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THE STATUS OF THE LIZARD *CNEMIDOPHORUS PERPLEXUS* BAIRD AND GIRARD (TEIIDAE)

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Several years ago Burger (1950), in a paper concerned with the systematics of *Cnemidophorus*, stripped the name *Cnemidophorus perplexus* of all specimens previously associated with it except the type. This action followed a period of some 50 years of taxonomic confusion and, as Burger himself pointed out, was a temporary measure until more material was available with definite locality data. Burger, with qualifications, followed Burt (1931) in his designation of the type and type locality. Burt in turn apparently based his designation of the type on indirect statements made by Cope in 1893 and again in 1900 and possibly from examinations of the catalog entries of the U. S. National Museum (USNM). But he based his designation of the type locality on the original description of Baird and Girard in 1852. His selection of the type locality has been accepted by most workers since then, but his action was unjustified. He designated one specimen as the lectotype of *perplexus*, and the habitat of different specimens as the type locality. This discrepancy and the recent description of two new striped species from the Southwest provided

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the original motivation for a reinvestigation of the status of the species, which poses the problem of answering three questions. First, what specimen actually constitutes the type; second, what is the type locality; and third, with what species in this area may the name *perplexus* be associated? These questions while simple are not easily answered. Their solutions have been greatly facilitated by the kindness of Dr. Remington Kellogg, director of the U. S. National Museum, in making available to us type material and other specimens; by the cooperation of Dr. Doris M. Cochran in her search of the USNM catalogs; and by the material assistance of the Council on Research and Creative Work of the University of Colorado, whose monetary aid has made possible the acquisition of comparative material.

THE TYPE: Baird and Girard (1852) published descriptions of a series of lizards based largely on material collected by Dr. John H. Clark, under Col. J. D. Graham, head of the Scientific Corps, U. S. and Mexican Boundary Commission; but there were also included specimens collected by others. In this paper the extremely brief description of *Cnemidophorus perplexus* is based on an unstated number of specimens presumably collected by Clark in the valley of the Rio San Pedro of the Rio Grande del Norte (according to Smith and Taylor, 1950, p. 363, this is the Devils River, Val Verde County, Tex.) and specimens collected by Gen. Churchill on the Rio Grande west of San Antonio and by Dr. William Gambel, at no specific locality, on his last journey to California. No holotype is indicated, nor by any clue from the description, title, or introduction does one specimen seem to receive closer attention than any other. This is not too surprising in that the type concept was in its infancy at that time.

As far as we are aware, the first indication that a type existed is Cope's (1893, p. 34) remark that "The type specimen is the largest obtained, and is probably adult." He does not, however, indicate to which specimen he is referring; but this can be determined on the basis of size alone. Cope (1893, pl. 6, figs. 1, A-G; pl. 12, fig. B) also figures the species. In his explanation of plates (p. 51) it is indicated that figure 1 of plate 6 is of "Specimen No. 3060 U. S. National Museum." Cope used these figures again in a later work (Cope, 1900, p. 573, fig. 105), but here they lie above the legend "Cat. No. 3060, U. S. N. M." This suggests, but does not specifically state, that the figures are of the type and that a lectotype, USNM 3060, had been designated. We can find no such designation in the literature and assume that Cope himself selected a type sometime prior to 1893. Frequently Cope (1900) designated the types in the tables of specimens held by the Museum. But in this instance USNM 3060 is not even listed, nor does Yarrow (1882) list this specimen in his catalog. Furthermore, in his extended description of "the type" Cope's (1900, p. 573) first sentence does not

agree with the published figure above it. He states: "In the type specimen of this subspecies the interparietal plate is narrower than the parietals, and is twice as long as wide." In the figure it is much broader. Farther on he also states that there are 19 femoral pores on each side in the type; the excellent figures show 25.

