

THE UNIVERSITY OF KANSAS SCIENCE BULLETIN

VOL. XXXVIII, Pt. II] MARCH 20, 1958

[No. 17

The Status of the Mexican Lizards of the Genus *Mabuya*

BY

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ABSTRACT. The Mexican lizards of the genus *Mabuya* are examined critically. Material consisting of 75 specimens from seven Mexican states was available. A study of the variation from the various localities was made and it was found that the populations were for the most part homogeneous and no subspecific variants were recognized. It was determined that the proper name for the Mexican species is *Mabuya brachypoda* Taylor.

INTRODUCTION

The conservatism of Dunn (1936), who considered *Mabuya mabouya mabouya* as ranging from Mexico to Ecuador, Brazil and the Lesser Antilles has been questioned. Burger (1952) revived the name *alliacea* of Cope (1876) and regarded the mabuyas ranging from Mexico to Costa Rica as *Mabuya mabouya alliacea*. In addition, Taylor (1957) resolved Costa Rican material into three distinct species, *Mabuya unimarginata*, *Mabuya brachypoda*, and *Mabuya alliacea*. Dunn, himself, (*loc. cit.* : 545) in his concept of *M. mabouya mabouya*, recognized that the populations were “. . . numerous and quite diverse, . . .” This variation in populations of the mainland coupled with an insular type locality (restricted to St. Vincent by Smith and Taylor, 1950:156) for *M. mabouya mabouya* suggests the presence of mainland populations worthy of taxonomic recognition.

In view of this variation, Dr. Edward H. Taylor suggested to the author that a study of the variation exhibited by the genus *Mabuya* in Mexico be made in an effort to clarify the taxonomic relationships of the northern mainland populations. The author is grateful to Doctor Taylor for permission to study specimens in

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his private collection and for constructive criticism of the manuscript.

The present study is based on an examination of 75 specimens from seven Mexican states which were collected intermittently in the years 1932 to 1940. All numbers are those of the EHT-HMS collection (private collection of E. H. Taylor), and are listed by locality below.

Campeche.—Balchacaj, 14435-36, 14438-39, 14450-51, 14457; Tres Brazos, 14441-45, 14447-48; Encarnación, 14453-54, 14456 (17 specimens).

Chiapas.—San Ricardo, 10504; Libertad, 15425; Tuxtla Gutierrez, 15343 (3 specimens).

Guerrero.—12 mi. S. Chilpancingo, 10453; 7 mi. E. Chilpancingo, 22237-38, 23915; near Chilpancingo, 23885; 1 mi. N. Organos, 10454; El Limoncito, near Acapulco, 19094-95, 19097-98, 19100-01, 19103-04, 19106-07; between Chilpancingo and Omilteme, 23882-83; Agua del Obispo, 10456-57, 23907-08 (22 specimens).

Michoacán.—Uruapan, 10460, 10462-63, 10465-66, 10468-69, 10471-72, 10474-75, 10477-78, 10480-81, 10483-84, 10486-87, 10489-90, 10492-93, 10495-96, 10498-99, 10501-02 (29 specimens).

Morelos.—Puente de Ixtla, 19092 (1 specimen).

Oaxaca.—Totalapan, 10459 (1 specimen).

Yucatán.—Progreso, 14432; Mérida, 14433 (2 specimens).

VARIATION

Body proportions.—The following measurements were utilized:

Snout-vent length—from the tip of the snout to the anterior margin of the anus.

Tail length—from the anterior margin of the anus to the tip of the tail; only measurements of complete tails were taken.

Head length—from tip of snout to anterior margin of ear along a line parallel to the lateral axis of the head.

Head width—the greatest width in a transverse straight line.

Leg length—from the tip of the longest toe (including the claw) to the angle with the body (posterior to fore limb and anterior to hind limb), with the leg extended at right angles to the body.

Axilla-groin distance—a straight line from the posterior margin of insertion of the fore limb to the anterior margin of the insertion of of the hind limb.

Also, ratios from six body proportions were calculated; these were snout-vent/axilla-groin, snout-vent/fore limb, snout-vent/hind limb,

snout-vent/head length, snout-vent/head width, and axilla-groin/hind limb.

