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A NEW FRINGE-FOOTED SAND LIZARD FROM COAHUILA, MEXICO

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The Parras Basin in southern Coahuila has not been well explored herpetologically despite the fact that it is readily accessible from the highway that traverses the region from Saltillo to Torreon. Partly because the region has been neglected, it was chosen as a suitable place in which to carry out field work during the summer of 1946. In August field parties from the Chicago Natural History Museum and the American Museum of Natural History encountered an area of low dunes along the northern edge of the dry lake shown on recent maps as Laguna de Mayrán (and on older maps as the Laguna del Muerto). A lizard taken in these dunes represents not only a new species, but also the first record for the genus *Uma* from the eastern side of the Continental Divide.

Heifetz (1941, p. 99) has recently reviewed the lizards of the genus *Uma* and mapped the range of the four populations known from southern California and the adjacent portions of Baja California, Arizona, and Sonora. The easternmost record was Tepoca Bay on the west coast of Sonora, over 600 miles to the northwest of the Parras Basin. Because of the isolated position of the population discovered in the dunes near Laguna de Mayrán we are calling it

Uma exsul, new species

TYPE: No. 67404 in the collection of the American Museum of Natural History, collected by Karl P. Schmidt and C. M. Bogert, in dunes located 12 miles north of San Pedro de Las Colonias, Coahuila, Mexico, on August 20, 1946. Thirty-one paratypes taken at the same time, at the same locality, are available.

DIAGNOSIS: A *Uma* that differs from other members of the genus in lacking small subdigital scales intercalated between the fringe and the lamellae, in having two strongly enlarged auricular lobules instead of four (fig. 1), and usually four internasals in contrast to three or five in other species. In pattern characters the *Uma* from Coahuila is strikingly different from previously known forms, all of which have an ocellated pattern; reticulating black lines, emphasized at intervals to form diagonal lines or chevrons when viewed from above, enclose lighter-colored areas that may be round or elongate, without a dark spot in the center. The pattern, unlike that of other species in the genus, includes a prominent black spot on the shoulder, a diagonal lateroventral blotch at midbody that is confluent above with one of the chevrons, and two vertical black bars at the groin, with a vestige of a third on the base of the femur.

DESCRIPTION OF THE TYPE: An adult male, with the habitus approximating that of other lizards in the genus. The body and tail are flattened, the depth being about half the width. The frontal portion of the head is rounded in profile. The ear openings are vertically elliptical but hidden at the upper extremities by the auricular lobules. The adpressed front limbs extend to the groin, and the fourth toe extends slightly beyond the tip of the snout when the hind limbs are adpressed to the body.

The rostral is pentagonal and extends back on the snout to a blunt point. There are three transverse rows of internasal scales, each comprising four scales separating the nares, which are elliptical and dorsal in position. There are two enlarged canthals on each side separated by 17 scales across the head. The scales in the pre-

frontal region are enlarged more than twice the diameter of the adjacent lateral head scales. The prefrontal series of scales diminish in width posteriorly where they are confluent with two rows of less strongly enlarged scales in the frontal region. The supraoculars are feebly enlarged, and the labials with diagonal keels, followed posteriorly by smaller, irregular scales bordering the mouth. A single row of small scales separates the supralabials from a greatly enlarged, keeled subocular. The latter is preceded by two preoculars similarly keeled. In the loreal region small scales