These discrepancies suggest that possibly the type is some specimen other than USNM 3060 or, as was frequently done in those days, more than one specimen was cataloged under that number. Through the kindness of Dr. Kellogg we have been able to examine all of the specimens upon which Baird and Girard based their description. The largest of these is now numbered 3060, and it is perfectly obvious that the figure, in spite of the legend beneath it, is not of this specimen. On the other hand Cope's (1900, pp. 573-574) description of the type is a remarkably accurate description of this very same individual. Originally, however, there were, indeed, two specimens cataloged under this number. The smaller of the two was reidentified by Stejneger (Cochran, in lit.) as *gularis* and assigned a new number, USNM 30885. Actually the specimen—judging by its small size, seven light stripes, moderately enlarged hexagonal post-antebrachial scales, enlarged temporal scales, etc.—is a specimen of *C. inornatus*. It is of interest to note that Cope's (1900, p. 588, fig. 112) figure of *Cnemidophorus tessellatus variolosus* Cope is also of a specimen numbered 3060. But this figure, too, is not of the specimen now bearing this number, nor is it a figure of USNM 30885. Cope obviously had been careless in assembling his manuscript, and his figures in this instance are valueless in determining the status of this species. His (1900) figure 105 is not a figure of a specimen of *C. perplexus* at all, but probably of some race of *C. tigris*.

Before assuming that USNM 3060 is the type of *perplexus* as indicated but not specifically stated by Cope, it is essential to know if this specimen is a syntype. The original material upon which Baird and Girard based their description of this species is apparently intact, or nearly so, and in the U. S. National Museum; but the catalog entries of this material do not completely match Baird and Girard's (1852, p. 128) locality notations.

Dr. Doris M. Cochran, curator of herpetology at the U. S. National Museum, has kindly provided us with the catalog entries on this material. The specimens from the "Valley of the Rio San Pedro of the Rio Grande del Norte" are cataloged as having been collected along the "Rio San Pedro to the Rio Grande, Texas" by Col. Graham. However, Baird and Girard (1852) in their introduction specifically state the bulk of the material upon which their paper is based was "collected by John H. Clark, under Col. J. D. Graham." There are now five specimens in this lot cataloged under USNM 3022; origin-

ally there were six. The specimens "collected" by Gen. Churchill are two in number and are cataloged under USNM 3050, and designated as having been collected in "Texas." Gambel's contribution is now entered as follows: "Type/*Cnemidophorus perplexus*/'Calif'??/ probably W. Texas/. Dr. W. Gambel/3060/1." Dr. Cochran (in lit.) informs us that at Dr. L. Stejneger's suggestion she added in her own hand the word "type," the two question marks after "Calif" and the notation "probably W. Texas." These entries so closely match the notation of Baird and Girard in their original description of the species that there seems little doubt that they truly represent the specimens in hand when the original description was made, even though at that time the specimens were uncataloged and without numbers. The taxonomic fate of Clark's and Churchill's specimens will be mentioned later; it is Gambel's large specimen that is of importance at the moment.

The catalog entry of USNM 3060 was made on July 20, 1858, probably by Baird himself (Cochran, in lit.). Between that time and 1893 it had presumably been selected by Cope as the type of *perplexus*, for in 1900 he described a specimen which he designated in his description as the type, and this specimen is unquestionably USNM 3060. It is not until Burt (1931) published his studies on the teiid lizards of the genus *Cnemidophorus* that a statement is finally made in the synonymy of *Cnemidophorus sexlineatus perplexus* that the type is USNM 3060.

This action of Burt's constitutes a formal designation of a lectotype, properly selected from the syntypes of Baird and Girard. According to our interpretation of the proceedings of the 12th International Congress of Zoology, Paris, 1948, and the 14th International Congress of Zoology, Copenhagen, 1953, this action is final and the lectotype of *Cnemidophorus perplexus* Baird and Girard is what is now USNM 3060.

THE TYPE LOCALITY: Examination of the Clark material shows that it is not *Cnemidophorus perplexus* but rather *C. sacki gularis*. Hence, the type locality of Rio Pedro of the Rio Grande del Norte is invalid for the former species. As will be seen, Gambel's specimens, including the type, USNM 3060, could not have been collected in "W. Texas" as suggested by Dr. Stejneger inasmuch as Gambel never visited this part of the Southwest. Furthermore, the suggestion by several authors that Gambel made the collections on his second journey to California seems unlikely because of the northerly route followed and certain terminal events associated with that trip. Therefore it is necessary to reevaluate the actual type locality for *Cnemidophorus perplexus*, as evidence permits.

William Gambel was a young Philadelphia protégé of the frontier botanist Thomas Nuttall. After making several eastern collecting

excursions with this eminent scientist, Gambel, at 18, was encouraged to attempt a trip to the West, penetrating the only portion of this new country which Nuttall had not himself visited, namely the Southwest.