In an attempt to determine ontogenetic variation, individuals were assigned to three arbitrary size groups as follows: 1) 20-40 mm., 2) 41-60 mm., 3) 61-83 mm.

The largest sample available from a single locality is 29 specimens from Uruapan, Michoacán. A consideration of geographic variation involved a comparison of the Michoacán sample with 22 specimens from Guerrero and 19 from Campeche.

The construction of scattergrams and calculation of mean and extreme ratios revealed little sexual diamorphism, ontogenetic growth, or geographic variation in body measurements. Smaller individuals have larger heads. In the 20-40 mm. size-group the head length is contained in the snout-vent length an average of 4.2 times (13 specimens), whereas in the 61-83 mm. size-group it is contained 5.3 times (38 specimens). Similarly, the snout-vent/head width average ratio for 13 specimens in the 20-40 mm. size-group averages 6.2, whereas the same for 38 specimens in the 61-83 mm. size-group averages 7.4.

The hind limb is longer in the smaller individuals in relation to the axilla-groin length. The average axilla-groin/hind leg ratio in the 20-40 mm. size-group was 1.4, whereas the same in the 61-83 mm. size-group was 1.7. The length of the fore limb in relation to the axilla-groin length was not considered. It is of interest that no ontogenetic growth in the hind limb is revealed if a comparison of the snout-vent/hind limb ratios of the three size-groups is made, as an average ratio of 3.1 is maintained; this is probably reflected in the differential growth of the head.

In regard to tail length, seven juveniles ranging in snout-vent length from 26 to 31 mm. (sex undetermined) have an average tail length/snout-vent length ratio of 1.3 (1.2-1.4). The analysis of variation in tail length of adults was limited to five specimens (2 males, 3 females) in which the tail length/snout-vent ratios in males (1.9 and 2.0) are larger than that in females (1.7, 1.7, and 1.7). A male, 64 mm. in snout-vent length, had the longest tail, (130 mm.); all females exceeded 64 mm. in snout-vent length. The meager data indicate that adult males have longer tails in relation to snout-vent length than do adult females.

Females attain a larger size than males and have an average snout-vent length of 71.2 mm. (extremes 62-83 mm.) based on 19 specimens, whereas males have an average snout-vent length of

