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THREE NEW SPECIES OF THE GENUS *RHADINAEA*
FROM GUATEMALA

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RECENT collecting in the central mountain ranges of Guatemala by Mr. Raymond Stadelman of the United States Department of Agriculture and by the senior author has resulted in the capture of 6 specimens of the genus *Rhadinaea*. Though it may seem overcritical to assign these 6 specimens to 3 new species, the junior author¹ has already noted that the tendency of this genus to invade high altitudes has undoubtedly contributed to the multiplication of species of limited distribution. The new forms originated, moreover, from the herpetologically poorly known mountains of the Alta Verapaz and from the wholly unknown Sierra de los Cuchumatanes.

An arrangement of the Mexican species of *Rhadinaea* has recently been presented by the junior author,² but there is still much to be desired in our knowledge of the Central American forms. The first 2 species described below clarify, to some extent, the *lachrymans-godmani*³ relationships suggested in

¹ Joseph R. Bailey, "The Mexican Snakes of the Genus *Rhadinaea*," *Occ. Papers Mus. Zool. Univ. Mich.*, 412 (1940): 2.

² *Ibid.*

³ Though Günther used a double "n" in the original description of this form, we believe that it was a *lapsus calami*, as he spelled Godman's name correctly several lines later.

the junior author's paper.⁴ Until Nicaragua and Honduras are better known, few suggestions can be made as to relationships between northern and southern Middle American forms.

The first species to be named is dedicated to Mrs. R. W. Hempstead of Cobán, Alta Verapaz, Guatemala, to whom the senior author is greatly indebted for the many courtesies she extended to him during his investigations in the Alta Verapaz. It may be known as

Rhadinaea hempsteadae, new species

HOLOTYPE.—University of Michigan Museum of Zoology (U.M.M.Z.) No. 89080, an adult male collected by L. C. Stuart in the cloud-forest zone (ca. 5700 feet) above Finca Chichén, Alta Verapaz, Guatemala,⁵ May 26, 1940.

PARATYPE.—U.M.M.Z. No. 89081, from the same locality as the holotype, though from a higher altitude.

DIAGNOSIS.—A *Rhadinaea* of the *lachrymans-godmani* group, with 19 rows of dorsal scales, 163–66 abdominals, and 93–94 subcaudals. A dorsal pattern of a narrow, dark, middorsal stripe, and a light lateral stripe on either side on the fifth dorsal scale row.

DESCRIPTION OF THE TYPE.—Head scales normal; internasal suture $\frac{1}{2}$ as long as the prefrontal suture; frontal very slightly longer than its distance from the end of the snout and shorter than the parietals. Supralabials, 8, fourth and fifth entering the orbit; infralabials, 8 on one side, 9 on the other, 5 in contact with the anterior chin shields, which are shorter than the posterior ones; oculars 1–2; temporals 1 + 2. Dorsal scales in 19 rows on the body; abdominals, 163; subcaudals, 94 + 1; anal divided. Maxillary teeth, 21, increasing in size posteriorly, the last 2 strongly enlarged but not separated from the others by a diastema. Body length, 266 mm.; tail length, 128 mm.

Dorsally the ground color is brown. There is a darker mid-dorsal stripe, 1 scale row in width. Laterally, the center of

⁴ *Op. cit.*, pp. 15–16.

⁵ Finca Chichén is in the pine zone of the Alta Verapaz about 10 km. (straight line) south and slightly east of Cobán, Alta Verapaz.

each scale in the fifth row is lighter, to produce a light lateral stripe, bordering a dark stripe which is situated on the lower $\frac{1}{3}$ of scale row 5, on all of scale row 4, and on the upper $\frac{1}{3}$ of scale row 3. The color of the lower $\frac{1}{2}$ of scale row 3 and the upper half of scale row 2 is somewhat lighter than the ground color. The outer edge of all the ventral scutes is somewhat darkened, and gives the appearance of a ventrolateral stripe.

