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NEW TREE FROGS OF THE GENUS *HYLA* FROM THE CLOUD FORESTS OF WESTERN GUERRERO, MÉXICO

By

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Because of the difficulty of travel in the mountainous regions of western Guerrero, this major area of uplift has remained one of the poorest known in México. Therefore, it is not surprising that a number of new species of amphibians and reptiles has been discovered in this region; only a few of these species have been described to date. These montane species occur in cloud forests in the Sierra Madre del Sur, which is flanked by the arid Río Balsas basin to the north and west and by the Pacific Ocean to the south. This mountain range extends eastward into Oaxaca; however, several high but dry valleys interrupt the crest and create discontinuities in the cloud forest. The two new frogs described below are representatives of two species groups. Although representatives of both of these groups occur in the Sierra Madre del Sur in Oaxaca, the apparently closest known relatives of the two new species occur to the northeast, in the high mountains between México and Veracruz.

Hyla trux new species

(Figure 1; Plate 1)

Holotype.—Adult male, KU 137551, from 11.4 km (by road) southwest of Puerto del Gallo, Guerrero, México [about 35 km

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airline northeast of Atoyác de Álvarez], elevation 1985 meters; collected 20 December 1969, by K. Adler, D. M. Dennis and D. H. Snyder.

Paratypes.—FMNH 171784, LACM 64882, USNM 192304, all 10.2 km (by road) SSW of Asoleadero, 2120 m, collected 17 December 1969; AMNH 84584, BMNH 1971.441, both 5.6 km (by road) NE of Yerbabuena, 2000 m, collected 17 December 1969; KU 137550, 10.4 km (by road) SW of Puerto del Gallo, 1940 m, collected 20 December 1969; UMMZ 130154, same data as holotype; and UMMZ 130155, 11.5 km (by road) NNE of El Paraíso, 1760 m, collected 20 December 1969; all from Guerrero, México; same collectors as for holotype.

Diagnosis.—A large member of the *Hyla taeniopus* species group (males to 81.0 mm snout-vent length) possessing, as an adult, a brown dorsum spotted with irregularly-shaped, chocolate-brown blotches, and banded limbs in life; a clear, brown-edged palpebral membrane; vocal slits in males; tarsal folds; prevomerine teeth; and no axillary membranes. The fingers are one-half webbed, the toes three-fourths webbed. *Hyla trux* differs from other known members of the *taeniopus* group in having extensive nuptial excrescences (largely confined to the thumb but also found on all other fingers) and a hypertrophied web between toes one and two (in sexually mature males).

Description of Holotype.—The holotype is an adult male with a snout-vent length of 81.0 mm. The head is broad and moderately flat (25.7 mm long, 24.1 mm wide) with slightly protuberant nostrils, which are horizontally oval; the internarial distance is 5.3 mm. The canthus is distinct and straight in profile; the loreal region is slightly concave. From above the snout is long and moderately pointed, with no rostral keel, and is round in lateral profile. The eye length is 7.6 mm; the upper eyelid is 5.8 mm wide, and the interorbital distance is 6.5 mm. The tympanum is small, distinct, round, and 3.5 mm long; there is a strong supratympanic fold extending from posterior border of eye to above the insertion of the arm and barely covering the upper edge of the tympanum. The length of the hand is 22.9 mm (Fig. 1a). The fingers are moderately long, $1 < 4 < 2 < 3$, and about one-half webbed. The fourth finger and outer side of the third are webbed to the base of the penultimate phalanx; the inner side of third finger is webbed to the middle of the antepenultimate phalanx; the outer side of the second finger is webbed to the middle of the penultimate phalanx, and the first finger and inner side of the second are webbed to the distal end of the antepenultimate phalanx. The

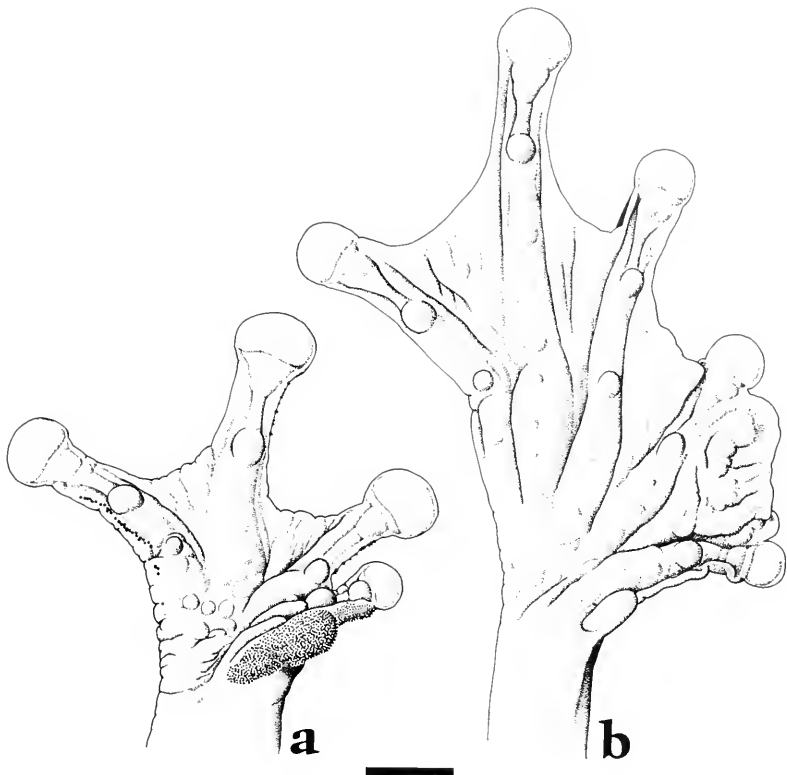


FIG. 1. Hand (a) and foot (b) of *Hyla trux* (KU 137551, mature male; holotype). Scale is 5 mm in length.