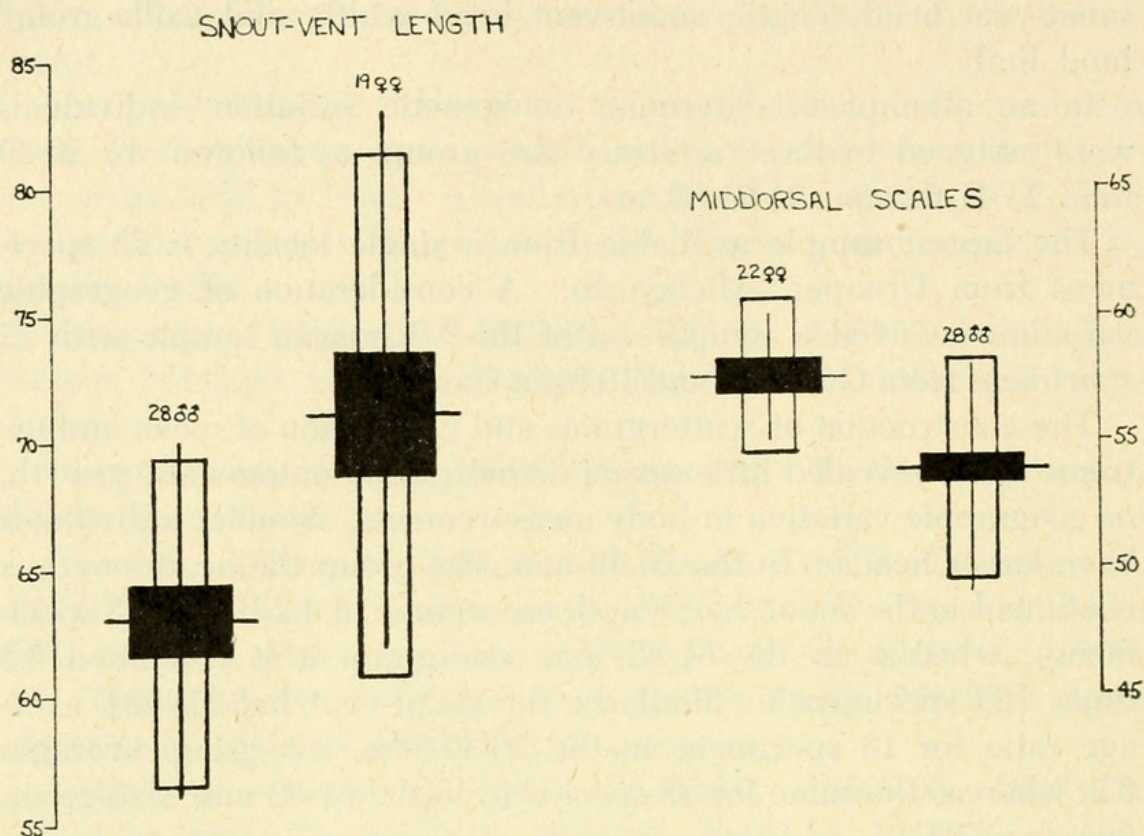


FIG. 1. Variation between sexes in snout-vent length and number of mid-dorsal scales. The horizontal line indicates the mean; the vertical line, the observed variation; the white rectangle, four standard deviations; the black rectangle, four standard errors of the mean.

63.0 mm. (extremes 56-70 mm.) based on 28 specimens (Fig. 1). Data used are from specimens regarded as sexually mature (see page 1312).

Scutellation.—The dorsal body scales of all specimens are smooth with no evidence of keels.

Middorsal scales: A count of the dorsal scales from the most anterior body scale (excluding the nuchal), in a straight line at or near the middorsal line as far back as a line even with the posterior margins of the thighs, when the hind legs are held at right angles to the body. There is a distinct sexual dimorphism in the number of middorsal scales (Fig. 1). Males averaged 53.9 (extremes 49-58), based on 28 individuals, whereas females averaged 57.6 (extremes 55-60), based on 22 individuals.

Mid-body scales: A transverse count of the longitudinal scalerows at a point one fourth the axilla-groin length anterior to the insertion of the hind leg. Counts taken at mid-body usually include intercalary rows which extend posteriorly from the axillary region. These scales varied in number from 28 to 32. A count of 28 scale-rows (51%) was recorded for 29 of 57 specimens; thirty scalerows

occurred in 24 counts (42%) and 32 scalerows in 4 counts (7%). The count of 32 scalerows was restricted to females.

Supralabials: The scales bordering the upper edge of the mouth except at the tip of the snout where the rostral occurs. The largest posterior scale is regarded as the last supralabial. Of 73 specimens in which both sides could be counted, 51 (70%) had a combination of 6-6, 15 (20%) had a combination of 6-7, 5 (7%) had a combination of 5-6, and 2 specimens (3%) had a combination of 7-7. Considering each side separately and based on 148 counts, 6 supralabials occurred in 124 counts (84%), 7 occurred in 19 counts (13%), and 5 occurred in 5 counts (3%). When a count of 6-6 occurs, the fifth supralabial is the largest and lies immediately beneath the orbit, with one labial posterior and four anterior. In the case of seven supralabials, the sixth is the largest and beneath the orbit, and with five supralabials, the fourth is the largest and beneath the orbit. Five supralabials occurred only in certain specimens from Guerrero.

Infralabials: The scales bordering the lower edge of the mouth except for the most anterior mental scale. Of 71 specimens in which both sides could be counted, 59 specimens (84%) had a combination of 6-6, 7 (9%) had a combination of 6-7, 3 (4%) had a combination of 7-7, and 2 (2%) had a combination of 5-6. Considering each side separately and based on 146 counts, six infralabials occurred in 129 counts (89%), 7 occurred in 15 counts (10%), and 5 occurred in 2 counts (1%). All specimens with five infralabials are from Guerrero.

Postmental: A scale following the mental along the midventral line. The postmental was unpaired in 72 specimens and asymmetrically divided in another.

Nuchals: The enlarged paired scales immediately posterior to the parietals. Of 72 specimens, all had one pair of nuchals; the two nuchals were fused medially in one specimen from Yucatán.

