

A NEW SPECIES OF FROG IN THE *HYLA PARVICEPS* GROUP FROM ECUADOR

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ABSTRACT: *Hyla carnifex* is named from Tandapi, Pichincha Province, Ecuador. The brightly colored new species, characterized by a bright yellow venter, yellow spots on the lips, and orange markings on the flanks and thighs, is from the Pacific slopes of the Andes and is a member of the *Hyla parviceps* group, which is distributed principally in the Amazon Basin. The external and cranial morphology of the adults, structure of the tadpoles, and nature of the mating call definitely associate *Hyla carnifex* with the *parviceps* group.

THE *Hyla parviceps* group currently is known to consist of five species: *H. parviceps* Boulenger widespread in the Amazon Basin, *H. bokermanni* Goin and *H. rondoniae* Bokermann in the upper Amazon Basin, *H. luteo-ocellata* Roux in northern Venezuela, and *H. subocularis* Dunn in eastern Panamá. These species seem to form a natural group characterized by small size (maximum snout-vent length 28 mm in males, 33 mm in females) and the dorsum variously marked with dark brown. A creamy white canthal stripe and/or labial bars or spots usually are present. The thighs are marked by conspicuous yellow or orange spots bordered by brown or black. There is noticeable sexual dimorphism in coloration; females usually have a conspicuous broad pale tan, creamy yellow, or white diagonal dorsolateral band. Dermal folds and appendages are lacking on the limbs, and the tympanum is indistinct or concealed. Males have a single, median, subgular vocal sac and lack nuptial excrescences on the pollices. The cranial elements are weakly ossified; a large frontoparietal fontanelle is present. The quadratojugal is greatly reduced and not in contact with the maxillary; the anterior arm of the squamosal is short and does not extend to the maxillary. The nasals are small, rectangular, and separated medially, but in contact with the sphenethmoid. The known tadpoles have xiphicercal tails and terminal mouths with a reduced number of tooth rows or teeth entirely lacking. The mating call consists of a short note, which may or may not be followed by a series of shorter secondary notes.

While collecting on the Pacific slopes of the Andes in Ecuador in March, 1967, I obtained one specimen of a small brightly colored *Hyla*. Subsequent study of this specimen revealed that it was allied with the *Hyla parviceps* group, otherwise unknown from the Pacific slopes in South America. In July, 1967, John D. and Marsha Lynch spent 12 days at Tandapi, Ecuador, and obtained 57 additional specimens, plus tadpoles and recordings of the mating call. John Lynch returned to Tandapi in March, 1968, and again in July

and August, 1968, accompanied by Robert W. Henderson and Gerald R. Smith. On both occasions additional material was collected. The name proposed for the new species is Latin, meaning hangman, and is used in loose reference to John D. Lynch, who collected most of the specimens.

Hyla carnifex, new species

Holotype.—University of Kansas Museum of Natural History (KU) 117993, an adult male obtained at Tandapi (formerly known as Corneja Astorga, 0° 24' S, 78° 51' W), Provincia Pichincha, Ecuador, 1460 m, 3 March 1968, by John D. Lynch.

Paratopotypes.—103, as follows: American Museum of Natural History 81399–81403, Gerald R. Smith and Robert W. Henderson, 27 July 1968; British Museum (Natural History) 1969.640–644, same data; Field Museum of Natural History 170746–170750, same data; Museum of Comparative Zoology 75062–75066, same data; University of Michigan Museum of Zoology 129016 (8), same data; United States National Museum 166543–166550, same data; Werner C. A. Bokermann, São Paulo 44290–44293, same data; KU 109557, William E. Duellman, 28 March 1967; KU 111838–111890, John D. and Marsha Lynch, 15–26 July 1967; KU 117994–118001, John D. Lynch, 3 March 1968; KU 124236–124237, John D. Lynch, 1 August 1968.

Referred Specimens.—KU 117992, Apuela, Provincia Imbabura, Ecuador, 1550 m; KU 112360 (tadpoles), Tandapi; KU 111867–111870 (skeletons), Tandapi.