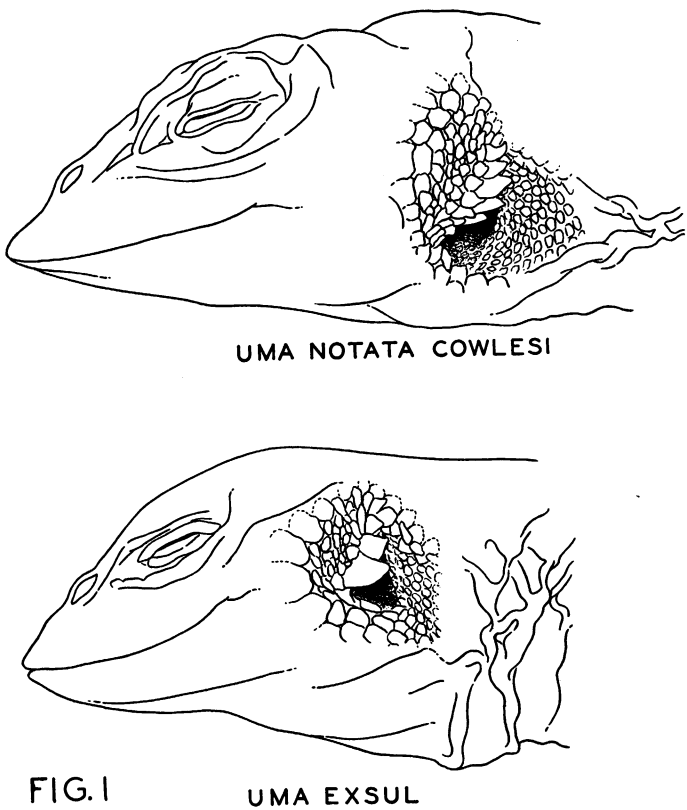

Fig. 1. Profiles of *Uma notata cowlesi* (A.M.N.H. No. 67603, from Punta Peñasco, Sonora) and *Uma exsul* (A.M.N.H. No. 67406, paratype from type locality), showing the more depressed head characteristic of lizards in the *notata* group, and the less perfectly adapted *exsul* with a profile more like that of lizards in the genus *Callisaurus*. Details show the differences between the auricular lobules of the two species.

supraorbital semicircles are ill defined. The interparietal, nearly round, with irregular edges, is the largest scale on the top of the head; in this scale, the central transclucent portion that covers the parietal organ is raised as a conspicuous tubercle.

On the sides of the head there are six (right) and seven (left) enlarged supra- are irregularly disposed; eight can be counted between the supralabials and the apex of the region delineated by the canthal and the preoculars. The ciliaries are pectinate and increase in size at each end of the series; on the lower lid the ciliaries are somewhat larger than they are on the upper eyelid. There are two greatly enlarged auricular lobules on each side, with smaller

but distinctly enlarged lobules present above and below the larger ones.

A small pentagonal mental is bordered by the first in each series of 10 smooth infralabials on each side. The postmental is somewhat triangular, and its apex extends between the first pair of chin shields, separating them for approximately half their length. These chin shields are nearly as wide as they are long. Posteriorly there are four rows of sublabials. Small, smooth, flat scales on the gular region are slightly enlarged at the midline. A well-defined gular fold, preceded by enlarged scales, is present on the neck.

Smooth, flat scales on the under side of the body are about half the diameter of the small, slightly convex scales covering the dorsum and sides. On the pectoral region the scales are enlarged, pointed, and projecting. On the sides of the belly at midbody the transition from large ventral scales to small lateroventrals is abrupt. Posteriorly the ventral scales diminish in size at the level of the groin but are enlarged in the pre-anal region. The scales on the under side of the base of the tail are relatively small, flat, and arranged in irregular fashion, but distally on the tail they increase in size, and rows, or whorls, are readily distinguishable. There are two enlarged, horizontally elongate postanal scales flanking a smaller median one; the posterior margins of these three scales are in contact with 10 additional less strongly enlarged scales.

The dorsum from the occiput to the base of the tail is covered with small, smooth, slightly convex scales that are nearly uniform in size. Distally on the upper surface of the tail the scales are somewhat larger, and in definite rows continuous with the series beneath the tail. The scales on the upper surface of the femur are similar to the dorsal body scales. Enlarged scales are present on the anterior surface of both front and hind limbs. The minute femoral pores, 26 on each side in widely separated series, are located at the rear extremity of enlarged, roundish scales. An area of elongate, nearly granular scales separates the femoral pore series from a patch of larger scales with projecting points located on the proximal posterior surface of the thigh.