Today, Gambel is most well known for making the first collections of plants from the Santa Fe, N. Mex., region and for his observations on and collections of birds from this frontier country of the 1840's. However, he also acquired a small collection of reptiles, including the designated type of *Cnemidophorus perplexus* and the following: *Holbrookia texana* (USNM 2787), *Sceloporus graciosus* (USNM 2861), *Phrynosoma modestum* (USNM 176), *Crotaphytus wislizeni* (USNM 2722), *Heterodon nasicus nasicus* (USNM 1277), *Masticophis taeniatus* (USNM 1979), and *Thamnophis elegans vagrans* (USNM 908).

Because Gambel published on the birds and Nuttall published on Gambel's plant collections for the Academy of Natural Sciences of Philadelphia, accurate information is available with respect to localities and dates for these specimens. With respect to the reptiles, however, no study of the material was ever published by Gambel or his immediate colleagues; consequently, collection details are vague. Baird and Girard (1852, p. 128) note that the specimens of *Cnemidophorus perplexus* were collected on Gambel's "last journey to California." In Yarrow's (1882) catalog, Gambel's several species are for the most part designated as having been collected in "Calif." The only specific locality is that given for *Phrynosoma modestum*. Yarrow (1882) cites this specimen (USNM 175) as coming from "Plaenis." No such place can be located in the territories through which Gambel passed and it seems likely that Yarrow misread a label in making this notation. Cope (1900, p. 439) cites the same specimen as coming from the "plains," presumably of eastern New Mexico. In order to reach some decision on the collection locality, especially of *Cnemidophorus perplexus*, it is necessary to scrutinize more closely the two western trips of Gambel.

The first, in 1841, embarked upon undoubtedly at the behest of Thomas Nuttall, followed in general outline the Santa Fe Trail from Independence to Santa Fe and the Old Spanish Trail from that community to California. The second expedition, which culminated in Gambel's death, followed the eastern portion of the Oregon Trail from Independence to Wyoming and the Hudspeth Trail over Hastings Cut-Off through Nevada to California. This latter trip was in 1849.

Despite suggestions to the contrary in the literature, especially Baird and Girard (1852), it is implausible that any of Gambel's extant collections were from the second trip, either from California or en route. Indeed, it is most unlikely that any specimen material Gambel might have collected on this trip was ever returned to the East, due to the circumstances described below.

At the end of this second overland journey, Gambel died of typhoid fever in December 1849 in the northern Sierra Nevadas of California and was buried at Roses Bar above the Feather River. His grave was subsequently destroyed by placer miners. There were friends in California aware of Gambel's death. D. B. Woods of Mountain House wrote an obituary of Gambel which later appeared in a Philadelphia newspaper. Also, on this trip Gambel had apparently been accompanied by a man named Beesley from the Philadelphia area who returned to the East early in March of 1851 (Osborn, 1931, p. 259; letter, John Cassin to Baird, March 12, 1851, ". . . . Beesley who accompanied poor Gambel has returned within a day or two . . .").

Gambel, on this second trip, had made a journal which was returned to his wife after his death, most probably by Beesley. Later the journal was turned over to the Academy of Natural Sciences and subsequently lost. There is no evidence, however, that anything beyond this journal was returned from the young naturalist's belongings. Nonscientific friends on the scene of Gambel's death would be most unlikely to take sufficient interest and effort to send or bring back from far away California any specimens, especially alcoholics, either by the torturous overland route or around Cape Horn by ship. Also, little among the known accessions of Gambel suggests a collection point close to the more northerly route which apparently was followed in 1849. Therefore, the designation "second journey to California" seems invalid as a time and locality for any of Gambel's collecting, particularly herpetological collecting.

The route of Gambel's first trip west, to Santa Fe and eventually to southern California, has been outlined by several authors but is herein changed somewhat to conform with newly discovered evidence. Gambel left Independence for Santa Fe with a party of 80 men, mostly merchants and their merchandise-loaded wagons, between May 8 and May 10, 1841. This yearly caravan to Santa Fe followed the Santa Fe Trail on to the Arkansas River in Kansas. It now appears evident that this particular caravan did not proceed to Fort Bent near the Colorado Rockies and then south over Raton Pass. Instead, it took the Cimmaron Cut-Off, leaving the Arkansas River in western Kansas, cutting across the panhandle of Oklahoma into northeastern New Mexico, probably encountering the mountains proper near Wagon Mound, passing on to Las Vegas and thence to Santa Fe.