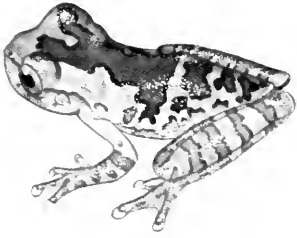
discs are moderately large; that of the third finger is 3.5 mm wide. The prepollex is moderately enlarged with an elongate, non-projecting prepollical spine which, from radiographs, appears to be only moderately ossified. The prepollex and inner side of the first finger are extensively covered with nuptial spines; isolated groups of spines also occur on the inner edges of the penultimate phalanx of the second and third fingers and on the outer edge of the entire fourth finger. The subarticular tubercles are round; none is bifid. Distinct supernumerary tubercles are present on the palm and proximal segments of the fingers; there is also a longitudinal row of pustules on a raised ridge along the ventrolateral edge of the forearm. There is a fold on the wrist. The length of the foot is 36.0 mm (Fig. 1b). The toes are moderately long, $1 < 2 < 5 < 3 < 4$, and about three-fourths webbed. The first, second, and fifth toes are webbed to the base of the disc; the

fourth toe is webbed to the base of the penultimate phalanx, and the third toe is webbed to the distal end of the penultimate phalanx. The webbing between the first and second toes is greatly hypertrophied, the edge of the web being deflected dorsally and folded into a flap. The inner metatarsal tubercle is distinct and elliptical; there is a small but distinct outer metatarsal tubercle. The tarsal fold is indistinct. The subarticular tubercles are round; none is bifid. Indistinct supernumerary tubercles are present on the soles and proximal segments of the toes. The discs are moderately large; that of the fourth toe is 3.5 mm wide. The length of the tibia is 39.8 mm; the tibiotarsal articulation extends to the tympanum, and the heels overlap 9.0 mm when the legs are flexed and held at right angles to the body. The cloacal sheath is moderately long, directed posteroventrally, and opens at the mid-level of the thighs; there is a transverse dermal fold above the sheath and large, distinct pustules below its aperture. The skin of the dorsum and undersurfaces of arms, head and lower legs is smooth; the skin of the venter of the body and thighs is granular. There is no axillary membrane. The dentigerous processes of the prevomers are each the same size as a choana, oval, and oriented transversely between the choanae, nearer one another than to choanae; there are 3-4 prevomerine teeth. The choanae are oval, each 1.5 mm long. The vocal slits are paired and extend from the midlateral base of the tongue to the angle of the jaws; the vocal sac is apparently barely distensible. The tongue is elongate, cordiform, and one-sixth free and slightly notched posteriorly. The left testis is 17.0 mm long; the right is 15.1 mm. As determined from radiographs, the quadratojugals are well-developed but lack a bony articulation with the maxilla on one side.

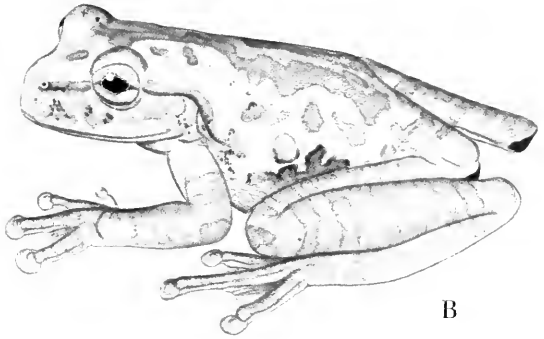
Color in life: The dorsum of head, body, limbs, hands and feet are pale brown with small to large, irregularly shaped, dark chocolate-brown blotches on the head, body and upper arms, and bands of the same color on other parts of the limbs (Plate I). Clusters of iridophores are superimposed unevenly over the body, head, and limbs. The ground color of the flanks is paler, tending towards yellowish brown. A wash of chocolate-brown extends from the lip to the nostril and below the canthus, to the eye, and from the eye to the tympanum. The iris is yellowish golden with black reticula-

PLATE 1. *Hyla trux*: A. Guerrero, 28.0 mm snout-vent length (BMNH 1971.441, juvenile female; paratype). B. Guerrero, 51.2 mm (KU 137550, immature female; paratype). C. Guerrero, 81.0 mm (KU 137551, mature male; holotype). →

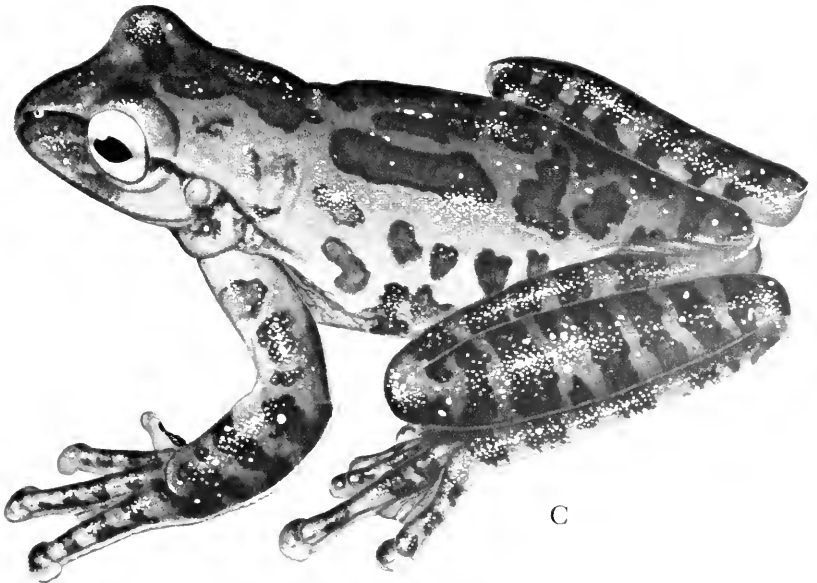
PLATE I



A



B



C

tions; the tympanum is pale brown. The lateral edges of the lower limbs and outermost digits are creamy white. The axillae and groin are pale blue; the webbing of the hands and feet is pale blue, laced with thin black lines. The venter is dull creamy brown, with the greatest concentration of melanophores on the throat, abdomen and thighs. The nuptial spines are dark brown.

Color in alcohol: As in life, except that all browns are darker, making detection of the dorsal blotches more difficult. The iris is dark bluish brown, the webbing slate gray, and the nuptial spines dark yellowish brown. The creamy-white color of the borders of the limbs and digits is not evident, and the belly and throat are suffused with grayish brown.