The infratarsals are much smaller than the supratarsals and sharply delineated from subdigital lamellae with two or three keels near the base of the digits, whereas only one keel is present on the lamellae beneath the distal portion. Fringe spines, most strongly developed along the outer edges of the toes, extend from the edges of the subdigital lamellae; there is no regular series of small subdigital scales separating the fringe from the lamellae except for isolated small scales at the digital joints. The fringe spines, counted on the external side of the fourth toe from the claw to the base of the toe as far as the spines are distinctly enlarged, number 37 on the right and 33 on the left.

The principal dimensions of the type, in millimeters, are as follows: Body length, snout to vent, 78; head length, 20; head width, 12.8; rostral to edge of interparietal, 12.5; rostral to lower anterior border of ear opening, 10.9; width of orbit, 3.7; arm fully extended, measured from the axilla to end of fourth toe, 39; leg fully extended, measured from the groin to the end of the fourth toe, 70; tail, 103, width of tail at base, 12.2.

The top and sides of the head are mottled with gray blotches, most prominent on the supralabials and the rostral. Five black crescents, none of them well defined at the apex, are present on the throat, the middle one somewhat darker than the others and continued across the labials onto the subocular. The iris, and the inner margins of the inner row of both the upper and the lower ciliaries, are black. In life the small scales above the eye were vermilion, but in the preserved specimen they are whitish, with darker mottling. The under side of the belly is immaculate white, except for the wedge-shaped lower extremity of the ventrolateral black blotch. Five black cross bars, increasingly longer distally, are present on the under side of the tail. A slit made in the belly discloses a black peritoneum.

Where the edges of the gular fold extend onto the sides of the shoulders a prominent black blotch margined with white is present

on each side. On the dorsum a complex, roughly symmetrical arrangement of black blotches, or stripes interposed with whitish dots, produces the effect of three rows of black dots, the median one down the center of the back, flanked by one on each side with larger diagonal lines extending onto the sides. Viewed from above the diagonal lines form chevrons, each with three small dark blotches (the horizontal rows comprising the interrupted rows of lengthwise lines) at the apex. Approximately nine or 10 chevrons are discernible, the posterior two terminating in conspicuous black blotches in the groin, with vestiges of a third blotch situated farther out on the femur. A dark bar with light margins is present on the posterior of the femur. In life the grayish ground color of the dorsum had a yellowish tinge.

NOTES ON THE PARATYPES: The 31 specimens[1] comprising the paratypic series were all taken within a radius of half a mile. There is little difference between sexes, although males exceed females in size. The largest and the smallest specimens in the series have incomplete tails, but those with complete or unregenerated tails range in total length from 120 mm. to a maximum of 186 mm. Snout to vent measurements for the entire sample range from 32 mm. in a juvenile to 90 mm. in an adult male. The ratio of tail to total length varies from 0.54 to 0.59 with a mean of 0.56; ratio of tail to snout-vent length from 1.18 to 1.52, mean 1.29. The ratio of the hind leg (measured from the groin to the end of the claw on the fourth toe) to the snout-vent length ranges from 0.80 to 0.98, with a mean of 0.88. The femoral pores vary in number from 19 to 28, averaging 24.8.

Four scales in the longest internasal row are normally present (21 out of 27), less commonly three, five in one specimen. The fringe spines on the outer edge of the fourth toe vary from 31 to 40, with means of 38.2 for the right side and 35.8 for the left. There is some variation in the enlarged auricular lobules; two in the middle of the series are usually considerably larger than the others, but on one specimen three are enlarged on both sides. The postanal plates vary in size, shape, and number, tending to be relatively larger in males than in females. Consequently the sexes are difficult to distinguish without dissection.