The basis for suggesting this change in route is a letter which was published in Niles' National Register (vol. 61, p. 1575, 1841). This anonymous letter, dated July 1841, was written by a man who joined the annual Santa Fe caravan just before the crossing of the Arkansas River in Kansas. That he and Gambel were members of the same party from that time on is borne out by practically identical descriptions of two Indian encounters in letters of the two men to people in

the East. Information in the Niles' National Register letter makes it possible to designate the arrival date at Santa Fe as July 2, 1841.

Gambel was in the vicinity of Santa Fe, along the Rio Grande and in the nearby mountains, for the period from July 2 to about September 1. He made representative collections of plants, especially from the "sandy hills along the borders of the Rio del Norte, Santa Fe (Mexico)." The Rio Grande River lies about 20 miles west of Santa Fe and today is generally inaccessible by highway in this area. During Gambel's visit, however, the main road from the east crossed Santa Fe Creek near the town and continued to the Rio Grande along the south side of this creek, thence turning south towards Albuquerque. It would seem justifiable to assume that Gambel gained access to the Rio Grande collecting localities by means of this road. Thus, specimens from "Rio del Norte, Santa Fe" presumably were collected south of the entrance of Santa Fe Creek into the Rio Grande River, west and southwest of Santa Fe.

None of the plant collections or bird observations warrant suspecting that Gambel went far south of Santa Fe; but one of the species of reptiles he collected suggests that he might have. This species, *Holbrookia texana*, extends up the Rio Grande Valley as far as Valencia County (4 miles north of Sabinal). It might even extend as far north as Albuquerque; but the likelihood of its occurring in Santa Fe is questionable. Although he makes comments about birds at Taos, it seems unlikely that Gambel went that far north. One of his comments concerns wintering juncos, and certainly he was not there during the winter. He probably learned about Taos birds from people in Santa Fe.

On or within a day or so after September 1, Gambel departed from New Mexico, supposedly from Abiquiu, with John Workman's party for California. This party is reported to have traveled northwest from New Mexico across southwestern Colorado, over the Colorado and Green Rivers in eastern Utah in September, into the mountains south of Salt Lake, then southwest across mountains and desert to southern California. There is some variance in arrival dates in California between the Workman party and Gambel, the former arriving in early November and the latter "the last of November being three month's traveling over Rocky Mountains & barren deserts . . ." The difference in arrival dates may simply mean that Gambel took time out for exploration on his own or with a small detached party somewhere en route.

In considering the most likely localities from which Gambel might have made his collections of reptiles on this first California expedition, the valley of the Rio Grande River southwest of Santa Fe seems the most probable choice, especially with respect to *Cnemidophorus perplexus*. Inasmuch as Gambel's type specimen was a female contain-

ing at least one large ovarian egg, the date it was collected probably fell somewhere between July 25 and not much later than August 7. During this period Gambel was collecting a number of plants near the river and, in the course of such collecting, had, like modern-day botanists with herpetological leanings, ample opportunity to collect lizards as well.

Assuming that Gambel did collect *C. perplexus* on the Rio Grande River near Santa Fe, he may or may not have shipped it home before leaving for California. The fall express for Independence left Santa Fe shortly after July 25, on which date Gambel wrote a letter (Pennsylvania Historical Society collection) home to his mother in Philadelphia. Nuttall had urged that Gambel dispatch his plants to George Engelmann of St. Louis, who was to send them through a John H. Barnard on to Nuttall in Philadelphia. Nuttall (letter, Nuttall to Engelmann, Nov. 3, 1841; Missouri Botanical Gardens) received a letter from Gambel at Santa Fe stating that he intended to send to Nuttall via Engelmann "a part of the collections he had made up to that place by another party returning to St. Louis in October." There is nothing, however, among the Engelmann correspondence at the Missouri Botanical Gardens to suggest that Engelmann ever received Gambel's shipments from Santa Fe, either from the annual express or from an October party. If shipments were made, they must eventually have reached Philadelphia and the Academy of Natural Sciences but undoubtedly after Nuttall had departed for England at the end of 1841. Thus they probably would have remained in storage at the Academy. It seems logical that Gambel would ship east anything collected to this point, since the next shipment point would have to be from California, over a thousand miles away across difficult country. But apparently no such shipment was made. Judging from the gravid condition of the type of *Cnemidophorus perplexus* the chances of its having been collected before the fall express left for Independence is very slight. It appears, then, as though Gambel carried all of his collections to California.

