

**Catalogue of American Amphibians and
Reptiles 916.**

McCranie, J. R. 2018. *Craugastor fecundus*.

Craugastor fecundus
(McCranie and Wilson)
Nombre de Dios Streamside Frog

Eleutherodactylus milesi: Schmidt 1933:18 (in part).

Eleutherodactylus rugulosus: Meyer 1969:156 (in part).

Eleutherodactylus milesi / Population System: McCranie et al. 1989:487 (in part).

Eleutherodactylus stadelmani: Campbell 1994:411 (in part).

Eleutherodactylus fecundus McCranie and Wilson 1997:162. Type locality, "from Quebrada de Oro (15°38'N, 86°47'W), elevation 880 m, tributary of Río Viejo, south slope of Cerro Búfalo S of La Ceiba, Cordillera Nombre de Dios, Departamento de Atlántida, Honduras." Holotype, Natural History Museum of Los Angeles County (LACM) 137311, an adult male, collected by J. R. McCranie, K. L. Williams, and L. D. Wilson, 16 August 1982 (examined by author).

Eleutherodactylus aurilegulus: Campbell and Savage 2000:255 (in part).

Eleutherodactylus (*Craugastor*) *fecundus*: Lynch 2000:150.

Craugastor fecundus: Savage 2002:551. By implication.

Craugastor fecundus: Frost et al. 2006:360. First use of combination in print.

Craugastor (*Campbellius*) *fecundus*: Hedges et al. 2008:34.

CONTENT. No subspecies are recognized.

DESCRIPTION. *Craugastor fecundus* is a small eleutherodactyline (in ten adult males, snout-vent length [SVL] range = 21.1–23.5 mm, mean [standard deviation] = 22.2 mm



FIGURE 1. Adult female (USNM 497098) of *Craugastor fecundus* from Quebrada de Oro, Atlántida, Honduras. SVL 33.3 mm. Photograph taken by James R. McCranie on 24 May 1988.

[± 0.8 mm]; in ten adult females, SVL range = 29.8–37.3 mm, mean [standard deviation] = 33.5 mm [± 2.4 mm]) with a moderately long, broad head (head length/SVL in adult males = 0.400–0.462, in adult females = 0.379–0.419; head width/SVL in adult males = 0.395–0.455, in adult females = 0.369–0.435). The snout is nearly rounded to rounded in dorsal aspect and rounded to nearly vertical in lateral profile. The top of the head is flat. The canthal ridges are angular and the loreal regions are concave. The upper lips are not flared. The nostrils are directed posterolaterally and are situated at a point slightly less than, to about two-thirds the distance between the anterior borders of the eyes (interorbital distance/eye length in males = 0.636–0.867, in females = 0.638–0.833) and the tip of the snout. Cranial crests are absent. The upper eyelids are prominent (eyelid width/interorbital distance in males = 1.040–1.318, in females = 1.031–1.333). Tympana are indistinct or not visible externally in both sexes, tympana located posteroventral to the eyes and separated from the eyes (in five males, tympana-eye distance about one-half to two-thirds tympanum length; in four females, distance slightly over three-fourths tympanum length). A well-developed supratympanic fold is usually present



MAP. Distribution of *Craugastor fecundus*. The open circle marks the type locality and the black dots represent additional localities.

on each side.

The upper arms are slightly more slender than the moderately robust forearms. A transverse dermal fold is absent on the upper surfaces of the wrists. No vertical dermal folds are present along the elbows. Tubercles are absent, or tubercles arranged in an irregular series, or tubercles occasionally arranged in a linear row along the posterior ventrolateral edges of the forearms, but tubercles not developed into a dermal ridge. The finger discs are narrowly expanded to definite (disc on Finger III about 1.3–1.8 times width of digit just proximal to disc). The disc covers on fingers I–II are rounded, but are ovoid apically, those on fingers III–IV are rounded (even; see Savage 1987). The disc pads on fingers I–II are ovoid, those on fingers III–IV are broadened. The subarticular tubercles on the fingers are round to ovoid and globular. Supernumerary tubercles are absent on the fingers. The palmar tubercle on each hand is elevated and ovoid (sometimes bifid), and is

about as large as, or slightly larger than the thenar tubercles. A few small accessory palmar tubercles are present. The thenar tubercle on each hand is suboval, elevated, and visible from above. Each prepollex is not enlarged, but nuptial thumb pads bearing granular, colorless nuptial excrescences are present in adult males. Relative length of the fingers is $I < II < IV < III$ or $I = II < IV < III$. The fingers are not webbed, but bear lateral keels.