The complexities of the pattern make it impossible to describe many of the variations in quantitative terms, but it can be stated that the number of black bars under the tail is usually six, although sometimes there are four, five, seven, or even eight. The black chevrons of adults are rudimentary on small specimens, and they are not always symmetrical; a dark diagonal line on one side of the midline may have no counterpart on the other. The black blotches on the shoulder, the sides, and the groin are invariably present on both adults and juveniles. Black gular crescents may be well defined, but they are always faint at midline, and in a few specimens they are reduced to mere traces, the throat being almost immaculate. Except on the smallest specimens, a dark horizontal bar present on the posterior surface of the femur is separated from the mottled gray dorsal color by a light stripe of approximately the same width. Vermilion shading around the eyes was observed only on adults, and the color quickly disappeared in alcohol.

RELATIONSHIPS AND COMPARISONS: As might be expected on zoogeographical grounds, *Uma exsul* differs from other species in the genus in more respects than *scoparia*, *inornata*, or *notata* (including the subspecies *cowlesi*) differ from one another. Comparisons are summarized in table 1, but it may be added that the mean number of femoral pores in *exsul* is approximately that reported for *U. n. notata*, and the mean for the fringe spines on the fourth toe is approximately that reported for *scoparia* (by Heifetz, 1941). Four internasals, predominantly present in *exsul*, occur most often in *U. n. cowlesi* (25 per cent of the specimens) and in *scoparia* (19.2 per cent). The maximum size of *exsul*, 90 mm. snout to vent, is exceeded by the other forms. Thus, there are no grounds for stating that *exsul* is more closely related to one species than to another; pattern characters indicate a totally different line of evolution, and

[1] Chicago Natural History Museum Nos. 44301–44314, and American Museum of Natural History Nos. 67405–67421.

the proportionately long legs, as well as other characters, indicate affinities with the genus *Callisaurus*.

In fact, it may be observed that some of the characters formerly used to separate *Uma* and *Callisaurus* are no longer valid. The absence of small infradigital scales separating the lamellae from the fringe spines on the toes of *exsul* (except at the joints) is also characteristic of *Callisaurus draconoides crinitus;* such scales are uniformly present and form a continuous series other *Uma*. The black bar on the posterior surface of the femur of *exsul* occurs in virtually all specimens of *Callisaurus*, but is unknown on other species of *Uma*. The lateroventral blotch, confluent with dorsal markings on *exsul*, more closely approaches the condition found in *Callisaurus* than that in other members of the genus *Uma*. Other features of the pattern of the Coahuilan *Uma* are either unique or as much like those of either genus.

On the other hand the (1) enlarged auricular lobules; (2) patch of enlarged scales with projecting points (more pronounced in *exsul* than in other species) on the posterior of the femur; (3) high number of femoral pores; (4) flattened body, with the width averaging twice the depth; and (5) vermilion shading around the eyes of adults, are all characters of *Uma* that are not shared with *Callisaurus*. None of the other more variable or less tangible characters—the profile, the extent of the flaring of the lips, the close fitting jaw, the granular scalation of the dorsum, the modifications in the nasal passages—offers any defi-

TABLE 1

	Uma notata GROUP	*Uma exsul*	*Callisaurus*
1.	4 moderately enlarged auricular lobules	2 strongly enlarged auricular lobules	No enlarged auricular lobules
2.	Usually 3 or 5 internasals	Usually 4, rarely 3 or 5 internasals	2, 3, or 4 internasals
3.	Subdigital scales separating lamellae from fringe spines on toes	No subdigital scales separating lamellae from fringe spines on toes	No subdigital scales separating lamellae from fringe, when fringe scales are present
4.	A patch of enlarged scales with projecting points on rear of femur	A patch of enlarged scales with projecting points on rear of femur	No patch of enlarged scales on rear of femur
5.	Dorsal pattern of well-defined ocelli, no black bar on rear of femur, a single black, square, lateroventral blotch on both sexes (absent on one species), black gular crescents well defined or nearly absent	Dorsal pattern with 3 median rows of spots, and black chevrons, with reticulum outlining whitish dots or blotches, a black bar on rear of femur, a single black, diagonally elongate, ventrolateral blotch on both sexes, black gular crescents not well defined or nearly absent	Dorsal pattern various, some subspecies with whitish dots, a black bar on rear of femur, 3 or 2 black, diagonally elongate, black blotches (absent on females), peripheral traces of black gular crescents on some subspecies, or throat immaculate, sometimes with median bluish region
6.	Femoral pores usually more than 20	Femoral pores usually more than 20	Femoral pores usually fewer than 20
7.	Tail comprising approximately half the body length	Tail comprising more than half the body length	Tail usually comprising more than half the body length
8.	Hind leg varying from 0.66 to 0.84 of body length	Hind leg varying from 0.80 to 0.98 of body length	Hind leg varying from 0.78 to 1.04 of body length