How the specimens eventually reached the Smithsonian Institution is as obscure as where they were originally collected. In the Seventh Annual Report of the Smithsonian Institution (1853, p. 55) there is a notation under the section on new 1852 reptile accessions, "A small number of specimens procured by Dr. Gambel, in the same country, has also come into the possession of the Institution." There is, unfortunately, no further information on the accession. The accessions immediately preceding this entry were of specimens from California. It appears from this entry and Baird and Girard's (1852) locality notations that Gambel must have shipped all of his herpetological collections from California and that the original recipient of these collections, whoever he may have been, simply assumed that it was there

that they had been collected. The possible ways by which the Smithsonian Institution could have acquired them are many. They might have been donated through Gambel's wife directly or through her brother, might have been sold to someone by Gambel's wife, and subsequently donated, might have been received from the Academy of Natural Sciences, purchased by some Smithsonian agent such as John Kirk Townsend, a friend of Gambel's, etc.

How the other specimens of *C. perplexus* (so identified at that time) got into Baird's hands at the Smithsonian is an easier problem. General Churchill was a close personal friend of the Bairds in Carlisle, Pa., and indeed became Baird's father-in-law. Colonel Graham's collections were actually made for him under orders by John H. Clark, and Clark had been a student of Baird's at Carlisle College. Rowan Kennerly, who also collected one of the early, but not syntypic, USNM specimens of *C. perplexus*, had also been one of Baird's students.

In summary, the type of *Cnemidophorus perplexus* was undoubtedly not collected in "Calif.," in "W. Texas," or during Gambel's "last journey to California"; but was probably collected sometime during the last week of July 1841 during Gambel's first journey to California. The type locality is probably the valley of the Rio Grande in Sandoval County, N. Mex., in the vicinity southwest of Santa Fe.

DESCRIPTION: We are now faced with a paradox, namely the identification of a type. Cope's (1900, p. 573-574) description of the specimen for the most part is accurate. The specimen is in fair condition but rather soft, and as Burt (1931, p. 122) points out the tail is now incomplete. Cope's (*loc. cit.*) measurements, therefore, are probably as accurate as any which can now be made. Our own measurements agree essentially with his.

USNM 3060, mature female, possessing nearly mature ovarian eggs. Total length, 260 mm. (according to Cope); length of head and body, 86 mm.; length of head to posterior edge of auditory meatus, 20.7 mm.; length of head to posterior face of jaw articulation, 20.3 mm.; length of forearm from axilla, 27 mm.; length of hind leg from inguen, 58 mm.; width of head, 11.6 mm. Interparietal twice as long as wide, narrower than parietals; a pair of frontoparietals; third and fourth supraoculars completely separated from frontoparietals by a series of small scales; first and second supraoculars broadly in contact with frontal; five scales in both anterior and posterior occipital rows, anterior nasals 1-1; posterior nasals 1-1; loreals 1-1; preoculars 1-1; suboculars 4-3; frenoculars 0-0; supra-labials 6-6, counting first scale in contact with last subocular; infra-labials 7-6; chinshields 5-5, first pair in contact throughout their length; chinshields separated posteriorly from infralabials by 4-4

scales, these preceded by a few smaller granules. Scales of central intermandibular area slightly larger than adjacent scales, intermandibular scales gradually decreasing in size posteriorly; anterior gular scales about half diameter of lateral intermandibular scales; gular fold with medial, anteriorly directed open notch; fold bordered by small scales, medially small scales form a triangle, apex forward, anterior to notch, this triangle separating two patches of enlarged scales; these enlarged gular scales smaller than enlarged median intermandibular scales. Anterodorsal brachial scutes in four rows; anterodorsal antebrachial scutes in three rows; post-antebrachial scales small with central strip of very slightly enlarged scales; anterodorsal femoral scutes in seven rows; anterodorsal tibial scutes in three rows. Three enlarged anal plates consisting of a pair separated from cloaca by four rows of small scales and preceded by an enlarged median scale. Femoral pores 19-19, median two separated by four scales. There are 178 vertebral scales counting from but not including enlarged occipitals to first row of enlarged scales at base of tail; 73 scale rows at region of greatest girth excluding ventral plates; 25 scales around base of tail.