Variation.—The snouts of both large males (79.1 and 81.0 mm snout-vent length) are pointed, but those of smaller males (up to 67 mm) and the largest female (51.2 mm, immature) are noticeably more rounded from above. This apparently represents an ontogenetic change found also in the closely-related *H. taeniopus* (see Duellman, 1965). The peculiar, hypertrophied web between toes one and two is found only in the two large, sexually mature males (Fig. 1b). The quadratojugal is slightly reduced in most individuals and does not have bony contact with the maxilla; in one, only a short spine is present. On one or both sides in three individuals the quadratojugal is in bony contact with the maxilla. The testes of the two mature males range in length from 15.1 to 17.1 mm (mean, 16.4). Morphological variation in some mensural characters is given in table 1.

The considerable color variation apparently is only partly ontogenetic (Plate I). Only the two adult males have blue webbing. In a juvenile female (28.0 mm snout-vent) and several subadult males (59.2-67.0 mm), the dorsal ground color is a rich orange-brown; this ground color is superimposed with the chocolate brown blotches (golden-edged in the males) and iridophores found in the full-grown males. The flanks are yellowish (greenish in one male), and the hands and feet, including webbing, are pale to vivid orange; in several of the half-grown males, there is a chocolate brown band below the tarsal fold which extends to the heel. The rear of the thigh has a greenish tinge, and the border along the lateral edges of the lower limbs and outer edges of the digits is golden white. In the juvenile female, the brown blotches on the dorsum are bordered by black, and the bands on the limbs are orange with brown borders; the rear of the thighs is orange. In two immature females (34.1 and 51.2 mm) the dorsal ground color is a pale yellowish tan with dark-bordered tan or greenish tan

TABLE 1. Morphological variation in the type series of two Mexican *Hyla*.
(All measurements in mm; means in parentheses below ranges.)

Species	<i>Hyla mykter</i>				<i>Hyla trux</i>			
	adult ♀	immature ♂	adult ♂		immature ♀	immature ♂	adult ♂	adult ♂
Sex and age								
Number	1	1	1		4	3	2	
Snout-vent	50.9 ---	30.8 ---	40.1 ---		28.0-51.2 (38.3)	59.2-67.0 (64.4)	79.1-81.0 (80.1)	
Tibia/ snout-vent	0.436 ---	0.481 ---	0.509 ---		0.464-0.486 (0.473)	0.496-0.510 (0.505)	0.432-0.491 (0.462)	
Foot/ snout-vent	0.452 ---	0.438 ---	0.501 ---		0.421-0.469 (0.447)	0.454-0.465 (0.460)	0.429-0.444 (0.437)	
Hand/ snout-vent	0.301 ---	0.325 ---	0.339 ---		0.287-0.309 (0.299)	0.307-0.318 (0.311)	0.268-0.283 (0.276)	
Head width/ snout-vent	0.314 ---	0.334 ---	0.327 ---		0.342-0.364 (0.351)	0.312-0.338 (0.324)	0.295-0.298 (0.297)	
Head length/ snout-vent	0.275 ---	0.296 ---	0.282 ---		0.314-0.357 (0.332)	0.297-0.320 (0.310)	0.313-0.317 (0.315)	
Preopercine teeth (total)	8 ---	7 ---	9 ---		5-11 (7.8)	10-15 (11.7)	7-17 (12)	

blotches; in the larger female, the flanks are pale blue; the throats of these two individuals are pale yellow in one and golden white in the other. Little metachrosis was noticed, except for darkening which was especially apparent in the adult males.

Habitat and Habits.—These frogs were found along cascading mountain streams flowing through cool, moist, oak-pine or (at the lower elevations) bamboo-tree fern cloud forests near Cerro Teotepac, Guerrero, at elevations between 1760 and 2120 meters. At one ridge-top locality the general habitat was dry, but frogs were found along a lush, plant-shrouded stream in a ravine; all were collected within 2 m of the stream. One frog was wedged among rocks and a root system behind a small waterfall in such a way that water continuously flowed around the animal. Another individual was 1 m from the stream, well camouflaged among some relatively dry rocks in an outcropping, whereas another was caught on a cliff face beneath a loose patch of moss through which water constantly percolated. All of these individuals were collected in mid-morning. At night, an immature female was found abroad on a moss-covered rock by a stream. Both large males were found, during the early evening, sitting in root systems 2-3 m directly above open pools in the stream. Another immature female collected at night was completely exposed on a heavy vine over the stream. The climate at these localities was moderate. It often rained by night and day, but the temperatures never reached the near-freezing levels experienced at night at higher elevations in this area. These frogs were quiescent when discovered but became very active after capture. Although males possess vocal slits, none was heard calling. Other frogs taken at the same time along these streams were *Eleutherodactylus saltator*, *E. rugulosus*, *Hyla mykter*, *H. pentheter* and *Ptychohyla* sp.

Remarks.—The combination of a large adult size, a brown dorsum with darker brown blotches, a clear palpebral membrane, a tarsal fold, and absence of an axillary membrane places *Hyla trux* in the *Hyla taeniopus* species group as characterized by Duellman (1970). However, *trux* differs from all three previously described species of that group. The quadratojugals in *taeniopus*, *chaneque* and *altipotens* are well ossified and articulate with the maxillae. Radiographs show that the quadratojugal in *trux* is more slender, often reduced, and only rarely articulates with the maxilla. The nuptial excrescences of *trux*, as described for the holotype, are more extensive than those found in the other members of the group (these are apparently lacking altogether in *altipotens*). Finally, the hypertrophied webbing between toes one and two of mature

males is not found in any other member of the species group; the function of this enlarged web and its condition in adult female *trux* are not known.

Hyla trux differs from other members of its species group in several details. It differs from *taeniopus* in having an elongate (rather than sickle-shaped) prepollical spine, a shorter anal sheath, and more extensively webbed hands. *Hyla trux* is distinguished from *chaneque* by the absence of a tuberculate dorsum and the presence of a pointed snout (at least in adult males), an elongate (rather than sickle-shaped) prepollical spine, more extensively webbed hands, shorter legs, and a shorter head. *Hyla trux* differs most noticeably from *altipotens* by possession of vocal slits and nuptial excrescences in mature males, shorter legs, and a longer head. It also lacks the bronze-bordered canthus, the creamy yellow reticulations on the flanks and thigh, and the middorsal stripe found in some *altipotens*. An ossified prepollical spine cannot be detected with certainty in the two available skeletons of *altipotens* (mature male and female), although radiographs suggest it is ossified at the proximal end.