in the previously known species of *Uma*. The hind leg of *Uma exsul* is proportionately longer than that of other species in the genus (with a mean length approximating 89 per cent of the body length, in contrast to other species in the genus with means varying from 76 to 78 per cent), but well within the range of means (86 to 96 per cent) reported by Schmidt (1922, p. 651) for various species and subspecies of *Callisaurus*. The pattern of *Uma exsul* is unlike that of any species previously known in either genus, but it resembles some subspecies of *Callisaurus* more than it does any

nite basis for referring *exsul* to one genus or the other. On the whole *Uma exsul* appears to represent a more primitive species than others in the genus. Indeed it is not difficult to imagine that *exsul* evolved from an ancestral stock that was not unlike *Callisaurus draconoides crinitus* of central Baja California, although the similarities of the two species indubitably result from parallel modifications rather than close genetic affinities. *Uma exsul* conceivably represents a less progressive offshoot of the early *Uma* stock that also gave rise to the more perfectly adapted *Umá notata* and its close relatives. There can be little doubt that *exsul* was geographically isolated (see map, fig. 2) long before peripheral populations on the Mojave Desert (*scoparia*), in Coachella Valley north of Salton Sea (*inornata*), and along the west coast of Sonora (*cowlesi*) were separated from the parent stock (*notata*). The vast aeolian deposits near the mouth of the Colorado River must have been in continuous existence over a long span of time, geologically speaking, and perhaps represent the region of origin as well as the center of dispersal for the genus. Other dunes of suitably fine aeolian sand (*vide* Stebbins, 1944) must have existed in the intervening area to permit representatives of the group to cross the Continental Divide. If such dunes are still in existence in the smaller basins to the north and to the south of the Parras Basin it is quite probable that near relatives of *exsul* will be discovered.