Diagnosis.—A species in the *Hyla parviceps* group differing from all other members of the group by the following combination of characters: (1) Venter pale in both sexes (bright yellow in life), (2) Numerous creamy yellow labial spots, (3) Elongate orange or deep yellow spots on flanks and posterior surfaces of thighs bordered by dark brown, (4) Dorsum pale brown with a dark brown median mark and dark brown flecks, and (5) No pale canthal stripe or orange spots on shanks. *Hyla bokermanni*, *luteo-ocellata*, and *subocularis* have cream, orange or bright yellow, black-bordered spots on the thighs, a creamy yellow canthal stripe, and one or two creamy yellow subocular bars; these species have a creamy white venter and no orange or yellow spots on the flanks. The markings on the head of *Hyla rondoniae* are like the preceding three species, but the thigh pattern consists of two creamy yellow spots on the anterodorsal surface, which otherwise is brown. *Hyla parviceps* lacks canthal stripes and spots on the thighs; except for the median part of the chest and belly, which are white, the ventral surfaces are dark gray, marked by an orange spot on the ventral surface of each shank.

TABLE 1.—Measurements and proportions of *Hyla carnifex*
(Means in parentheses after observed ranges).

Character	Males	Females
N	20	15
Snout-vent Length	24.6–27.7 (26.1)	29.2–32.5 (31.3)
Tibia Length/S–V L	0.433–0.481 (0.455)	0.416–0.481 (0.455)
Foot Length/S–V L	0.395–0.455 (0.424)	0.387–0.446 (0.416)
Head Length/S–V L	0.285–0.313 (0.299)	0.280–0.314 (0.293)
Head Width/S–V L	0.310–0.349 (0.327)	0.298–0.320 (0.306)
Interorbital/Head Width	0.295–0.354 (0.332)	0.310–0.354 (0.333)

Description.—The following description is a composite, based on the entire sample of 105 specimens, except the measurements, which are based on 20 males and 15 females.

Size small; maximum snout-vent length in males 27.7 mm, in females 32.5 mm (see Table 1); body robust; head small, noticeably narrower than body; snout moderately short, rounded in dorsal and lateral profiles; nostril about four-fifths distance from eye to snout; canthus rounded, barely evident; loreal region slightly concave; lips moderately thick, not flared; supratympanic fold thin, short; tympanum small, barely evident in females, usually concealed in males.

Axillary membrane absent; arms slender; row of low tubercles on ventro-lateral edge of forearm; thin dermal fold on dorsal surface of wrist; fingers moderately short, bearing discs that are only slightly wider than digits; sub-articular tubercles moderately large, flat; distal tubercle on fourth finger weakly bifid in some specimens; supernumerary tubercles small, present in multiple rows on proximal segments; palmar tubercle distinctly bifid; prepollex slightly enlarged, not bearing nuptial excrescence in breeding males; fingers only about one-fourth webbed; webbing vestigial between first and second fingers, extending from base of penultimate phalanx of second finger to base of antepenultimate phalanx of third and on to middle of antepenultimate phalanx of fourth finger. Hind limbs short; heels overlapping by about one-fifth length of shank; tibiotarsal articulation extending to posterior corner of eye; thin transverse dermal fold on heel; tarsal fold absent; inner metatarsal tubercle low, flat, elliptical, not visible from above; outer metatarsal tubercle small, conical; toes moderately long, bearing discs about same size as those on fingers; sub-articular tubercles small, round; supernumerary tubercles minute, present in single row on proximal segment of each digit; toes about two-thirds webbed; webbing extending from distal end of penultimate phalanx of first toe to base of penultimate phalanx of second, from base of disc of second to base of penultimate phalanx of third, from base of disc of third to base of penultimate phalanx of fourth and on to base of disc of fifth toe.

Skin on belly and proximal posteroventral surfaces of thighs granular; skin on other surfaces smooth; anal opening directed posteriorly at level of upper edges of thighs; anal flap short, broad. Tongue elliptical, shallowly notched anteriorly, barely free posteriorly; denticerous processes of prevomers short, posteromedially inclined, widely separated medially between small elliptical choanae; total number of prevomerine teeth 7–11 (mean 9.2) in 20 males, 9–12 (mean 10.4) in 15 females; vocal slits short, extending posterolaterally from posterolateral base of tongue; vocal sac single, median, subgular, moderately distensible.