The hind limbs are relatively long (shank length/SVL in males = 0.562–0.611, in females = 0.491–0.581; foot length/SVL in males = 0.511–0.544; in females = 0.440–0.544). The heels are not overlapping to slightly overlapping when the hind limbs are held together towards the cloacal opening at right angles to the body. A weak vertical dermal fold is present on the outer lateral edge of each heel. Each heel has 15–30 small, pustular tubercles. Tubercles or dermal ridges are absent along the posterior ventrolateral edge of each tarsus. An inner tarsal fold is



FIGURE 2. Apparent hybrid between *Craugastor fecundus* and *Craugastor chrysozetetes* (USNM USNM 497114) from Quebrada de Oro, Atlántida, Honduras. An adult female with a SVL of 38.3 mm. Photograph taken by James R. McCranie on 7 August 1989.

absent. The subarticular tubercles on the toes are ovoid and globular. Supernumerary and plantar tubercles are absent on the toes. Each inner metatarsal tubercle is elongate, elevated, and visible from above. The outer metatarsal tubercles are small, rounded, and elevated. Relative toe length is $I < II < V < III < IV$. Each toe disc is definite to narrowly expanded (*sensu* Savage 1987) with disc on Toe IV about 1.3–1.8 times the width of the digit just proximal to the disc). Disc covers on the toes are rounded (even; see Savage 1987) and the disc pads on the toes are broadened. The modal webbing formula of the feet is $I \ 2-2\frac{4}{5}$ $II \ 2-3\frac{3}{4}$ $III \ 3-4\frac{1}{4}$ $IV \ 4\frac{1}{4}-2\frac{3}{4}$ V . Lateral keels are present on the unwebbed portions of the toes, although weakly-developed fringes are occasionally present on Toe IV of the largest females. An inguinal gland is usually visible on each side.

The vent opening is directed posteroventrally near the upper level of the thighs, with tuberculate skin around the vent. The skin of the dorsal surface of the head (except the upper eyelids) and the anterior portion of the body varies from wrinkled with numerous tiny tubercles to wrinkled with numerous tiny tubercles plus scattered small tubercles. The skin of the upper eyelids is wrinkled, with 10–20 small to moderately enlarged tuber-

cles. The tubercles on the flanks and posterior portion of the body are larger than those on the remainder of the dorsum. A row of raised skin, with or without tubercles, forms discontinuous postocular ridges that extend to the level of the scapular region. Dorsolateral ridges are absent on the body. The skin on the chin, throat, and chest is smooth. The skin of the belly and ventral surfaces of the thighs is slightly wrinkled, almost smooth. The ventral disc is absent to indistinct in both sexes. The pupil is horizontally elliptical. The palpebral membrane is translucent and unpatterned. The tongue is ovoid, not notched posteriorly, and is free posteriorly for about one-fourth of its length. The vomerine tooth patches are on elevated, ovoid to nearly triangular-shaped ridges located posteromedially to round, tear-shaped, or ovoid choanae. Each tooth patch is separated by a distance about equal to, or less than the width of either patch in males, and by a distance much less than the width of either patch in females. Maxillary teeth are present. Males have paired vocal slits and a single, median, subgular vocal sac, but that sac is not evident externally. All of the above data were taken by the author and published by McCranie and Castañeda (2007) and McCranie and Wilson (1997, 2002).