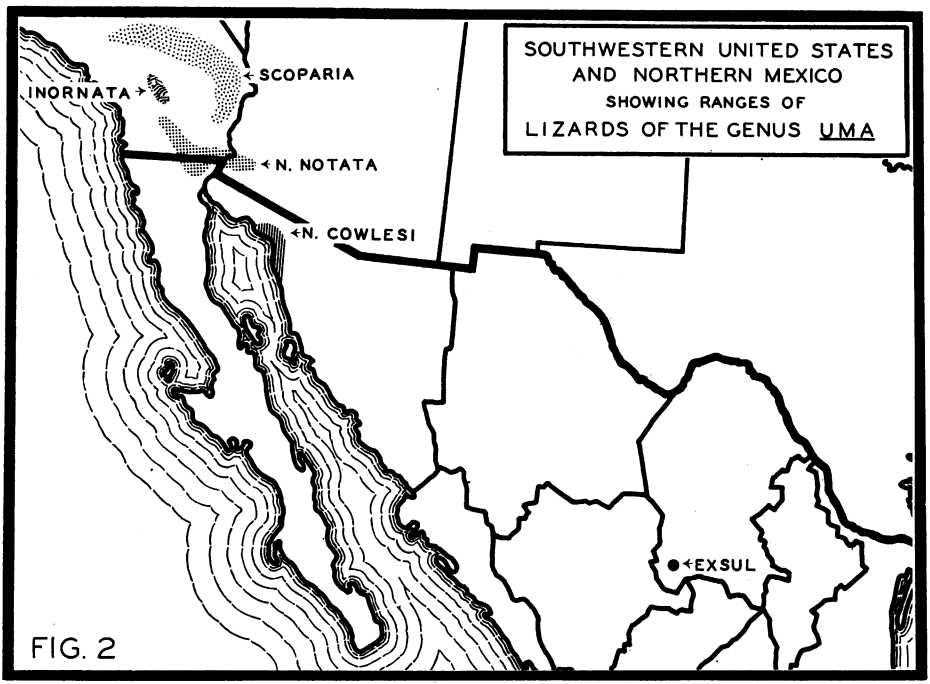

FIG. 2

The acquisition of the enlarged digital fringe by *Callisaurus draconoides crinitus* presumably was antedated by the same development in *Uma*. The same sort of modification has long been known for lizards inhabiting dune sand in other parts of the world. Hence it is a relatively safe assumption that fringe scales on the digits represent an adaptive response to a specialized environment, and it is less astonishing to have such fringe evolving twice in lizards descended from a common ancestral stock than it is to find such modifications on the feet of such distantly re-

lated forms as *Ptenopus* (Gekkonidae) or *Aporosaura* (Lacertidae).

HABITAT AND HABITS: The dunes along the northern edge of the dry lake, Laguna de Mayrán, where the type and paratypes were taken, are relatively low, and composed of fine gray sand. They are not lacking in vegetation. Small mesquite shrubs (*Prosopis chilensis*) on the summits of the dunes provide cover for the lizards and presumably prevent extensive shifting of the dunes. At the time the lizards were collected it was impossible to say from which side the wind had been blowing, and there was no evidence of any pronounced sand movement. The main axis of the dune ridges is approximately east and west, and whereas they are irregular, with scattered outlying hillocks, the dune area is no more than one-quarter of a mile in width. The extent of the dunes along the main axis was not ascertained, but undoubtedly encompasses a few miles.

Uma exsul was not observed outside the dune area. Both *Cnemidophorus tessellatus* and *Uta stansburiana* were taken with the *Uma*, but *Holbrookia dickersonae*, a species seen in the flats to the north, was not encountered in the dunes. The fringe-footed lizard was predominantly more abundant than either *Cnemidophorus* or *Uta;* within an hour and a half, 32 specimens were taken by two collectors with guns, using dust shot, although assistance in flushing the lizards from cover was provided by six additional members of the party.

Cloacal temperatures of 10 specimens taken between the hours of 11:15 to 11:43 A.M. varied from 36.5° C. to 41.1, with a mean of 38.8° C. It is of interest to note that precisely the same mean was obtained by Cowles and Bogert (1944, p. 281) who recorded the body temperatures of a series of *Uma n. notata* in the dunes near Yuma, Arizona.

The behavior of *Uma exsul* under field conditions is much like that of other species, although in no instance was one observed to bury itself in the sand. More often the lizards fled into the mesquite at the summit of the dunes, sometimes emerging from the other side. When frightened they ran with great rapidity across the open sand between individual dunes to seek shelter in a more distant patch of mesquite. Two specimens were observed within a yard of each other, with backs arched and tails curled upward in some sort of display that may have been courting behavior, or one male may have been intimidating an intruder. Because the sex cannot be ascertained with certainty without dissecting, it is doubtful whether one or both sexes were involved. Females with snout-vent measurements of 67, 65, and 66 mm. contained, respectively, two, two, and three maturing eggs, approximately 12 by 8 mm.

Examination of the stomach contents of a few specimens indicates that the food of *Uma exsul* consists almost exclusively of small insects, particularly ants and beetles. No plant material was detected, but inasmuch as the specimens were all taken at the end of the dry season no succulent plants or buds were in evidence, and the absence of plant food in the diet may be seasonal. Stebbins (1944, p. 329) reports a few leaves and buds in the diet of *Uma inornata*, and he found a number of insects, particularly beetles, in the fecal pellets.

LITERATURE CITED

COWLES, RAYMOND BRIDGMAN, AND CHARLES MITCHILL BOGERT
1944. A preliminary study of the thermal requirements of desert reptiles. Bull. Amer. Mus. Nat. Hist., vol. 83, pp. 261–296, text figs. 1–3, pls. 19–29, table 1.