Color pattern. Median vertebral light stripe as distinct and as wide as paravertebral light stripes, commencing as a pair of light spots on occipital scales, extending posteriorly to first row of enlarged scales of tail, posterior three-fifths of line undulant or wavy; width of vertebral light stripe, paravertebral dark and light stripes about equal; paravertebral light stripes separated by 12 rows of scales (average of 10 counts) at midbody; paravertebral (first) dark stripes or fields darker than remaining ones; toward center of body vague indication of one or two light spots in these dark fields; second, third and fourth dark stripes successively wider, fourth stripe more than twice as wide as any light stripe which are all subequal in width. Second and third dark stripes each with a very vague indistinct median row of large light spots, somewhat confluent, difficult to count, approximately 12 or 13 spots in each field. Fourth dark stripes with one or two extremely vague, large, diffuse, light spots. Ventrums immaculate white.

COMPARISONS: With this description in mind the type can now be compared with the species of *Cnemidophorus* that Gambel might have encountered from Missouri to California. These species are as follows: *tesselatus*, *tigris*, *sexlineatus*, *inornatus*, *neomexicanus*, *velox*, *sacki*, and *hyperythrus*. The tessellated forms *tesselatus* and *tigris* may be dropped from the list immediately on the basis of color pattern alone. The species *hyperythrus* occasionally has a median light stripe but it has only a single frontoparietal scale and its distribution is such that it is the least likely to have been encountered by Gambel.

Of the remaining forms *sexlineatus* can also be removed from the list on several counts. In this species there is never a median light line as bright or as narrow as the lateral light lines; the third and fourth supraocular scales are in contact with the frontoparietal; the posterior antebrachial scales are definitely though not abruptly enlarged; there are seldom more than 15-15 femoral pores; the intermandibular scales are larger and abruptly demarked by a sudden decrease in size from the small anterior gular scales; the gular fold is not notched, nor are the enlarged gular fold scales interrupted medially by a patch of smaller scales; the enlarged gular fold scales are larger than the median intermandibular scales. Furthermore, the species does not occur in the vicinity of Santa Fe, N. Mex. There is no question of doubt that *sexlineatus* and *perplexus* are not the same.

The remaining species all occur in the vicinity of Santa Fe, and it is these species which must be examined most critically. Of these four species *perplexus* resembles *sacki* the least. In this latter form there is no conspicuous median light stripe; the post-antebrachial scales are abruptly and greatly enlarged; the intermandibular scales are larger and abruptly demarked from the smaller anterior gular scales along a transverse line; the gular fold is unnotched and bordered by a row of enlarged, scutelike scales much larger than the median intermandibular scales and uninterrupted by a triangular patch of smaller scales. The paravertebral light stripes are separated by only about five scales; the second and, particularly, third dark bands are spotted by numerous light spots alternating from side to side of each band; the fourth and lowest band also contains numerous light spots.

C. inornatus of New Mexico and Arizona differs from *perplexus* in that it lacks spots in the dark fields; has about eight scales between the paravertebral light stripes; is much smaller than the type; has larger post-antebrachial scales; the intermandibular scales are much larger, relatively few in number, and abruptly differentiated from the smaller anterior gular scales by one or two transverse rows of still smaller, granular, median scales; the gular fold is unnotched and the enlarged scales of the fold are larger than the median intermandibular scales; there is no patch of smaller scales interrupting the row of enlarged gular fold scales; temporal scales larger and fewer in number; femoral pores fewer.

In spite of the conspicuous differences in scale counts and size, *C. inornatus* in the northwestern part of its range and *C. velox* resemble each more than they resemble any other species of *Cnemidophorus*. Lowe (1955) has discussed the relationship of these two species in a study demonstrating the validity of *C. velox*. While he did not emphasize the fact that *velox* and *inornatus* are nowhere known to be sympatric, he pointed out that they exhibit a marked difference in

habitat and geographic distribution. Moreover, both species are relatively rare in those areas where their ranges approach one another. It is possible that *C. velox* is a direct derivative of *C. inornatus*. As far as we are aware, no definitely identified specimens of *velox* have been reported from Santa Fe, but the species has been collected in New Mexico at Taos, Taos County; 5 miles south of Youngsville, Rio Arriba County, a site some 50 miles northwest of Santa Fe; and 2 miles west of Sands, San Miguel County, some 30 miles southeast of Santa Fe. That the species will ultimately be collected near Santa Fe seems inevitable, for it is a member of similar pinyon-juniper communities not far distant and has been taken both to the north and south of this locality.