Color in life for four adult females follows description by McCranie and Wilson (2002). USNM 497095 had the dorsal surfaces dark chocolate brown with a broad, irregular ocher dorsolateral stripe extending from posterior to the eye to the groin. An ocher blotch was present ventral to the canthus and another ocher blotch was present on the upper surface of the upper arm. The latter blotch was continuous with the dorsolateral stripe. The dorsal surface of the thigh was ocher with brown crossbands and that of the tibia was banded brown and dark brown. Orange para-cloacal spots were present. The chin and chest were gray, the belly and ventral surface of the thigh were pale lemon yellow and flecked with brown. Each iris was black with dense gold flecking. USNM 497096 had

the dorsal surface of the body dark chocolate brown with a dark red dorsolateral stripe extending from posterior to the eye to the groin. The dorsal surfaces of the limbs were also dark chocolate brown. The posterior surface of the thigh was dark brown, as were the chin and chest. The belly and the ventral surface of the thigh were lemon yellow and flecked with brown. Each iris was black with dense gold flecking. KU 209100 had the dorsal surfaces dirty dark greenish gray, with a pale red to rust red spot on the rostrum, at the forelimb insertion point, and on the heel. The chin and chest were gray and the belly and ventral surface of the thigh were lemon yellow with some brown flecking. Each iris was pale copper. USNM 497103 had brown dorsal surfaces with the larger tubercles having slightly darker brown tips. A thin, orange middorsal stripe extended from a level just posterior to the eye to the vent. The flank and dorsal surfaces of the limbs were dark brown. The toe and finger discs were white dorsally. The chin and chest were pale brown and the belly and ventral surface of the thigh were yellow with a brown suffusion. A subadult female (USNM 497094) had the dorsal surfaces of the body and head dark chocolate brown, with a pale orange blotch on the loreal-lip region. The forelimb also had an orange blotch on the dorsal surface. The anterior and posterior surfaces of the forelimb were banded with orange and dark brown. The dorsal surface of the hind limb had dark brown mottling and the posterior surface of the thigh was brown. Pale orange spots were present on both sides of the vent and at the heel. The chin and chest were gray and the belly was pale lemon yellow posteriorly.

DIAGNOSIS. The following combination of characters will distinguish *Craugastor fecundus*, a member of the *Craugastor milesi* species group, from all other Honduran species of *Craugastor*. A tympanum is indistinct or absent, and an inner tarsal fold is absent. The toe webbing is basal with the modal webbing



FIGURE 3. Another apparent hybrid between *Craugastor fecundus* and *Craugastor chrysozetetes* (USNM 497113) from Quebrada de Oro, Atlántida, Honduras. An adult female with a SVL of 49.5 mm. Photograph taken by James R. McCranie on 2 August 1989.

formula I 2–2 $\frac{4}{5}$ II 2–3 $\frac{3}{4}$ III 3–4 $\frac{1}{4}$ IV 4 $\frac{1}{4}$ –2 $\frac{3}{4}$ V. The toes have lateral keels, but lateral fleshy fringes are absent. The dorsal surfaces of the body and limbs contain numerous tiny and some small tubercles. The maximum SVL for males of *Craugastor fecundus* is 23.5 mm; the maximum SVL for females is 37.3 mm. One other species of streamside frog of the *Craugastor milesi* species group, *Craugastor chrysozetetes*, is known to occur sympatrically with *Craugastor fecundus*. *Craugastor chrysozetetes* is larger (maximum SVL in males is 41.3 mm SVL, maximum SVL in females is 45.6 mm), has more toe webbing (modal webbing formula I 1 $\frac{1}{3}$ –2 II 1 $\frac{1}{3}$ –2 $\frac{1}{2}$ III 2–3 $\frac{1}{3}$ IV 3 $\frac{1}{3}$ –2 V), and has well-developed, ventrally folding lateral fleshy fringes on the unwebbed portions of the toes. A recent account for *Craugastor chrysozetetes* was provided by McCranie (2017) in the Catalogue for American Amphibians and Reptiles.

