos. 12026-12027); however, Cooper (1869) reported specimens from Fort Mojave, California. Storer (1925) cited these by number from "Mohave [= Ft. Mohave], Ariz. [1861]." Mearns (1907) also mentioned seeing *B. alvarius* at Fort Mojave, Arizona, in 1884. Stebbins (1951) ignored the Fort Mojave record but suggested a possible extension up the Colorado bottomlands into southern Nevada and Utah.

These toads are found mainly in the Lower Sonoran Life Zone, but also occur in the Upper Sonoran, ranging from about sea level to 5300 feet (Cole, 1962). They occur primarily in desert, but also in grassland and lower oak-woodland, commonly taking refuge in rodent burrows (Lowe, 1964). They apparently depend on the presence of rather permanent water, although frequently breeding in temporary pools.

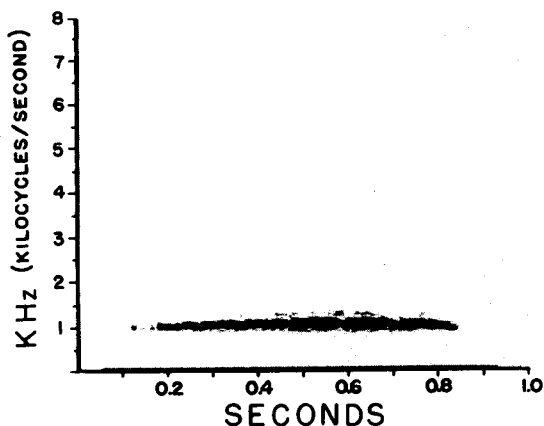
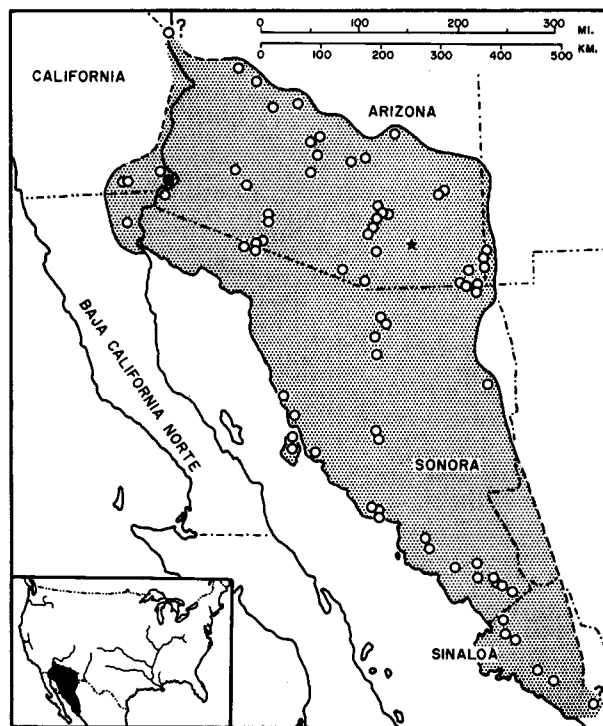


FIGURE. Audiospectrogram (narrow band, 45 Hz) of *Bufo alvarius* breeding call: Sahuarita, Pima Co., Arizona, 16 August 1966, water 22°C. (Courtesy William F. Martin, Univ. Texas).



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

• **Fossil Record.** A coccyx fragment (Amer. Mus. Nat. Hist. No. 3256) from the Lower Pliocene (Blancan) near Benson, Cochise Co., Arizona, is tentatively referred to *alvarius* (Tihen, 1962b).

• **Pertinent Literature.** Cope (1862) placed *alvarius* in the genus *Phrynoïdis*, but later (1889) ignored this treatment. Fouquette (1968) reviewed the status of the type-specimens and designated a lectotype and two (lost) paralectotypes; he also redesignated the type locality to conform to the lectotype locality. This modified Kellogg's (1932) treatment of the three as cotypes (= syntypes).

Potency of skin secretions was first discussed by Musgrave and Cochran (1930). Hanson and Vial (1956) tested toxicity of these secretions. Wright (1966) observed a racoon ripping open the ventral wall and feeding on the viscera of these toads.