Of these three species, *Hyla trux* shares the greatest number of characteristics with *taeniopus*. These two species are more similar to each other in body, limb and head proportions, and in general coloration than either is to any of the other two species. Furthermore, the development of a pointed snout at maturity in males of *taeniopus* occurs also in males of *trux*. Adult males of both species have vocal slits; the nuptial excrescences of *taeniopus*, although not as well developed as those of *trux*, are considerably more extensive than are those of males of *chaneque*. All four species are found in cloud forests at intermediate elevations in southern México: *Hyla taeniopus* (Hidalgo, Puebla and Veracruz, 1200-2100 m), *trux* (Guerrero, 1760-2120 m), *chaneque* (Oaxaca and Chiapas, 800-2200 m) and *altipotens* (Oaxaca, 1100-1900 m).

Etymology.—The Latin name *trux*, meaning fierce or ferocious, refers to the liberally spined fingers.

Distribution.—Known only from localities in the vicinity of Cerro Teotepec in the Sierra Madre del Sur of Guerrero, at elevations between 1760 and 2120 m.

***Hyla mykter* new species**

(Figure 2; Plate 2)

Holotype.—Adult male, KU 137553, from 11.4 km (by road) southwest of Puerto del Gallo, Guerrero, México [about 35 km air-line northeast of Atoyác de Álvarez], elevation 1985 meters; col-

lected 20 December 1969, by K. Adler, D. M. Dennis and D. H. Snyder.

Paratypes.—KU 137552, Asoleadero, elevation 2520 m, collected 17 December 1969; USNM 192421, 8.2 km (by road) SW of Puerto del Gallo, elevation 2050 m, collected 20 December 1969; all from Guerrero, México; same collectors as for holotype.

Diagnosis.—A medium-sized member of the *Hyla bistrincta* species group (males to 40.1 mm snout-vent length, females to 50.9 mm) possessing long fingers with vestigial webbing (except outermost which are one-fifth webbed) and a prominent, non-projecting prepollical spine; a rounded, truncate snout with slight rostral keel; toes four-fifths webbed; a weakly defined thoracic fold; nuptial excrescences on the prepollex of adult males; moderately long legs; no quadratojugal; no axillary membrane or vocal slits; and a yellowish, olive-green or light gray-brown dorsum with mottled flanks and thighs in life.

Description of Holotype.—The holotype is an adult male with a snout-vent length of 40.1 mm. The head is broad and moderately flat (11.3 mm long, 13.1 mm wide) with slightly protuberant nostrils which are horizontally oval; the internarial distance is 3.0 mm. The canthus is rounded but distinct and slightly concave in profile; the loreal region is slightly concave. As seen from above the snout is long and slightly pointed, with a moderately distinct rostral keel, and is round in lateral profile. The eye length is 3.7 mm; the upper eyelid is 3.5 mm wide, and the interorbital distance is 3.5 mm. The tympanum is small, distinct, round, and 2.1 mm long; there is a strong supratympanic fold extending from posterior border of eye to above the insertion of the arm and barely covering the upper edge of the tympanum. The length of the hand is 13.6 mm (Fig. 2a). The fingers are long, $1 < 4 < 2 < 3$, with greatly reduced webbing. The webbing between first and second fingers is vestigial; that between second and third fingers extends to the distal end of the antepenultimate phalanx, and the webbing between the third and fourth fingers extends to the middle of the antepenultimate phalanx. The discs are moderately large; that of the third finger is 1.9 mm wide. The prepollex is moderately enlarged with a large, spine-shaped, non-projecting prepollical spine. The prepollex and inner edge of the first finger are extensively covered with nuptial spines; isolated groups of spines also occur on the outer edge of the first finger below the disc, along the entire inner edge of the second finger, on the inner edges of the two outermost subarticular tubercles of the third finger, and in tiny patches along outer edges of the two outermost subarticular tubercles of the fourth finger.

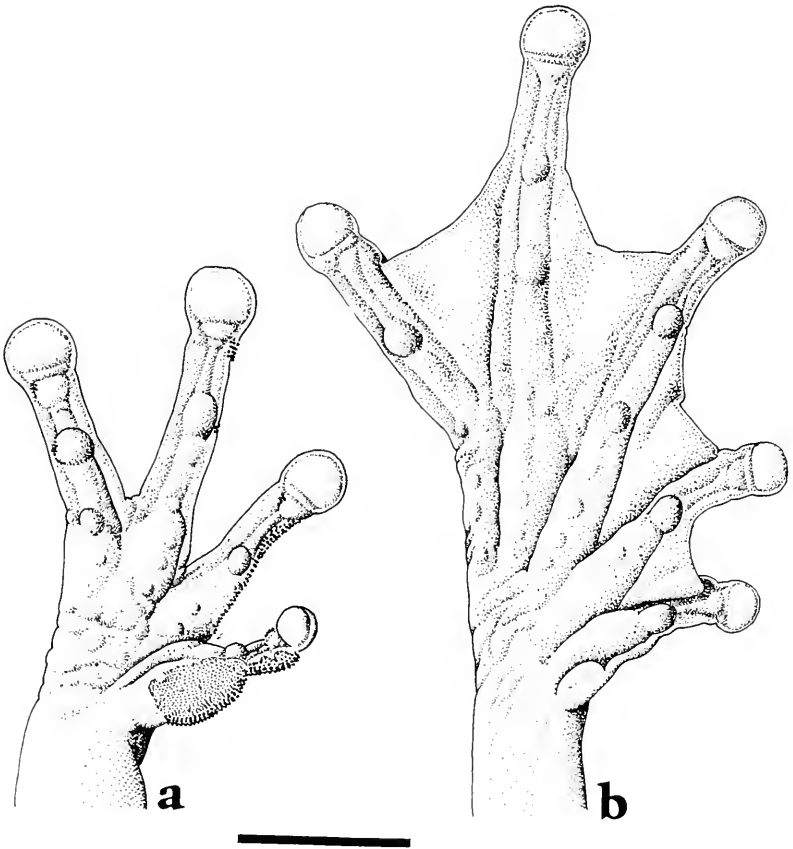
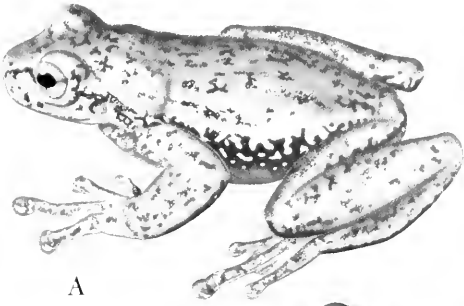


FIG. 2. Hand (a) and foot (b) of *Hyla mykter* (KU 137553, mature male; holotype). Scale is 5 mm in length.