PUBLISHED DESCRIPTIONS. Detailed descriptions of the external morphology of the adult were done by the author and published by McCranie and Castañeda (2007) and McCranie and Wilson (1997, 2002). The jaw musculature condition of *Craugastor fecundus* (based on KU 209105) was described by Lynch (1993; as *Eleutherodactylus milesi*).

ILLUSTRATIONS. **Color photographs** of an adult were presented by Köhler (2011), McCranie and Castañeda (2007), McCranie and Wilson (2002), and Wilson and McCranie (2004). A **black-and-white photograph** of an adult and a **black-and-white drawing** of a hind foot were published by McCranie and Wilson (1997). A **color photograph** of an apparent hybrid between *Craugastor chrysozetetes* and *Craugastor fecundus* was published by McCranie and Wilson (2002).

DISTRIBUTION. *Craugastor fecundus* is known to occur from 200 to 1260 m elevation in the Lowland Moist Forest and Premontane Wet Forest formations (see Holdridge 1967) in the central and northeastern portions of the Cordillera Nombre de Dios, Honduras.

FOSSIL RECORD. None.

PERTINENT LITERATURE. Relevant citations are listed by topic: **checklists and faunal lists** (Anonymous 2016; Campbell 1999; Frost 2018; Glaw et al. 1998, 2000a, 2000b; Heinicke et al. 2007; Hutchins et al. 2003; McCranie 2006, 2007, 2009, 2015; McCranie and Castañeda 2005, 2007; McCranie and Solís 2013; McCranie and Wilson 2002; McCranie et al. 2006; Padial et al. 2014; Solís et al. 2014; Townsend and Wilson 2010, 2016; Wilson and Johnson 2010; Wilson and Townsend 2006, 2010; Wilson et al. 2001), **comparisons to new species** (McCranie and Wilson 1997; Savage 2001), **conservation status** (Johnson et al. 2015; McCranie and Castañeda 2005; McCranie and Wilson 2004; Mitchell 2017; Stuart et al. 2008; Townsend et al. 2012; Wilson and McCranie 1998, 2003, 2004; Wilson and Townsend 2006, 2010), **identification keys** (McCranie and Castañeda 2007; McCranie and Wilson 1997, 2002), and **taxonomy, systematics, and phylogenetics** (Frost et al. 2006; Lynch 2000; Padial et al. 2014).

REMARKS. Six trips to the Quebrada de Oro region, the type locality of the species, were

made between 1980 and 1989, the last year *Craugastor fecundus* was seen alive. *Craugastor fecundus* was seen on five of those six trips. After the August 1989 trip, I did not return to Quebrada de Oro until February 1995 and despite efforts targeting streamside *Craugastor*, not a single streamside *Craugastor* was seen. Subsequent trips were made to the Quebrada de Oro in 1996, 2003, and 2005, all without seeing a single streamside *Craugastor*. Thus, sometime between August 1989 and February 1995 the population of *Craugastor fecundus* at Quebrada de Oro completely crashed. As a result, *Craugastor fecundus* is feared to be extirpated from that, its best known, locality.

The habitat destruction in the Quebrada de Oro region was discussed by McCranie (2017). Additionally, the chytrid fungus *Batrachochytrium dendrobatidis* was recorded in two of the four anuran species that were collected along the Quebrada de Oro in 2003 by Puschendorf et al. (2006). This chytrid fungus has been linked to anuran declines in other neotropical regions (Puschendorf et al. 2006; also see recent summary by Whifield et al. 2016 and references cited therein) and likely played a role in the extirpation of this species at that locality.

The best chance for a surviving population of *Craugastor fecundus* might be at its only other known locality, from along streams at low elevations of Cerro Calentura south of Trujillo, Colón. Four specimens of this species were collected at that locality on one day during June 1989 at 460 m elevation. The author has not visited that site since that year.