Parietals: Paired scales posterior to the frontoparietals and bordering the interparietal on either side. Of 73 specimens, all had the parietals in contact posteriorly.

Supraoculars: The scales above the orbits. A count of 4-4 occurred in 68 specimens (95%), two specimens had a count of 3-4 (3%), and one specimen had a count of 3-3 (2%). Considering each side separately and based on 146 counts, four supraoculars occurred in 141 counts (97%) and three supraoculars occurred in 5 counts (3%). The most anterior supraocular is the smallest, the one immediately posterior to it is the largest.

Prefrontals: Paired scales immediately preceding the frontal. The prefrontals were separated in 67 specimens (92%) and in contact in six specimens (8%).

Supranasals: Paired scales immediately preceding the frontonasal and posterior to the rostral. Of 75 specimens, 55 (73%) had the supranasals in contact medially, whereas they were separated in 20 specimens (27%). Of possible geographic interest is the fact that none of the 28 specimens from Michoacán had the supranasals separated. Dunn (*loc. cit.* :540) reports contact of the supranasals in only 33% of the specimens he examined from Mexico. Burger's comments (*loc. cit.* :187) concerning the variation of this character in Mexico closely parallels the results of this study.

Chin shields: A paired series of scales extending posteriorly from the postmental. From a total of 73 specimens, 52 (71%) had a combination of 2-2, 10 (14%) had a combination of 1-2, 8 (11%) had a combination of 1-1, 2 (3%) had a combination of 2-3, and 1 specimen (1%) had a combination of 3-3.

Coloration.—The following comments pertain to all sizes of both sexes, there being little or no sexual or ontogenetic variation in coloration. Dorsally the ground color ranges from a dark olive to a light burnt-brown and may be uniform or marked with small dark spots. The venter, throat, and undersurface of the limbs are light and without markings. The anterior, posterior, and dorsal surfaces of the limbs have a marbled or reticulate appearance. A lateral white stripe extends from the angle of the mouth posteriorly through the lower half of the tympanic cavity and just above the insertion of the fore limb to terminate just above the insertion of the hind limb or just posterior to it on the tail. This bilateral white stripe is about one scale wide and, at mid-body, usually (73%) overlaps two longitudinal scalerows, the ventral half of the seventh and dorsal half of the eighth scalerows on the right side, and the ventral half of the sixth and dorsal half of the seventh scalerows on the left side (excluding the middorsal scalerow). Occasionally (27%), the lateral white stripe engages only one scale row on each side, the seventh on the right and the sixth on the left. Immediately dorsal to the lateral white stripe is a longitudinal dark brown band on either side which is two (rarely one and one-half or two and one-half) scalerows wide; it begins anteriorly on the lateral head scales and extends posteriorly through the eye, the upper half of the tympanic cavity and terminates posteriorly at the posterior insertion of the hind limb. Ventral to the lateral white

stripe on both sides is a dark band varying in width, which merges with the immaculate venter. Adjacent and dorsal to the lateral brown band on either side is a narrow light line which may be indistinct.

Geographic variation and sexual differences were noted in the extent of markings on the dorsum. In males from Guerrero, Oaxaca and Morelos, the dorsum (area between lateral dark brown bands) was uniform without markings (19092, 19098, 10459), or with only a few small scattered black spots (19095, 22238, 23882). One specimen, however, (10457) had considerable dark marking. In males from Michoacán, the dorsum is more consistently marked with small black marks which in some tend to form short narrow longitudinal stripes (10465, 10483, 10498); others have a more or less uniform dorsum (10466, 10492-93). The tendency to form longitudinal dark stripes by fusion of the small black spots is increased in the more eastern states of Campeche, Chiapas and Yucatán, and is apparent in three males (14456, 14442, 14445). Another (14432) has a spotted dorsum but no evident stripes. All other males have some markings, though sparse. Females have for the most part a uniform dorsum and do not exhibit as strong a geographic trend as do males. Guerrero and Michoacán females may have a uniform dorsum or one with scattered dark marks. One female from Michoacán (22237) is strongly marked but there is no tendency for longitudinal stripes. Of 11 females from Chiapas, all have a uniform dorsum, or nearly so, except three specimens, one of which has narrow longitudinal stripes (14439), and two (14435, 15343) which tend toward the formation of longitudinal stripes.