The head is dark brown dorsally and laterally. The supralabials each possess a distinct, large, white spot, and there is a white bar which extends from the lower, posterior edge of the eye to the angle of the mouth. As in *stadelmani* (p. 4) there is an indication of a light rostral border. The entire undersurfaces are white except for brown fleckings on the anterior infralabials and for the brown outer edges of the ventral scutes.

The senior author's field notes indicate that in life the dorsal ground color was reddish brown. Lighter flecks on scale rows 2 and 3 and on scale row 5 suggested 2 light lateral stripes. The labial spots and the eye-mouth bar were bright yellow. The undersurfaces were lemon-yellow.

VARIATION.—The paratype, a male, is similar to the holotype in all respects. It has 166 abdominals, 93 subcaudals, and only 18 maxillary teeth. The dorsal ground color is grayish brown, or grayish blue where the *stratum corneum* is lacking. The middorsal dark stripe is very faint anteriorly and absent posteriorly. The fifth row of dorsal scales is white-spotted throughout its length, and scale row 2 is somewhat lighter anteriorly. Posteriorly the specimen is unicolor except for the light stripe on scale row 5. The eye-mouth bar is absent on one side and somewhat obscure on the other.

A headless specimen from the cloud forest above Finca Volcán, some 45 km. due east of Cobán (in a straight line), is reddish brown above, with the dark middorsal stripe and light lateral stripe anteriorly. When found, freshly killed, it was coffee-brown above and lemon-yellow beneath.

RANGE.—Probably restricted to the cloud forest between the Cahabón and Polochic rivers in the main mountain mass of the Alta Verapaz, Guatemala.

HABITS.—This species is apparently a secretive inhabitant of the cloud-forest zone, the lower limit of which in the Alta Verapaz is at about 5000 feet. The holotype was found beneath a log in a cleared *milpa*, and the paratype was taken from beneath a pile of wood chips in the cloud forest. The headless specimen was found dead on a trail in the cloud-forest zone. From the stomach of the holotype was taken a specimen of *Oedipus helmrichi* Schmidt. Inasmuch as the senior author has never found this salamander on the ground, and since *R. hempsteadae* is a gracefully attenuate form, it is suggested that it may, possibly at night, climb to some extent.

RELATIONSHIP.—This species is believed to represent a peripheral offshoot of *stadelmani*. Its eye-mouth bar, light-bordered rostral, and tendency towards 3 dark anterior stripes certainly place it in the *godmani-lachrymans* series. It has apparently invaded the Alta Verapaz from the west, a history similar to that of several other Verapaz species.

For Mr. Raymond Stadelman, whose collecting in Honduras and Guatemala has made him well known to herpetologists, we name

Rhadinaea stadelmani, new species

HOLOTYPE.—U.M.M.Z. No. 89078, a juvenile female collected by Mr. Raymond Stadelman at Todos Santos, Huehuetenango, Guatemala, at 8000 feet altitude, November, 1937.

PARATYPE.—U.M.M.Z. No. 89079 from the type locality.

DIAGNOSIS.—A *Rhadinaea* of the *lachrymans-godmani* series, with 19 rows of dorsal scales, 179–84 abdominals, and 74–77 subcaudals. A dorsal pattern of a narrow, dark, middorsal stripe, and a lateral stripe on the common borders of the third and fourth scale rows; posteriorly another stripe on the common borders of the sixth and seventh scale rows.

DESCRIPTION OF HOLOTYPE.—Head scales normal; internasal suture less than $\frac{1}{2}$ the length of the prefrontal suture; frontal considerably longer than its distance from the end of the snout and shorter than the parietals. Supralabials, 8, fourth and fifth entering the orbit; infralabials, 8, 4 in contact with the

anterior chin shields, which are shorter than the posterior ones; oculars, 1-2; temporals, 1 + 2. Dorsal scales in 19 rows over the length of the body; abdominals, 179; subcaudals, 74 + 1; anal divided. Maxillary teeth, 17, increasing in size posteriorly and lacking a diastema. Body length, 130 mm.; tail length, 43 mm.