C. velox differs from *perplexus* in that the median stripe if present and complete is indistinct, lighter in color and narrower than the paravertebral light stripes and never undulant; the paravertebral light stripes are separated by about eight scales; there are no spots in the dark fields; the post-antebrachial scales are larger than those of *perplexus* but not as large as those of *inornatus*; the intermandibular scales are larger and abruptly demarked from the anterior gular scales along a transverse line (in an occasional specimen this is not marked); the largest scales on the gular fold are usually larger but often equal in size to the largest median intermandibular scales; the gular fold is unnotched and the enlarged scales along it are not interrupted medially by a patch of smaller scales; the temporal scales are slightly larger; the third supraoculars are in broad contact with the frontoparietals.

C. neomexicanus has not yet been taken as near to Santa Fe as has *velox*. The nearest known locality for *neomexicanus* is 6 miles south of Bernalillo, Sandoval County, near the Rio Grande and about 50 miles southwest of Santa Fe. However, this locality more closely approaches the probable type locality for *perplexus* than does any in the presently known distribution of *velox*.

C. neomexicanus differs from *perplexus* in only a few characters, but these differences are for the most part concerned with variable characters and fall within the range of variation described by Lowe and Zweifel (1952). The chief and most important difference lies in the fact that in most specimens of *neomexicanus* the fourth, third, and often the second supraoculars are separated from the median head plates by small scales (circumorbitals). In the type of *perplexus* only the fourth supraocular and three-fourths of the third are so bordered. Another marked difference is in size. Of the 48 specimens available to Lowe and Zweifel (1952), all from Socorro County, N. Mex., the largest is a female measuring 76.4 mm. from snout to vent. The type of *perplexus*, also a female, measures 86 mm. In all other characters the two forms are strikingly similar.

The color patterns and the arrangement and size of the brachial, antebrachial, and post-antebrachial scales are identical; *neomexicanus* usually has a peculiar, anteriorly directed open notch on the gular fold as does *perplexus*; the scales of the gular fold are only moderately and gradually enlarged anteriorly as they are in *perplexus* and their maximum size is less than or equal to the largest median intermandibular scales. The enlarged gular scales are occasionally interrupted medially, as in the type of *neomexicanus*, by a patch of small scales. This condition closely approximates the condition of the type of *perplexus*. The intermandibular scales are larger than the anterior gular scales as they are in *perplexus* and usually are not sharply demarcated from them; however, on either side a few small scales, arranged in a short transverse row, often separate the two areas laterally in *neomexicanus*, but not medially. The arrangement and size of the temporal scales are as similar in the two forms as this type of scalation can be. The number of scales from the occipital region to the rump in the type of *perplexus* is 178, this is within six scales of the average given by Lowe and Zweifel (1952) for *neomexicanus*, namely 184.3 ± 1.2 ; and the number of circumabdominal scales exclusive of the ventral plates is 73, two scales less than the mean of *neomexicanus* which is 74.9 ± 0.62 . In spite of the differences in body size and the extent of the anterior extension of the circumorbital semicircles we are convinced at this time that *neomexicanus* and *perplexus* are one and the same.

It is appropriate to point out that this finding—the first proper allocation of the old name *Cnemidophorus perplexus* to a definitely known population—has been made possible through the detailed study of variation by Lowe and Zweifel (1952), where for the first time the body scale counts were determined and analyzed statistically in a study of variation in the genus *Cnemidophorus*.

The remaining specimens upon which the description of *perplexus* was based have been examined and may be identified as follows. The five specimens (USNM 3022) collected by John H. Clark in the valley of the Rio San Pedro of the Rio Grande del Norte are all *Cnemidophorus sacki gularis* Baird and Girard. The two specimens of USNM 3050, "collected" by General Churchill on the Rio Grande west of San Antonio, are both *Cnemidophorus inornatus* Baird. The second specimen, collected by Gambel and originally bearing the same number as the type (USNM 3060), is now numbered USNM 30885. This is also a specimen of *Cnemidophorus inornatus*.