Cope (1896) listed *B. alvarius* as a species peculiar to the Chihuahuan District of the Sonoran Region. Dice (1939) listed it as the only amphibian restricted to the Sonoran Biotic Province. Ruthven (1907) reported notes of J. J. Thornber indicating that the toads generally appear just before summer showers around Tucson, and congregate when the rains begin, breeding in temporary pools and croaking noisily and incessantly. He believed the larval period to be no more than a month. King (1932) reported food included beetles, grasshoppers, spiders, and small lizards. Arnold (1943) stated that individuals appeared on blacktop roads near Tucson in July, after at least two months without rain. Gates (1957) collected *alvarius* from 10 April to 3 December near Wickenburg, Arizona, and noted food included scorpions, beetles, mice, *Bufo cognatus*, and *Scaphiopus couchi*. Cole (1962) analyzed alimentary tracts and found a great variety of arthropods, a snail, and a young *Scaphiopus*.

Gloyd (1940) described calling behavior in a pond aggregation. Blair and Pettus (1954) described the call in detail, agreeing with Gloyd that the call is weak. They found the male vocal sac reduced and noted two females with rudimentary vocal sacs. Inger (1958) made a detailed anatomical examination of several specimens and agreed that male vocal sacs are degenerate, but disagreed that females had either rudimentary vocal sacs or slits. Stebbins (1951) and Blair and Pettus (1954) agreed that early reports cited by Mearns (1907) and Ruthven (1907) of loud calls by *Bufo alvarius* probably confused the call of *Scaphiopus* or another anuran with that of this toad. With mating call as a main basis, Blair (1958) established the *Bufo boreas* species-group, composed of *B. alvarius*, *B. boreas*, and *B. canorus*. Blair (1959) experimentally crossed male *alvarius* with females of three other *Bufo* species. Hybrid larvae from female *B. woodhousii* proceeded to metamorphosis; those from female *B. valliceps* and *B. debilis* stopped at gastrula. This contributed to Blair's (1963) treatment in which he retained the *boreas* group as established and suggested that the *boreas*, *americanus*, and *debilis* groups probably have a common ancestral stock. Blair (1964) suggested the *boreas* group might not be so close to the *americanus* group, but compatibility of *alvarius-boreas* crosses suggested *alvarius* should be retained in the *boreas* group.

Savage and Schuierer (1961) compared eggs of the *boreas* group and found those of *alvarius* differ strikingly from eggs of other species. Tihen (1962a) found *alvarius* osteologically quite distinct from *B. boreas* and *B. canorus*, but typical of the Mexican section of his broadly defined *valliceps* group.

Porter and Porter (1967) biochemically compared parotid venom of *B. alvarius* with that of 19 other *Bufo* species and found it so different that no statement of its affinities was possible. Erspamer *et al.* (1967) also found the biochemical nature of *alvarius* skin secretions unique among *Bufo*. Cei *et al.* (1968) considered the *boreas*, *punctatus*, and *debilis* groups related, with *B. alvarius* on a separate line nearest the *boreas* group, based on biochemistry of skin secretions.

Cole *et al.* (1969) compared karyotypes of representatives of seven of Blair's North American species-groups and found all were quite similar, including *alvarius*, except *B. marinus*.

Burlet (1968) compared the hypophysis histologically and histochemically with that of three other *Bufo* species.

Other literature not yet cited notes additional localities. These include, for Arizona: Campbell (1934), Gloyd (1937), Huey (1942), Kauffeld (1943), Little (1940), Nickerson and Mays (In press), Ortenburger and Ortenburger (1926), Stone (1911), and VanDenburgh and Slevin (1913); for Sonora: Allen (1933), Bogert and Oliver (1945), Burger and Hensley (1949), Langebartel and Smith (1954), Smith and Hensley (1958), Taylor (1936), and Zweifel and Norris (1955); and for Sinaloa and Sonora: Davis and Dixon (1957). I have attempted to cite all primary literature pertinent to the systematics and general biology of the species. Excluded are a few repetitions of locality records.

• **ETymology.** *Alvarius* is from the Latin noun *alvus*, and suffix *-arius*, meaning "belonging to the womb, or belly." The intended reference is obscure.

COMMENT

Blair (1956) suggested size difference is probably the primary mechanism inhibiting breeding between *alvarius* and other desert toads. A natural hybrid of *alvarius* × *cognatus* (Ariz. State Univ. No. 2601) indicates that size is not a completely effective barrier to interbreeding.

Description of larvae and data on development times have not been published. Additional lines of evidence are needed to clarify the relationship to other members of the genus.

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