HEIFETZ, WILLIAM
1941. A review of the lizards of the genus *Uma*. Copeia, no. 2, pp. 90–111, figs. 1–7.

SCHMIDT, KARL PATTERSON
1922. The amphibians and reptiles of Lower California and the neighboring islands. Bull. Amer. Mus. Nat. Hist., vol. 46, pp. 607–707, figs. 1–13, pls. 47–57.

STEBBINS, ROBERT C.
1944. Some aspects of the ecology of the iguanid genus *Uma*. Ecol. Monogr., vol. 14, pp. 311–332, figs. 1–22.

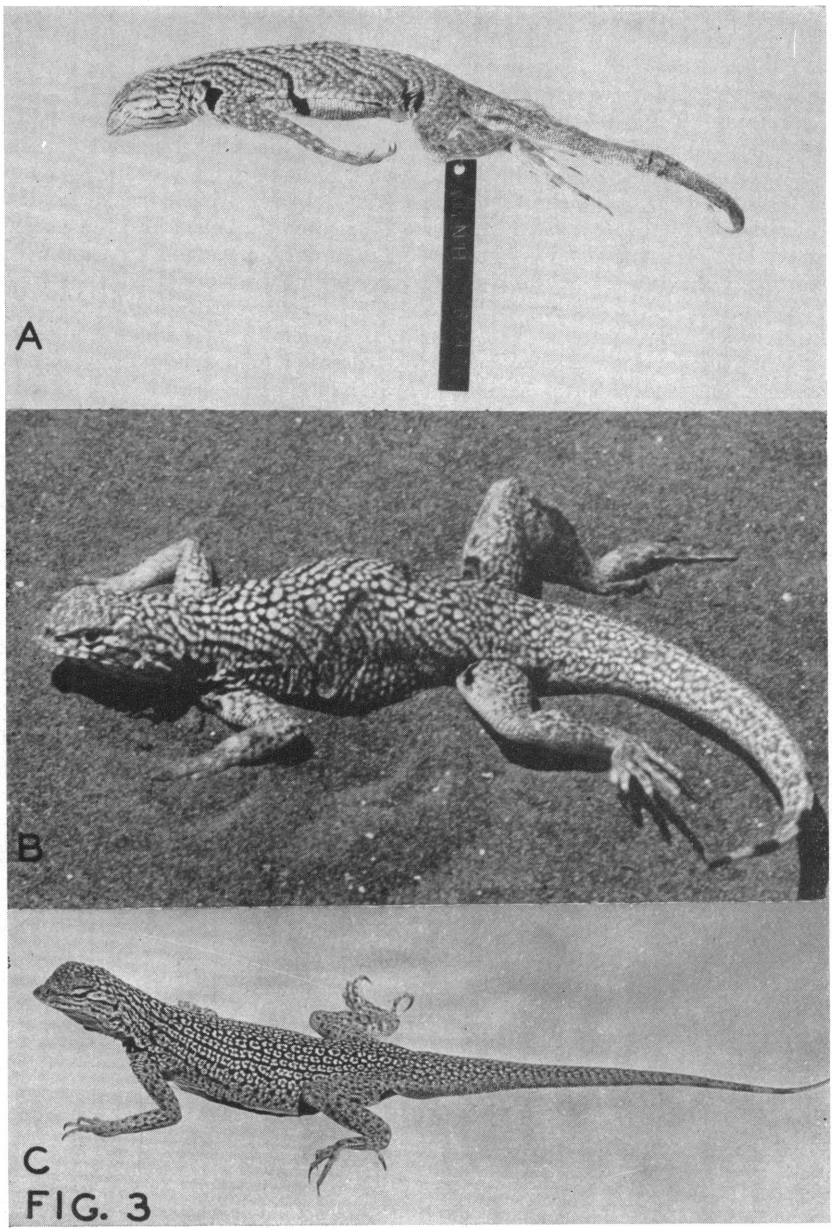

Fig. 3. A, Side view of paratype of *Uma exsul* (A.M.N.H. No. 67406) to show the black laterventral blotches confluent with the black chevrons of the dorsal pattern. B, Dorsolateral view of *Uma exsul* (A.M.N.H. No. 67404, paratype, wounded individual photographed shortly after capture in abnormal posture due to injuries) to show habitus and pattern. C, Dorsolateral view of adult *Uma notata notata* (live specimen taken in the dunes west of Yuma, Arizona, in California). Compare pattern and profile with those of *Uma exsul* in upper photographs.