One of Burger's criteria (*loc. cit.*:186) for recognizing the population occurring from Mexico to Costa Rica is based on the narrow dorsolateral dark stripe which is two or less scales in width rather than two and one-half or three scales. The dorsolateral dark stripes are the same as the lateral bands referred to in this paper, which are two scales wide.

COMPARISONS

The current appellation for Mexican mabuyas is *Mabuya mabouya alliacea*. Taylor (*loc. cit.*) dealing with the Costa Rican Mabuyas re-elevated *alliacea* to specific rank but made no mention that the binomial should be applied to Mexican representatives of the genus; his redefinition of *Mabuya alliacea* affords a basis for comparison with the Mexican population. The presence of an

azygous scale between the supranasals and the unequal, transverse division of each parietal scale resulting in a separation of the parietal scales, as depicted by Cope (*loc. cit.*:pl. 6, fig. 1) in the illustration accompanying the type description, is regarded as an anomaly as neither configuration has been encountered by Taylor or myself. The other characters given by Cope in the type description are either in agreement with or encompassed by the variation in the data presented by Taylor.

In regard to the enlarged preanal scales described for the types of *alliacea*, the author agrees with the comments of Dunn (*loc. cit.*: 542) who regarded the character of no useful taxonomic significance. Taylor calls attention to an axillary pit or pocket behind the insertion of the arm. These had been overlooked by previous workers. In all the Mexican specimens examined they were well developed.

Using, then, the data given by Taylor, selected characters of *Mabuya alliacea* from Costa Rica are compared with those exhibited by the specimens from Mexico (Table 1). The range of variation in the number of mid-body scales is slightly lower in *alliacea* though an average of 28 scales is common to both. *Mabuya alliacea* differs from the Mexican specimens in that 1) the sixth supralabial subtends the orbit, 2) the rostral normally touches the frontonasal, 3) a dorsolateral dark stripe is present, and 4)

TABLE 1.—Comparison of Characters of *Mabuya alliacea*, *Mabuya brachypoda* and specimens from Mexico.

	<i>alliacea</i> 18	<i>brachypoda</i> 12	Mexican specimens 75
midbody scales	26-29 28 (59%)	28-32 30 (66%)	28-32 28 (51%)
supralabial below eye	6th (84%)	5th (92%)	5th (84%)
supranasals in contact	no (82%)	yes (50%)	yes (73%)
dorsolateral dark stripe	yes	no	no
axillary pit	reduced	well defined	well defined

axillary pits are reduced and not prominent. The characters mentioned above from which the Mexican specimens differ from *alliacea* are in agreement with those mentioned by Taylor for *Mabuya brachypoda* (Table 1).

Mabuya brachypoda was described by Taylor as having limbs which, when adpressed, fail to overlap by a distance equal to or greater than the length of the hand. The limbs of the 12 speci-

mens which formed the type series were examined by the author. The separation of the adpressed limbs in Nos. 31312 and 31313 was about 5 mm. However in No. 34326 the limbs were found to overlap when adpressed. Doctor Taylor concurs with this measurement. This latter specimen has the parietals in contact and the sixth supralabial is below the eye, two characters which do not occur in the type or other paratypes. This is definitely aberrant or through some metathesis of data the locality is incorrect and the specimen may not belong where placed by Taylor.

The distance between adpressed limbs of the 12 *M. brachypoda*, as observed by the author, varied from approximately 10 mm. in the type specimen to 3-5 mm. Such variation could be due to the differential bending of the individual limbs, and a distance of 4-5 mm. between adpressed limbs need not be regarded as diagnostic. This is borne out by the fact that the limbs of No. 36313 do not overlap when adpressed, yet the sum of the fore and hind limb measurements exceeds the axilla-groin length by 5.5 mm. In other words, the length of limbs is not necessarily reflected in the degree of separation or overlap of adpressed limbs.