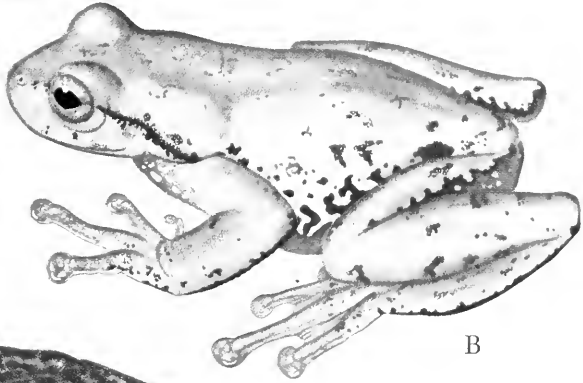
The subarticular tubercles are round or oval; none is bifid. Distinct supernumerary tubercles are present on the proximal segments of the fingers but are indistinct on the palms; a few small pustules are present along the ventrolateral edge of the forearm but are not raised into a ridge. There is a fold on the wrist. The length of the foot is 20.2 mm (Fig. 2b). The toes are moderately long, $1 < 2 < 5 < 3 < 4$, and about four-fifths webbed. The first, fifth, and

PLATE 2. *Hyla mykter*: A. Guerrero, 40.1 mm snout-vent length (KU 137553, mature male; holotype). B. Guerrero, 50.9 mm (KU 137552, mature female; paratype). *Hyla bogertae*: C. Oaxaca, 43.3 mm (LACM 44403, mature female; paratype). D. Oaxaca, 49.0 mm (LACM 44402, mature female, paratype). →

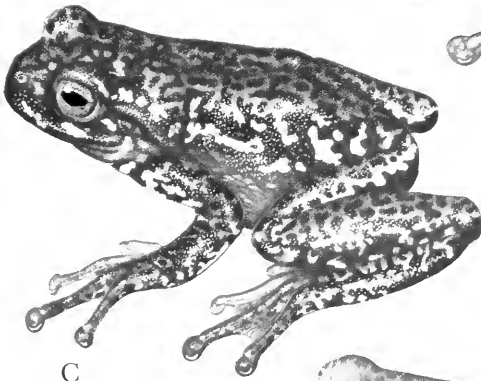
PLATE 2



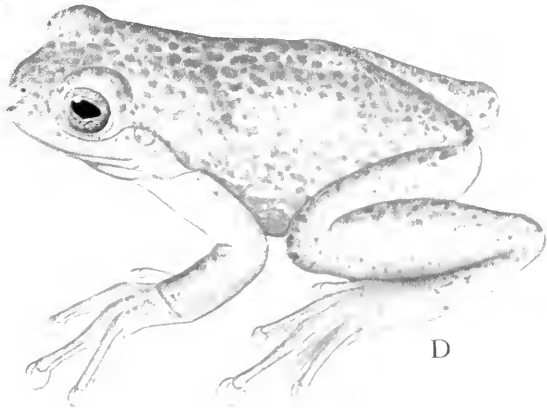
A



B



C



D

outer sides of the second and third toes are webbed to the base of the disc; the inner side of the second toe is webbed to the base of the penultimate phalanx, and the fourth toe and inner side of the third are webbed to distal end of antepenultimate phalanx. The inner metatarsal tubercle is distinct and elliptical; there is no outer metatarsal tubercle. The tarsal fold is short and faint. The subarticular tubercles are round or oval; none is bifid. Indistinct supernumerary tubercles are present on the soles and proximal segments of the toes. The discs are moderately large, that of the fourth toe is 2.0 mm wide. The tibia length is 20.4 mm; the tibiotarsal articulation extends to the middle of the eye, and the heels overlap 5.7 mm when the legs are flexed and held at right angles to the body. The cloacal sheath is moderately long, grooved medially, directed posteroventrally, and opens just below the midlevel of the thighs; there is a transverse dermal fold above the sheath and large, distinct pustules on the thigh adjacent to its aperture. The skin is only slightly thickened; that of the dorsum and undersurfaces of arms, chest, and lower legs is smooth; that of the throat, abdomen, and undersurfaces of the thighs is granular. There is no enlarged axillary membrane. The dentigerous processes of the prevomers are each the same size as a choana, oval, and oriented transversely between the choanae, nearer one another than to choanae; there are 4-5 prevomerine teeth. The choanae are oval, each 1.0 mm long. Vocal slits are absent. The tongue is cordiform, slightly notched and one-sixth free posteriorly. As determined from radiographs, quadratojugals are absent.

Color in life: The dorsum of the head and body is pale yellowish green, and the limbs are pale yellowish brown, all covered with black reticulations and spots; the flanks and rear of the legs and lower arms are mottled with black and pale yellow (Plate 2). The canthus and supratympanic fold are black-edged and the tympanum is brownish green. The iris is golden orange with black reticulations. The knee and ventrolateral edges of the forearms and legs are black-edged. The venter is mottled dusky brown, tending toward deep purplish gray or chocolate brown around the perimeter, overlaid with some brassy pigment. The nuptial spines are dark brown.

Color in alcohol: The body is dull grayish brown above with gray reticulations; gray mottling is present on the flanks. The gray or brown edging of venter and the yellow and green ground color of the dorsum are not evident. The ventral surfaces are pale yellowish cream with gray mottling. The iris is bluish, and the webbing is pale gray. The nuptial spines are brown.

Variation.—The snout of the adult females (50.9 mm snout-vent length) as well as that of an immature male (30.8 mm) are pointed and possess a rostral keel. The female has only vestigial webbing between all fingers. The female has noticeably shorter legs and feet, proportionate to body length, than have either of the males. The female is also more robust than either male but has a slightly narrower head. The quadratojugal is lacking in all three individuals. Morphological variation in some mensural characters is given in table 1.