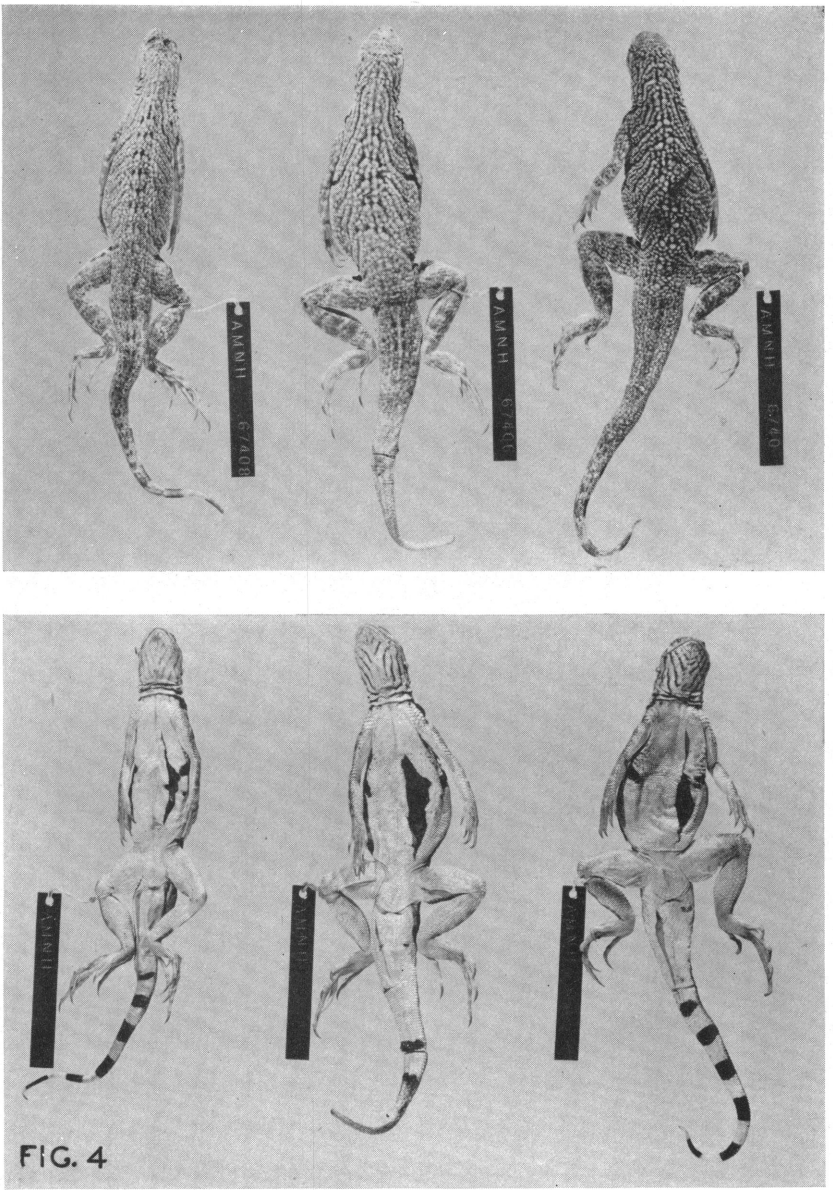

Fig. 4. Dorsal and ventral views of three paratypes of *Uma exsul* (A.M.N.H. Nos. 67408, 67406, 67407), to show variation in the pattern on three adult males.