Coloration in life: Dorsum pale creamy tan or grayish tan with a median brown or grayish brown blotch and numerous dark brown flecks; dorsal surfaces



FIG. 1.—Adult male of *Hyla carnifex*, KU 124237. 3 ×.

of limbs, exclusive of thighs, pale brown with faint darker brown transverse bands (not visible in some specimens); upper lip brown with numerous yellow spots; axilla, flanks posteriorly, anterior and posterior surfaces of thighs deep yellow or orange bordered by dark brown or black; ventral surfaces of shanks, inner surfaces of feet, webbing, and ventral surfaces of upper arms deep yellow or orange; throat, belly, and median part of flanks bright yellow; iris gray, flecked with reddish bronze; palpebrum clear (Fig. 1). In half grown individuals, belly white; faint tint of yellow on chin and chest; flanks and anterior and posterior surfaces of thighs brown. Deep yellow and orange flash colors developed only in larger individuals, mostly females.

Coloration in preservative: Dorsum tan or gray, usually with a distinct darker middorsal blotch extending from eyelids at least to sacrum; in some males and all females upper flanks dark brown or dark gray, enclosing a pale band between flanks and middorsal blotch; entire dorsum flecked with dark brown; groin mottled dark brown and cream; ventral surfaces, axilla, webbing, and spots on anterior and posterior surfaces of thighs and on upper lips cream.

Description of Tadpole.—Tadpoles in developmental stages 25 to 41 are available. A typical tadpole in stage 38 is described here. Body length 15.2 mm; total length 44.6 mm; body slightly wider than deep, widest at midlength, deepest posteriorly; snout in dorsal profile broadly rounded, in lateral profile acutely rounded; eyes large, widely separated, directed laterally; nostrils closer to tip of snout than to eyes, directed anterolaterally; spiracle sinistral, directed posteriorly at a point just below midline at about three-fifths distance from snout to posterior edge of body; anal opening dextral. Caudal musculature robust anteriorly, tapering to an attenuated point posteriorly; fins of equal depth throughout most of

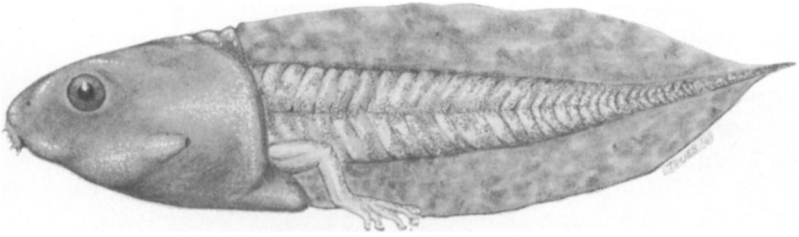


FIG. 2.—Tadpole of *Hyla carnifex*, KU 112360. 2.5 ×.

length of tail, constricted posteriorly, resulting in xiphicercal tail; depth of either fin at midlength of tail about equal to depth of caudal musculature; dorsal fin extending onto body (Fig. 2).

Mouth small (about one-fifth greatest width of body), terminal, directed anteriorly; upper lip bare; one row of small pointed labial papillae laterally and two rows ventrally; lateral labial folds absent; beaks moderately massive, bearing fine serrations; upper beak broadly arched with short robust lateral processes; lower beak broadly V-shaped. One upper and two lower rows of minute teeth; upper row just inside upper lip, irregular; first lower row straight, usually complete; second lower row shorter, complete or interrupted medially (Fig. 3).

Color (in preservative) dull brown above with bluish tint to venter; caudal musculature cream; caudal musculature and fins lightly flecked with brown in small tadpoles and more heavily flecked or mottled in larger tadpoles; in largest individuals caudal fins nearly entirely black. In life, dorsum creamy yellow to pale

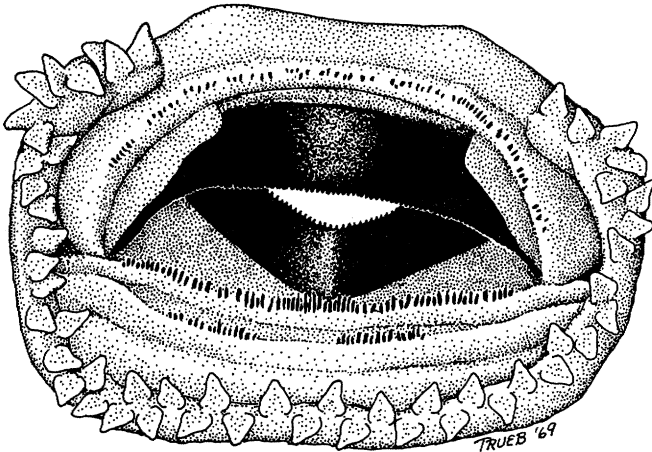


FIG. 3.—Mouth of tadpole of *Hyla carnifex*, KU 112360. 30 ×.

green; belly white; tail creamy yellow, mottled with black; iris silver with black reticulations.