For the most part descriptions of specimens of *perplexus* in the literature are so brief as to make identification virtually impossible. Furthermore, so many lined whiptails have been confused with each other that all of the earlier, more extended accounts of these forms,

when based on series, almost inevitably are based on more than one species. The synonymy given below is, then, tentative, and includes only those references which seem very likely to pertain to:

***Cnemidophorus perplexus* Baird and Girard**

- Cnemidophorus perplexus* Baird and Girard, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, p. 128, 1852; Appendix F, Reptiles, in Exploration of the Red River of Louisiana, in . . . 1852, p. 239, 1853 (reference to 1852 description).—Cope, U. S. Nat. Mus. Bull. 1, p. 46, 1875 (listed).—Gadow, Proc. Zool. Soc. London, p. 368, 1906 (Bernalillo County, N. Mex.; brief description).—Van Denburgh, Proc. California Acad. Sci., ser. 4, vol. 13, p. 211, 1924 (record from Santa Fe (San Ildefonso), N. Mex.; possible).—Burger, Chicago Acad. Sci., Nat. Hist. Misc., No. 65, p. 3, 1950 (diagnosis based on type).
- Cnemidophorus octolineatus*, Yarrow, Report upon the collections of batrachians and reptiles, in Geographical and geological explorations and surveys west of the 100th meridian, vol. 5, chap. 4, p. 558, 1875 (San Ildefonso, N. Mex.; possible).
- Cnemidophorus tessellatus perplexus*, Cope, Amer. Nat., vol. 26, pl. 18, fig. B, 1892 (dorsal color pattern, possibly of type of *perplexus*); Trans. Amer. Philos. Soc., vol. 17, pp. 34–35, 1893 (redescribes type specimen; pl. 6, figs. A–G not of *perplexus*; p. 12, fig. B, possibly of *perplexus*); in Ann. Rep. U. S. Nat. Mus. 1898, pp. 573–575, 1900 (figure 105 not of *perplexus*; redescription of type).
- Cnemidophorus sexlineatus perplexus*, Burt, U. S. Nat. Mus. Bull. 154, pp. 122, 125, 1931 (designates lectotype, gives description).
- Cnemidophorus sexlineatus*, Smith and Taylor, U. S. Nat. Mus. Bull. 199, p. 185, 1950 (cites *perplexus* as synonym; specifies type, type locality unknown).
- Cnemidophorus perplexus perplexus*, Smith and Taylor, Univ. Kansas Sci. Bull. 33, p. 363, 1950 (lists species as valid, identifies Rio San Pedro as Devils River).
- Cnemidophorus neomexicanus* Lowe and Zweifel, Bull. Chicago Acad. Sci., vol. 9, pp. 230–247, fig. 1c, pl. 1, fig. a, 1952 (type, Mus. Vert. Zool. Univ. California No. 55807, McDonald Ranch Headquarters, 4,800 ft., 8.7 miles west and 22.8 miles south of New Bingham Post Office, Socorro County, N. Mex., Charles H. Lowe, Jr., collector; detailed description, comparisons, and ecology).

LECTOTYPE: USNM 3060, adult female, type designation by Burt (1931, p. 122).

TYPE LOCALITY: Herewith restricted to valley of the Rio Grande in Sandoval County, N. Mex., in the vicinity southwest of Santa Fe. Type collected by Dr. William Gambel on his first journey to California, near the end of July 1841.

Summary

The type of *Cnemidophorus perplexus* was selected by Cope but not clearly designated as such. Burt (1931) followed the procedures recommended by the 13th and 14th International Congresses of Zoology and properly designated USNM 3060 as the lectotype of this species. The specimen was collected by William Gambel, probably on his first journey to California near the end of July 1841. The type

locality is probably the valley of the Rio Grande in Sandoval County, N. Mex., in the vicinity southwest of Santa Fe. As this locality is geographically and ecologically apart from the area formerly recorded as being occupied by this species, extensive comparisons of *C. perplexus* with all the species living in the region of Santa Fe had not been made. Of the various species that are now known to occur here it is evident that one of them, *C. neomexicanus* Lowe and Zweifel, is conspecific with *C. perplexus*. This name, therefore, must be considered as a synonym of *Cnemidophorus perplexus*.

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