Dorsally the ground color is brown. The central $\frac{1}{3}$ of the middorsal row of scales is darkened to produce a narrow, dark, middorsal stripe. Laterally the upper $\frac{1}{2}$ of scale row 3 and the lower $\frac{1}{2}$ of scale row 4 are also darkened to form a somewhat broader, dark, lateral stripe. Another faint stripe appears on the posterior third of the body as a result of the darkening of the upper $\frac{1}{2}$ and lower $\frac{1}{3}$ of scale rows 6 and 7 respectively. In this same region the lower lateral stripe is somewhat obscured because scale rows 1 and 2 are darker. The brown ground color of the dorsum infringes onto the outer edges of all the ventral scutes, which are otherwise white.

The ground color of the head is dark brown, both above and laterally. There is an irregular spot of white along the posterior edges of the frontal, and the rostral and adjacent scales, anteriorly, are bordered with white. The supralabials each contain a sharply demarked white spot, and a light stripe extends from the inferoposterior border of the orbit to the angle of the mouth. There is a large white spot laterally on either side of the nape. The inferior surfaces are immaculate white, with the exception of the brown spotting on the infralabials and the brown markings on the outer ends of the ventral scutes.

VARIATION.—The paratype, also a juvenile, with a crushed neck and partially crushed head, is essentially like the holotype. It has 184 abdominals, 77 subcaudals, and 19 dorsal scale rows anteriorly, which are reduced to 17 posteriorly through the fusion of the paravertebral (ninth) rows with the eighth row on either side. The sole difference in pattern is to be found in the greater clarity of the superior lateral stripe on the posterior part of the body.

RANGE.—Though known only from the type locality, it is not

improbable that this species is endemic to the Sierra de los Cuchumatanes of Huehuetenango and El Quiché.

HABITS.—We know nothing of the habits of this species other than that it was collected in the pine zone on the slopes of the Cuchumatán Mountains.

RELATIONSHIP.—In his recent paper, the junior author,⁶ although uncertain as to the position of *Rhadinaea lachrymans* (Cope), suggests that it is a relative of *R. godmani* (Günther). That such is the case is now more evident on the basis of this new form. In pattern it is almost identical with *godmani*, with the exception that there is an additional pair of lateral stripes posteriorly. Its posterior pattern is also close to that of *lachrymans*. With its 19 dorsal scale rows, it is intermediate between *godmani* and *lachrymans*, which possess 21 and 17 dorsal scale rows respectively.

Though *stadelmani* is geographically not exactly annectent between *godmani* and *lachrymans*, it is sufficiently close to offer no difficulties to being regarded as an intermediate form. An account of the group relationships will be presented below.

RELATIONSHIPS OF THE LACHRYMANS GROUP.—The *lachrymans-godmani* relationship previously suggested by the junior author⁷ is, through the discovery of the above-described species, greatly clarified and now permits the outline of another natural group of the complex genus *Rhadinaea*. Two species of *Rhadinaea*, *godmani* and *serperaster*, have stood out from the great mass of Middle American forms by virtue of their distinctive head pattern (described below), their possession of more than 17 rows of dorsal scales, and by an absence of a diastema in the maxillary dentition and of anal ridges in mature males. To these 2 species we may now add *stadelmani*⁸ and *hempsteadae*, which are similarly characterized.

These 4 species are linked to the more usual *Rhadinaea* types

⁶ *Loc. cit.*

⁷ *Op. cit.*, pp. 15–16.

⁸ Since we have not had access to adult specimens of *stadelmani* we are unable to state definitely that anal ridges are a diagnostic group character.

by *R. lachrymans*, which resembles the former in its lack of anal ridges in adult males and in its head pattern, and approaches the latter in possessing but 17 rows of dorsal scales and a diastema. Though *lachrymans* is a typical annectent form, we prefer to place it in a group with the other 4 species because of its head pattern and lack of anal ridges and because, as will be shown, it represents an end form in number of dorsal scales. These 5 species, which we may call the *lachrymans* group, inhabit the high mountains of Chiapas and Guatemala, except *serperaster*, which is known from Costa Rica. Additional members of the group undoubtedly await discovery in the higher altitudes of the intervening mountains of Honduras and Nicaragua.