Ecology and Behavior.—The natural vegetation in the vicinity of the type locality is cloud forest; many bromeliads and tree ferns are present. Although some individuals of *Hyla carnifex* were found on bushes and trees in the forest at night, breeding individuals were taken only in disturbed areas, such as a marshy clearing or along water-filled ditches. Calling males were heard on every night when collectors were at Tandapi in July, 1967, and in March, July, and August, 1968. By day two individuals were found beneath the bark on a log on 15 July 1967; one was in a bromeliad on 28 March 1967, and one was in the axil of an elephant-ear plant on 26 July 1967.

The mating call consists of a series of low-pitched notes. Each series is produced every 5–9 seconds and is composed of a long monophasic primary note followed by two or three short biphasic secondary notes.

On 15 July 1967, tadpoles were found in a ditch having a muddy bottom and floating vegetation. On 23 July 1967, metamorphosing young were obtained on emergent vegetation in the ditch. The presence of calling males and gravid females both in March and in July and August is indicative of either a lengthy breeding season or more than one breeding season per year.

Relationships.—On the basis of external characters and cranial morphology, *Hyla carnifex* obviously is related to members of the *Hyla parviceps* group. Much of the information presented below is based on unpublished observations and large series of specimens from eastern Ecuador. The calls of *parviceps* and *rondoniae* are structurally like that of *carnifex*, whereas the calls of *bokermanni* and *subocularis* have longer primary notes and usually no secondary notes. The tadpoles of *parviceps* are like those of *carnifex*, except that the former have only one lower tooth row and lack an upper tooth row. The tadpoles of *subocularis* lack tooth rows and have fewer, but larger, labial papillae. The tadpoles of the other species in the group are not known.

Hyla carnifex is the only member of the *Hyla parviceps* group west of the Andes. Excluding the Panamanian *Hyla subocularis*, the group is entirely South American; three species (*bokermanni*, *parviceps*, and *rondoniae*) are Amazonian, and *luteo-ocellata* occurs in northern Venezuela. Most of the species occur at low elevations, although *parviceps* ascends the eastern slopes of the Andes to elevations of about 1500 meters. Although the presence of a member of the *parviceps* group on the Pacific slopes seems to be anomalous, recent collecting on the Pacific lowlands of Ecuador has revealed the presence there of members of such typically Amazonian groups as the *Hyla granosa* and *rubra* groups.

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DENSITY AND COMPOSITION OF FENCED POPULATIONS OF LEOPARD LIZARDS (*CROTAPHYTUS WISLIZENII*) IN SOUTHERN NEVADA

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ABSTRACT: Leopard lizards exist in Rock Valley, Nevada, at low densities (1–2/acre) sustained by good adult survival (roughly 50% per annum) and maximal life-spans of at least 7–8 years. Among individuals more than 8 months of age, male survivorship appears to be superior to that of females. Thus, although the sex ratio among hatchlings is about even, there appear to be more adult males than females in our areas. Biomass estimates over a period of 5 years in three 20-acre areas ranged from 17.6 g/acre to 47.8 g/acre. Females do not ordinarily reproduce until 21–23 months of age, but in 1966 a few females reproduced when 9–11 months old. One clutch of eggs per year is typical, but occasionally two clutches may be laid (1965), and in 1964 there was no reproduction.

THE research of Blair (1960) and Tinkle (1967) on lizards has emphasized both the importance and difficulty of studies of comparative demography. Different species of North American lizards may exhibit markedly different demographic regimes, and such differences may also exist in species with extensive geographic distributions (e.g., *Uta stansburiana*). Life-span and age-specific survival, age-specific fertility, time of sexual maturity and the frequency of clutch deposition are intimately interwoven to produce the densities, age distributions and sex ratios which we observe in natural populations.

In general, the above parameters, and their mode of interaction, remain undescribed for populations of lizards. There are many investigations in which some features of population dynamics have been explored, but only in the long-term studies of *Sceloporus olivaceus* (Blair, 1960) and *Uta stansburiana* (Tinkle, 1967) has the picture been sufficiently detailed that yearly changes in population size and structure can be quantitatively related to known schedules of fertility and mortality.