Although the limbs of every Mexican specimen were not adpressed, casual observation revealed either slight overlap or separation of the toes and fingers. The sum of the limb lengths exceeded the axilla-groin length in all but nine of the Mexican specimens, and in only four of 12 *M. brachypoda*. Axilla-groin/hind leg ratios of 10 specimens exceeding 64 mm. in snout-vent length from Costa Rica averaged 1.9, whereas that of 38 individuals from Mexico exceeding 61 mm. averaged 1.7. Although slightly shorter hind limbs in the Costa Rican specimens are suggested, the data are inconclusive, and the author, at present, regards the difference in limb length between the two populations negligible.

There are, therefore, no characters known which will certainly distinguish the Mexican mabuyas and *M. brachypoda* as described by Taylor. It is proposed that the binomial, *Mabuya brachypoda*, apply to all the mabuyas occurring from Mexico to Costa Rica. Pertinent data given in accounts by Mertens (1952:58, table 11, fig. 59) and Werler and Smith (1952:563, fig. 14) do not reveal any significant deviations from the variation as now known. The morphological geographic variation in this species does not seem to be great and is indicative that the species is a recent immigrant to Mexico from the south. *M. brachypoda* is apparently a lowland form, and in Mexico probably does not occur above an elevation of 3000 feet.

BREEDING BEHAVIOR

A macroscopic examination of the gonads and associated ducts of the Mexican specimens was undertaken in an effort to determine the size at sexual maturity and other aspects of the reproductive cycle.

Females.—Specimens were regarded as sexually mature if embryos were present in the oviducts. Ten specimens, ranging in snout-vent length from 62 to 83 mm. contained embryos and were collected between June 26 (10453) and July 28 (10477); embryo complements varied from four to six. Ovaries of these individuals were 4 mm. in length with the largest ovocytes about 1 mm. in diameter. Four specimens collected within the interim July 21-28 and exceeding 62 mm. in length, did not have embryos in the swollen and convoluted oviducts. The ovaries measured 4-5 mm. in length with the largest ovocytes 1 mm. in diameter; recent expulsion of embryos is suggested. Five specimens collected in September and exceeding 62 mm. in length agree with the four above-mentioned individuals except that developing ovocytes are larger (about 2 mm. in diameter) and more yolk is present. The oviducts of one specimen (14447), collected in September, contained five (two in the right, three in the left) small structures interpreted as unfertilized eggs, which had a diameter of 2 mm. A specimen (23915), 60 mm. in length (collection date unknown) had ovaries 2 mm. in length with one ovocyte 1 mm. in diameter; the oviducts were 1 mm. wide and slightly wrinkled, but contained two similar-sized structures (as in 14447) in the right oviduct. Two of these same structures were present in the convoluted oviducts of a specimen 56 mm. in length (14457) collected in October. Five specimens smaller than 50 mm. had ovaries measuring 4 mm. in length with ovocytes 1 mm. in diameter, but the oviducts were straight and narrow.

The data indicate that deposition of young, which varies from four to six, occurs in June and July; of 14 adult females collected from June 26 to July 28, ten contained well-developed embryos. Five adult females collected in September contained no embryos but larger developing ovocytes than those collected in June. The smallest female definitely considered sexually mature is 62 mm. in snout-vent length, although a length of 56 mm. is suggested.

Males.—Seventeen specimens ranging from 58 to 70 mm. in length, and collected in June and July had testes 5 to 8 mm. in length and 3 to 5 mm. in width. Ten specimens ranging from 59 to 70 mm. in length, and collected in August and September, had

smaller testes with dimensions of 4 to 6 mm. and 3 to 4 mm. Thus there is only a slight seasonal decrease in testes size. The smallest male examined and regarded as sexually mature (22238) is 56 mm. in length (no collection date), and has testes measuring 5 mm. in length and 3 mm. in width. One specimen (14456), 58 mm. in length and considered immature, was collected in October and had a testis measuring 3 mm. in length and 1 mm. in width; another individual (14444) collected in October and 51 mm. in length also had testes 3 mm. in length. A specimen (19106), considered sexually mature and 58 mm. in length was collected in July and had a testis 5 mm. in length and 3 mm. in width; this inconsistency in the relation of testis size to snout-vent length is suggestive of the approximate size at sexual maturity. This interpretation is questionable if a seasonal decrease in testis size is more marked in October. The size at sexual maturity is thought to be approximately 56 mm.

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