In the number of dorsal scale rows *R. godmani* stands at one end of the series with 21 and *R. lachrymans* at the other end, with but 17. Between these extremes we find *R. serperaster*, with 21 or 19, and *R. hempsteadae* and *R. stadelmani*, with 19. The paratype of *stadelmani* shows a dorsal reduction of from 19 to 17 rows posteriorly, owing to a fusion of the ninth (paravertebral) and eighth scale rows on either side. Reduction in number of dorsal scale rows is, aside from the above instance, unknown in Middle American *Rhadinaea*, but this same reduction is found in the related genera *Diadophis* and *Coniophanes*, so that its occurrence here is not surprising. Our interpretation of dorsal pattern is based on the assumption that increase or reduction in dorsal scutellation is centered around the paravertebrals.

In the dorsal pattern of this group, as in the Mexican species, there is a tremendous amount of interspecific variation. Figure 1 is a diagrammatic representation of the pattern in the several species. Two sets of stripes occur in the group, the one which we refer to as the major or primary stripes (solid in the diagram) and the minor or secondary stripes (stippled in the diagram). All of the species of the *lachrymans* group have a major stripe, which varies in width, on the middorsal row. The common borders of the third and fourth rows likewise bear a major stripe, which in *hempsteadae* is widened

above to include part of the fifth row and in *lachrymans* is widened below to include a part of the second row.

Secondary stripes occur on the outer edges of the ventral scutes (occasionally overlapping slightly on the lower half of the first scale row) and on the common borders of the sixth and seventh scale rows. In *R. serperaster* this latter is widened above to include part of the eighth scale row. As in scutellation, *R. stadelmani* stands half way between *R. godmani*

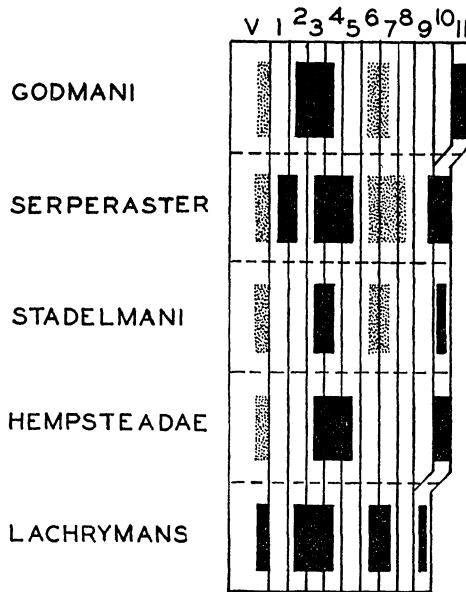


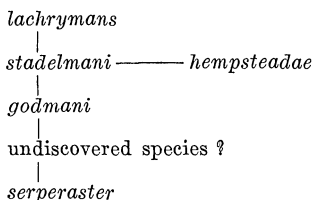
FIG. 1. Diagrammatic representation of the dorsal pattern of species of the *lachrymans* group of *Rhadinaea*.

and *R. lachrymans*. The pattern is most complex in *serperaster* and least so in *hempsteadae*. In *lachrymans* there is a distinct tendency for the stripes to darken with age, even to the extent of the 2 secondary stripes becoming as intense as the primary ones. To what extent ontogenetic changes in pattern occur in the other species we are not prepared to say.

The distinctive head pattern which serves to tie this group together is characterized by a light border around the posterior

edge of the rostral, prominent light spots on the supralabials, a light bar from the eye to the corner of the mouth, and the absence of a light temporal stripe behind the eye. This pattern is a diagnostic character of the group.