Two Quebrada de Oro specimens (USNM 497113–114) appear to represent hybrids between *Craugastor chrysozetetes* and *Craugastor fecundus*. The following identifying remarks were listed under *Eleutherodactylus chrysozetetes* by McCranie and Wilson (2002) and taken from the author's field notes for 7 August 1989. The latter specimen (USNM 497114; Figure 2) was identified as a hybrid in the field because the specimen had yellow in the groin and on the ventral surfaces (a trait

of *Craugastor fecundus*; purple in *Craugastor chrysozetetes*), red pustules on the dorsal surfaces (a trait of *Craugastor fecundus*) on an otherwise typical dorsal pattern for *Craugastor chrysozetetes*, broadly expanded finger and toe discs (traits of *Craugastor chrysozetetes*), and well-developed toe webbing (approaching the character state found in *Craugastor chrysozetetes*). The iris lacked red marks in this specimen (a trait of *Craugastor fecundus*), and it had well-developed lateral fringes on the unwebbed portions of the toes as occurs in *Craugastor chrysozetetes*. The second specimen (USNM 497113; Figure 3) resembled USNM 497114 by "having nearly uniformly pale cream ventral and groin surfaces in preservative, broadly expanded finger and toe discs, well-developed lateral fringes on the toes, and a comparable amount of webbing" (McCranie and Wilson 2002:376). Additionally, both of these presumed hybrids most closely resemble *Craugastor chrysozetetes* in size.

ADDITIONAL VERNACULAR NAMES.

"Ranita de Arroyo de la Cordillera de Nombre de Dios" was used by McCranie and Castañeda (2007) as a Spanish equivalent of the English name suggested herein. "Elevated Patterlove" was suggested by Mitchell (2017).

ETYMOLOGY. The name *fecundus* is Latin, meaning fertile or fruitful. The name was used in reference to the Cordillera Nombre de Dios, the mountain range where the type series of *Craugastor fecundus* was discovered. That mountain range has proved to be fertile or fruitful ground for discovery of other undescribed anuran species (see McCranie *in press*).

COMMENTS. The disagreement in tympanum characters of *Craugastor fecundus* as discussed by Savage (2001) in relation to McCranie and Wilson (1997), was a result of Savage not realizing that his discussion of that

character was based on more than one species (based on his own data included in McCranie et al. 1989). The jaw musculature discussed by Lynch (1993; as *Eleutherodactylus*) for *Craugastor milesi* actually applies to *Craugastor fecundus* (based on KU 209105). Discussion of this jaw musculature character was repeated by Campbell and Savage (2000), using KU 209105 as the source of those data. Specimens of *Craugastor fecundus* (all as *Eleutherodactylus*) were variously identified as *Craugastor aurilegulus* (Campbell and Savage 2000), *Craugastor milsei* (Lynch 1993; Lynch and Fugler 1965; Meyer 1969; Meyer and Wilson 1971; Savage 1975; Schmidt 1933), *Craugastor rugulosus* (Meyer 1969; Meyer and Wilson 1971), or *Craugastor stadelmani* (Campbell 1994).

The suggestion that *Craugastor* Cope might be available as a subgenus or genus name for the complex of frogs containing the subsequently described *Craugastor fecundus* (Lynch's *Eleutherodactylus rugulosus* group) was made by Lynch (1986, 1993). *Craugastor fecundus* was listed as belonging to the subgenus *Craugastor* by Lynch (2000). The use of *Craugastor* as a genus name was advocated by Savage (2002), but *Craugastor* was used as a subgenus of *Eleutherodactylus* by Crawford and Smith (2005). The subgenus name *Campbellius* was erected for the group of frogs containing *Craugastor fecundus* by Hedges et al. (2008); however, several errors occur in their literature-based morphological description of that subgenus. The speculation that the subgenus *Campbellius* "will ultimately be considered" a genus was made by Padial et al. (2014). However, that bold speculation was based solely on genetic data available from only two of the 13 species included in that subgenus by Padial et al. (2014).

The holotype of *Craugastor fecundus* (LACM 137311) was not listed by Wright et al. (2008) in the type specimen list for the Natural History Museum of Los Angeles County (LACM).

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