Apparently only moderate color variation exists in this species (Plate 2). The adult female was pale gray-brown with a little dark flecking above, with a gray tympanum. There was a green wash along the upper rear edge of the thigh and in the groin, and some brassy overlay on the venter including throat; there were a few yellow spots or blotches along the flank and front edge of arm. The immature male was a deep olive-green dorsally mottled with black flecks and reticulations. Little metachrosis was noticed, except that most individuals were dark greenish or dark yellowish tan if sluggish when first caught, and only later lightened to the colors described above.

Habitat and Habits.—These frogs were taken in a variety of locations, all in cool, moist, oak-pine or (at the lower elevations) bamboo-tree fern cloud forests near Cerro Teotepec, at elevations between 1985 and 2520 meters. All specimens of *Hyla mykter* were taken in December. The female (which has large pigmented eggs) was found early in the morning in a bromeliad 2 m above ground in a pine tree, at the edge of a large clearing at Asoleadero (2520 meters). The vegetation and climate at this locality have been described by Musser (1964) and Adler (1965). The day was warm (21° C maximally) and dry, but temperatures fell to near, or below, freezing at night; there was considerable frost on the logs and boulders in the clearing at daybreak. The two males were taken along lush, cascading mountain streams at considerably lower elevations. The habitat at the type locality is dominated by tree ferns, bamboo, pine and oak, and dissected by deep ravines containing plant-shrouded streams (this is also the type locality for *H. trux*). The holotype was collected at 8:30 PM, fully exposed on vegetation directly over a stream; whereas, the smaller male was found at night in a bromeliad which had fallen along a wide, open stream. The climate at these localities was considerably warmer than at Asoleadero. None of the males was heard to call. Other frogs taken at the same time along these streams include *Hyla trux*, *H. pentheter* and *Eleutherodactylus saltator*.

Remarks.—The relationships of *Hyla mykter* appear to lie with presumably the most advanced members of the *Hyla bistincta* species group. These species (namely *bogertae*, *crassa*, *pachyderma*, *robertsorum* and *siopela*) possess thick glandular skin, blunt heads, large webbed feet, and nuptial excrescences, and lack axillary membranes and vocal slits. We have not seen specimens of *pachyderma* or *crassa*, and have relied on Duellman (1970) for accounts of their characteristics. *Hyla mykter* differs from the latter two species and *bogertae* in having a weak tarsal fold, the outer fingers slightly webbed, a small spine-shaped quadratojugal, a rostral keel and a less robust body. It is distinguished from *crassa* by having feet four-fifths webbed and a well-defined tympanum. *Hyla mykter* differs from *pachyderma* in possessing smaller nuptial spines, a weak thoracic fold, and a well-defined tympanum in males (indistinct only in male *pachyderma*). The species is distinguished from *bogertae*³ by its rounded canthus and a gray-mottled belly. *Hyla mykter* differs from *robertsorum* in having a small quadratojugal, a more pointed snout with a better-developed rostral keel, more extensively webbed outer fingers, and, in males, a long cloacal sheath and less robust body shape. In two or three females of the *robertsorum* examined, the snout is slightly pointed, and in one there is a faint trace of a rostral keel; a few individuals of both sexes have a trace of webbing between the outer fingers, but in none of them is it as well developed as it is in *siopela* and *mykter*.

Hyla mykter and *siopela* seem to be closely related because they share more characteristics than either does with other members of the subgroup. Both have a trace of webbing between the outer fingers and have a rostral keel (rarely absent in *siopela*), although the snout is more truncate (in both dorsal and side views) and the canthus more angular in *siopela*. When viewed from above, the nostrils of *siopela* are more anterior than are those of *mykter*, which are located dorsal to the margin of the upper lip. Nuptial excrescences are restricted to the first and second fingers in *siopela* (2 males examined) but at least some spines are found on all fingers in *mykter* (1 mature male); however, this difference may not hold in larger samples. The toes are slightly more fully webbed in *mykter*, although the difference is not as great as a comparison

³The availability of specimens and colored slides of the recently described *Hyla bogertae* has made it possible to illustrate certain features of this form not given in the type description. In an effort to maintain the uniformity of treatment used by Duellman (1970), we have included color illustrations of adults (Plate 2) and drawings of the hands and feet (Fig. 3) because of the usefulness of these features in hyloid systematics.

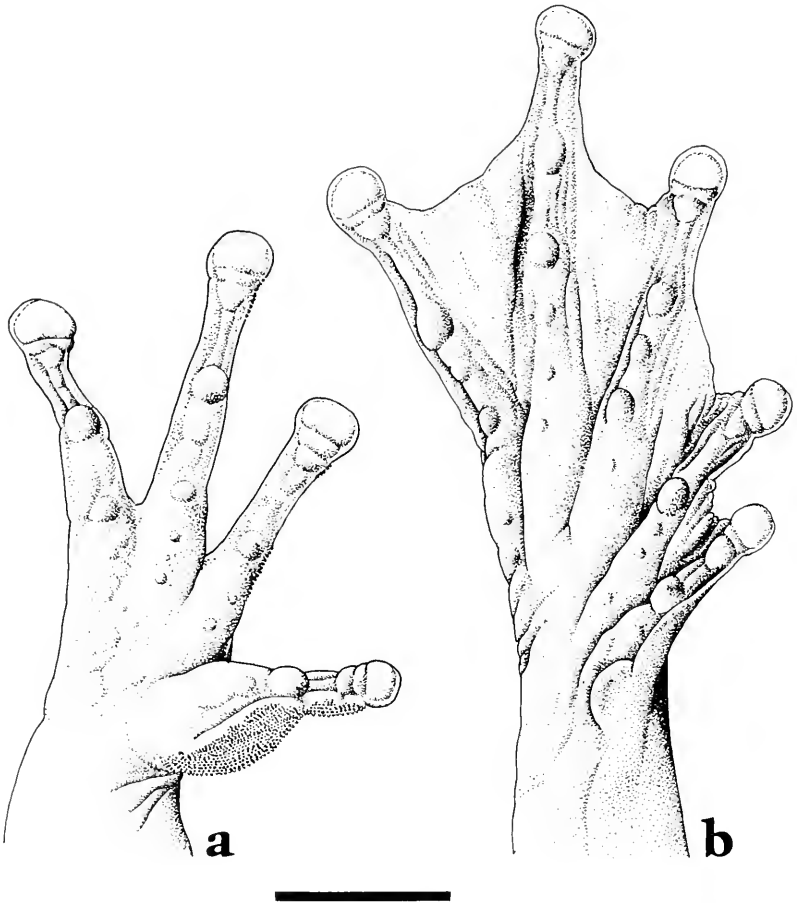


FIG. 3. Hand (a) and foot (b) of *Hyla bogertae* (LACM 44401, mature male; paratype). Scale is 5 mm in length.