The absence of a diastema in the maxillary dentition in species of *Rhadinaea* with more than 17 rows of dorsal scales is possibly a "primitive" character and may, in combination with the higher scale formula, indicate an ancestral position in the genus. The diacranterian dentition, on the other hand, is much commoner than the syncranterian type in the Xenodontinae and, with the increased number of dorsal scales, may well indicate specialization on the part of the *lachrymans* group. In whichever direction the series may progress, it is indicated that the relationships of the group are as follows:



It is with some hesitation that we describe a second species from the Alta Verapaz. Our type proves to be a juvenile male, but since, even allowing for the juvenile pattern, we are unable to allocate it to any known species group, we feel that attention should be called to it through a description. We name it

Rhadinaea veraepacis, new species

HOLOTYPE.—U.M.M.Z. No. 89077, a juvenile male collected in the pine zone (5100 ft.) at Finca Chichén, Alta Verapaz, Guatemala, by L. C. Stuart, May 17, 1940.

DIAGNOSIS.—A *Rhadinaea* of obscure relationships, possessing 17 dorsal scale rows, 145 abdominals, and 80 subcaudals. A dorsal pattern of a middorsal dark stripe and another distinct, dark, light-centered lateral stripe on either side.

DESCRIPTION OF HOLOTYPE.—Head scales normal; internasal suture about $\frac{1}{4}$ as long as prefrontal suture; frontal about $\frac{1}{2}$ as

long as the parietals and much longer than its distance from the end of the snout. Supralabials 8, fourth and fifth entering the orbit; infralabials, 8, 4 in contact with the anterior chin shields, which are longer than the posterior ones; oculars 1-2; temporals 1 + 2. Dorsal scales in 17 rows over the length of the body; abdominals, 145; subcaudals, 80 + 1; anal divided. Maxillary teeth, 13, increasing in size posteriorly and with a diastema anterior to the last 2. Body length, 111 mm.; tail length, 47 mm.

The dorsal ground color is light brown. The middorsal scale row is much darker brown, with minute white flecks, and it produces a dark middorsal stripe. Laterally, scale row 4 and the upper $\frac{1}{3}$ and the lower $\frac{1}{3}$ of scale rows 3 and 5 are similarly darkened, and a broad lateral stripe is thus produced on either side. The center of each scale in scale row 4 contains a light fleck, so that actually the broad lateral stripe appears as 2 narrower stripes in close proximity. A somewhat lighter lateral stripe with a similar light center appears on scale row 6 and the edges of the adjacent scale rows. Other bands, darker than the ground color but lighter than the middorsal or main lateral stripes, occur on the lower $\frac{1}{3}$ of scale row 1 and the outer edges of the ventral scutes, another on the upper $\frac{1}{3}$ and the lower $\frac{1}{3}$ of scale rows 1 and 2, and yet another on the upper $\frac{1}{3}$ and the lower $\frac{1}{3}$ of scale rows 2 and 3.

The dorsal surface and sides of the head are dark brown. The posterior portion of the frontal is strongly punctated with white, and the rostral is white-bordered above and laterally. The supralabials are brown, each of the first 7 with a large white spot. The infralabials, chin, and throat are white, slightly flecked with brown anteriorly. The remaining under-surfaces are white except for the brown lateral edges of the ventral scutes. There is a white vertical band laterally on either side of the nape.

RANGE.—Though known only from the type locality, this species may prove to inhabit the mountains of the Alta Verapaz below *R. hempsteadae*.

HABITS.—Nothing is known of the habits of this species. The holotype was found ensnared in a spider-web in the hacienda at Finca Chichén, which lies in the heart of the pine zone of the Alta Verapaz.

RELATIONSHIPS.—The relationships of *Rhadinaea veraepacis* are, at the present, obscure. Structurally, in having 17 dorsal scale rows and a distinct diastema in the maxillary dentition, it is closer to the other groups of *Rhadinaea* than it is to the *lachrymans* complex, which it resembles somewhat in head pattern. Though it lacks the light eye-mouth bar, it does possess a light rostral border and prominent light spots on the supralabials. Its tendency toward possession of light streaks along the centers of the dorsal scale rows may indicate a *pachyura-fulviceps-lateristriga* relationship to the south. The latter species present a body pattern which is uniformly dark, broken by 5 light streaks on certain of the scale rows. It is possible that this type of pattern forms one evolutionary extreme while the predominately light dorsum with accessory dark stripes, as in the *lachrymans* group, presents the opposite end.

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