of our drawing (Fig. 2) with that of *siopela* (Duellman, 1970, fig. 235-C) suggests; the latter figure shows an individual with less webbing than typifies most of the individuals we have seen of that species. The cloacal sheath of the single adult male *mykter* is longer than that of either of the two male *siopela*. *Hyla mykter* differs further in having a weak, instead of a well-developed, tarsal fold and in having proportionately longer legs. *Hyla siopela* and *mykter* are the only two members of this subgroup which typically have rostral keels and traces of webbing between the two outermost fingers. They also are the most thin-skinned and least robust of the six species. Of the remaining four species, *robertsorum* most closely

approaches *siopela* and *mykter* in these characteristics and presumably is closely related to them. The members of this subgroup of the *Hyla bistincta* species group typically are found in moist oak-pine forests at intermediate to high elevations in southern México and can be subdivided further into two series. The species in the first are more robust, have more glandular skin and include *bogertae* (Oaxaca, 2650 m), *crassa* (Oaxaca, 2300 m), and *pachyderma* (Veracruz, 1600 m); whereas in the second series the species are less robust, have thinner skin and include *mykter* (Guerrero, 1985-2520 m), *robertsorum* (Puebla and Hidalgo, 2250-3100 m) and *siopela* (Veracruz, 2500-2650 m).

Several frogs referred to the *Hyla bistincta* group have been recorded from Guerrero. The types and only known specimens of *Hyla chryses* were collected between 2540 and 2600 meters near Asoleadero. (This species is readily distinguished from *mykter* by the well-developed axillary membrane, the more slender and thinner-skinned body, and the absence of nuptial spines in *chryses*.) The three metamorphosing frogs from nearby Omiltemi (UIMNH 38023-25), referred to *bistincta* (by Duellman, 1964, and many subsequent authors including Adler, 1965), have been reexamined. All have tiny tailbuds (specimens collected in August, 1940), a mottled pattern on the dorsum, and long, virtually webless fingers. Newly metamorphosed individuals of *chryses* and *mykter* are not available; thus, these three specimens cannot be referred to any of the species known from Guerrero, although they seem to be allied to the *Hyla bistincta* group. They might even be referable to an as-yet-unnamed form in this species group based on an examination of eight frogs (IPN CB 149-156) collected in April 1963 at Agua Fria, a logging camp about 10 km E of Cerro Teotepac; these are the same specimens referred to *bistincta* by Duellman (1970, p. 698) as from "22 kilometers southwest of Yextla." All are in a poor state of preservation and exact measurements cannot be made; the snout-vent lengths of the three males are about 38, 39 and 39 mm; those of females range from 34 to 39 mm. They lack the long cloacal sheath, vocal slits, and flank pattern characteristic of *bistincta* and *pentheter*, and also lack the axillary membranes found in *chryses*. Their fingers are long, and the males have nuptial excrescences on the prepollex and smaller patches of spines on all other fingers; however, they have no webbing between the fingers, and lack the rostral keel and mottled venter characteristic of *mykter*. They were found by day in and along the edge of a pond at 2600 meters; their identity must await the acquisition of fresh material.

One other frog from Guerrero (UMMZ 125376, an adult female from near Asoleadero) also has been referred to *bistincta* (by Adler, 1965, and subsequent authors). A reexamination of this specimen shows this determination to be incorrect; the specimen lacks the bold markings on the flanks characteristic of *bistincta*, has a dark venter, is considerably smaller in size, and, according to radiographs, lacks a prepollical spine. It differs from *mykter* in the character of the prepollical spine, in having longer legs, and in several features of coloration; it is also dissimilar to the unnamed Agua Fria specimens in being larger, possessing reticulations on the flanks, and lacking a prepollical spine.

Thus, apparently none of the published references of *Hyla bistincta* in Guerrero is, in fact, based on specimens clearly referable to that species. Together with David H. Snyder, we collected four adult *bistincta* (KU 140420-23) in a moist cove along a dry, rocky canyon 4.5 km (by road) E of El Limón (about 6 km SW of Chilapa), Guerrero, at 1525 m elevation. The only other member of this species group known from Guerrero is *H. pentheter*, previously known only from Oaxaca; we obtained three individuals (KU 140424-26) at an elevation of 2000 m in the vicinity of Cerro Teotepec.

Etymology.—The specific name is from the Greek *μύκτηρ*, meaning nose, and is given in allusion to this frog's distinctive snout.

Distribution.—Known only from localities in the vicinity of Cerro Teotepec in the Sierra Madre del Sur of Guerrero, at elevations between 1985 and 2520 m.

SUMMARY

Two new frogs of the family Hylidae are described from the cloud forests of the Sierra Madre del Sur of Guerrero. They are members of two different species groups which have representatives primarily in the mountains of eastern and southern México. Both are illustrated (hands and feet; juveniles and adults in color).

Hyla trux, a member of the *H. taeniopus* species group, is a large species (males to 81.0 mm snout-vent length) with a mottled brown dorsum, vocal slits and blue webbing in adult males, absence of an axillary membrane, presence of a tarsal fold, nuptial spines on all fingers of mature males, and a hypertrophied web between toes one and two (in mature males). Specimens were taken at elevations between 1760 and 2120 m at several localities, all within 30 km of Cerro Teotepec. This species seems to be closely related to *H. taeniopus* Günther of the states of Puebla, Veracruz, and Hidalgo.

Hyla mykter, a member of the *H. bistincta* species group, is a medium-sized species (males to 40.1 mm; females to 50.9 mm) with a yellowish olive or pale gray-brown dorsum, absence of vocal slits and axillary membranes, no quadratojugal, nuptial spines on all fingers of mature males, long fingers with vestigial webbing, and a weak rostral keel. Specimens were taken at elevations between 1985 and 2520 m at several localities, all within 35 km of Cerro Teotepec. This species seems to be most closely related to *H. siopela* Duellman of the state of Veracruz.

Hyla bogertae Straughan & Wright, a member of the *H. bistincta* species group recently described from Oaxaca, is illustrated (hand and foot; adults in color).

RESUMEN

Dos nuevas ranas de la familia Hylidae, procedentes de las selvas nubladas de la Sierra Madre del Sur (México, Edo. Guerrero), son descritas en el presente trabajo. Estas especies pertenecen a dos grupos distintos de especies incluídas en el genero *Hyla* y con representantes en las áreas montañosas del sur y extremo este de México. Ambas especies son ilustradas (manos y pies; juveniles y adultos en color).

Hyla trux es un miembro del grupo *taeniopus*; se trata de una especie grande, machos con 81 mm de longitud naso-ventral y dorso irregularmente manchado de marrón; fisuras vocales y membrana interdigital de color azul; membrana axilar ausente; pliegue tarsal presente. Espinas nupciales presentes en todos los dedos de machos sexualmente maduros. Membrana interdigital entre los dedos uno y dos, hipertrofiada. Los ejemplares fueron colectados en varias localidades ubicadas entre 1760 y 2120 m altura, todas ellas a unos 30 kms del Cerro Teotepec. Esta especie parece estar relacionada a *H. taeniopus* Günther de los estados de Puebla, Veracruz e Hidalgo.

Hyla mykter es un integrante del grupo *bistincta*. Es una especie de talla media (longitud máxima de los machos, 40.1 mm; hembras 50.9). Coloración dorsal amarillo-oliváceo o marrón-grisáceo claro. Fisuras vocales y membranas axilares ausentes; cuadratojugales ausentes. Espinas nupciales presentes en todos los dedos de los machos maduros; dedos largos con membranas interdigitales vestigiales. Cresta rostral débil. Los ejemplares fueron colectados en varias localidades ubicadas entre los 1985 y 2520 m altura, a unos 35 kms del Cerro Teotepec. Esta especie parece relacionada a *H. siopela* Duellman del Estado de Veracruz.

Hyla bogertae Straughan y Wright, miembro del grupo *bis-tincta*, recientemente descrita de Oaxaca, es ilustrada (mano y pié; adulto en color).

ACKNOWLEDGMENTS AND METHODS

We thank David H. Snyder (University of Notre Dame) for field assistance and for comments on the manuscript. William E. Duellman (University of Kansas) kindly provided relevant portions of his monograph of Middle American hyloid frogs in advance of publication and loaned a large collection of comparative material (designated KU). Other museum abbreviations are: University of Michigan Museum of Zoology (UMMZ), University of Illinois Museum of Natural History (UIMNH), Los Angeles County Museum of Natural History (LACM), Instituto Politecnico Nacional, Ciencias Biológicas, México (IPN CB), United States National Museum of Natural History (USNM), Field Museum of Natural History (FMNH), American Museum of Natural History (AMNH), and British Museum (Natural History) (BMNH). Certain individuals loaned specimens from several of these institutions, namely Joseph T. Collins, Ticul Alvarez S., John W. Wright, Mrs. Dorothy M. Smith, and Charles F. Walker. James P. Collins and Arnold G. Kluge (both UMMZ) assisted in making x-rays. We thank Alfredo Sartorius Z. and his colleagues of Puerto del Gallo, Guerrero, for their hospitality, and Juan Luís Cifuentes L. (formerly of the Secretaria de Industria y Comercio, México) who provided our collecting permit. Carlos Machado-Allison (University of Notre Dame) translated the summary into Spanish. Field work involved in this study was supported incidental to research on salamander reproductive biology assisted by a grant from the Society of the Sigma Xi.

Methods of measurement of morphological features and of geographic distances are as indicated in Adler (1965:16).

SPECIMENS EXAMINED

Hyla altipotens Duellman. Oaxaca: 33-37 km N San Gabriel Mixtepec, KU 101002-06, 101008; 104341-42 (skeletons).

Hyla bogertae Straughan & Wright. Oaxaca: 1.6 km S La Cofradia, LACM 44401-03.

Hyla chaneque Duellman. Oaxaca: 4.2-16 km S Vista Hermosa, KU 86961-66, 86968, 86971; 84907-08 (skeletons); 8 km S Yetla, KU 86967.

Hyla charadriicola Duellman. Puebla: 14.4 km W Huachinango, KU 53813-15, 58415-22; 55624, 59813 (skeletons).

Hyla chryses Adler. Guerrero: 38 km airline WNW of Chilpancingo, UMMZ 125372-73, 125375; KU 106306.

Hyla mykter, new species. Guerrero: the type series, as listed above.

Hyla robertsonum Taylor. Hidalgo: El Chico Parque Nacional KU 71265-95; 59824-25, 71757 (skeletons).

Hyla siopcla Duellman. Veracruz: W slope Cofre de Perote, KU 100976-80, 100982-85, 105628-29; 117428-29 (skeletons); Cofre de Perote, KU 117430 (skeleton).

Hyla taeniopus Günther. Hidalgo: 3 km W Xochicoatlán, KU 53820-23, 53825-26; 55623, 59826 (skeletons); 2.5-4 km SW Tianguistengo, KU 53827-30. Puebla: 3.7 km NNE Tezuitlán, KU 53832-37, 57827; 55602-03 (skeletons).

Hyla trux, new species. Guerrero: the type series, as listed above.

Hyla, species uncertain. Guerrero: Omiltemi, UIMNH 38023-25; Agua Fria, 10 km E Cerro Teotepcc, IPN CB 149-56; between Puerto Chico and Asoleadero, UMMZ 125376.

LITERATURE CITED

ADLER, K.

1965. Three new frogs of the genus *Hyla* from the Sierra Madre del Sur of México. Occas. Papers Mus. Zool. Univ. Michigan, 642:1-18, pl. 1.

DUELLMAN, W. E.

1964. A review of the frogs of the *Hyla bistincta* group. Univ. Kansas Publ. Mus. Nat. Hist., 15:469-491.

1965. Frogs of the *Hyla taeniopus* group. Copeia 1965 (2):159-168.

1970. The hylid frogs of Middle America. Monogr. Mus. Nat. Hist. Univ. Kansas, 1:xii+1-753, pl. 1-72.

MUSSER, G. G.

1964. Notes on geographic distribution, habitat, and taxonomy of some Mexican mammals. Occas. Papers Mus. Zool. Univ. Michigan, 636: 1-22.

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