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Status of *Thamnophis sirtalis* in Chihuahua, Mexico (Reptilia: Colubridae)

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STATUS OF *THAMNOPHIS SIRTALIS* IN CHIHUAHUA, MEXICO (REPTILIA: COLUBRIDAE)

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ABSTRACT.—This is a study of the populations of *Thamnophis sirtalis* that occur in Chihuahua, Mexico, and the adjoining U.S. state of New Mexico. Reference is made to previous studies dealing with geographical and systematic relationships. Additional data are provided for the New Mexico subspecies (*dorsalis*), and the relationship of *T. s. parietalis* to the New Mexico population is discussed. The Chihuahua population is described as a new subspecies.

During the summer of 1899, Nelson and Goldman collected a specimen of *Thamnophis sirtalis* in north central Chihuahua. It was reported by Goldman (1951) to have been collected at Casas Grandes. Smith (1942) examined the specimen (USNM 46371) and referred it to the subspecies *Thamnophis sirtalis parietalis* (Say 1823). Smith's examination of this female specimen provides the following characters: scale rows 19-19-17, ventrals 152, tail incomplete, supralabials 7-7, infralabials 10-11, preoculars 1-1, and postoculars 3-3. It is further stated that the spots in the upper row are fused together, with those in the lower row confluent with the upper row but not with each other, and with spaces between red.

Since the Smith report, a number of studies have been made concerning the identity of specimens presumably collected in the Rio Grande basin (of which the Río Casas Grandes and Río Santa María in northern Chihuahua were a part during the recent pluvial period). Smith and Brown (1946), after an examination of the literature and available data, concluded that *T. ornata* (Baird 1859), which was supposedly collected between San Antonio and El Paso, Texas, was indeed a synonym of *T. s. parietalis*. Fitch and Milstead (1961) reexamined the status of *Thamnophis dorsalis* (Baird & Girard 1853) and concluded that *Thamnophis cyrtopsis* (Kennicott 1860) is a synonym of *Thamnophis sirtalis dorsalis*. Fitch and Maslin (1961), in their study of *Thamnophis sirtalis* in the Great Plains and Rocky Mountains, concluded that *dorsalis* was a synonym of *Thamnophis sirtalis ornata* Baird, referred the specimen from Casas Grandes, Chihuahua, to the subspecies *ornata*, and placed specimens from the Rio Grande valley of New Mexico, which had previously been designated as *Thamnophis sirtalis parietalis*, within the distribution area of *ornata*. Webb (1966), in his study by *Thamnophis cyrtopsis*, concluded that *Eutaenia dorsalis* is applicable to the upper Rio Grande population of garter snakes designated by Fitch and Maslin (1961) as *Thamnophis sirtalis ornata*.

In spite of much uncertainty concerning the type locality and the loss of the type specimen, Fitch (1980) accepted (with reservations) the subspecific name *dorsalis* as proposed by Webb for the population of *sirtalis* presently occurring in the Rio Grande valley of New Mexico.

Not until Van Devender and Lowe (1977) reported a series of *Thamnophis sirtalis* collected at or near Yepómera, in central Chihuahua, was there sufficient material to provide a basis for a study of the Chihuahua population. Since the study by Fitch and Maslin (1961), considerably more comparative material has become available from New Mexico. Through the courtesy of Dr. C. H. Lowe, I have had the privilege of examining the recently collected series of 13 specimens of *T. sirtalis* from Yepómera or nearby, 1 specimen from Nuevo Casas Grandes, and 3 specimens from near Galeana (one of these from Dr. R. Conant); in addition, USNM 46371 from Casas Grandes, Chihuahua, has been reexamined. A large series from New Mexico, loaned by Dr. W. G. Degenhardt, is now available. The series from Kansas (KU) and

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Utah (BYU) collections were also used as comparative material. Although there are many similarities to the population along the Rio Grande in central New Mexico, when compared to the population in central Chihuahua some significant variations are apparent (Tanner 1986). Differences are seen not only in some scale patterns, but also in color pattern. Furthermore, the Chihuahua population is several hundred miles removed from the nearest known populations in New Mexico and Texas. This isolation from the main body of this widespread species, which has apparently existed since the recent Ice Age, has resulted in character modifications sufficiently significant to recognize the Chihuahua population as a subspecies. It is, therefore, named in honor of one who has added much to the herpetology of southwestern United States and northwestern Mexico.

Thamnophis sirtalis lowei, n. subsp.

TYPE.—An adult female, UAZ 34879, Yepómera, Chihuahua, Mexico; collected 8 June 1972, by T. R. Van Devender. See Figure 1.

PARATYPES.—UAZ 34066, 34070, 34230, 34880–82, Yepómera; UAZ 34071, 3 km N Yepómera; UAZ 34067–69, 34399, 5 km N Yepómera; UAZ 34149, 6 km N Yepómera; UAZ 34434, 0.5 km N Nuevo Casas Grandes; USNM 46371, Casas Grandes, Chihuahua, Mexico.

DIAGNOSIS.—A subspecies similar to *T. s. parietalis* and *T. s. dorsalis* but with 21 rows of dorsal scales on the anterior part of the body, with the first reduction to 20 rows above the 10th to 19th ventral or the 10th to 19th scale posterior to the parietals in the middorsal stripe; ventrals male 158–166 (160.6), female 157–164 (160.7); subcaudals male 84–89 (86.5), female 73–78 (75.4); supralabials 7 or 8, infralabials 9–12. Color pattern (Fig. 1) similar to that of *T. s. parietalis* but differing noticeably from *T. s. dorsalis* as illustrated by Fitch and Maslin (1961, Fig. 4).

DESCRIPTION OF TYPE.—Top of head a dark olive brown, becoming darker on temporals, the expanded dark of temporal area narrowing to become a dark stripe 2–3 scale rows wide and sharply edging the middorsal cream-colored stripe, laterally being separated from the large dark spots by narrow longitudinal stripes of pink or reddish markings that usually surround the spots dorsally and laterally; ventrally the dark spots contact the light lateral stripe on the edge of the 3rd scale row. There are 66 lateral dark spots extending from nape to vent, distinct for the length of the body, but not extending onto the tail; dorsal stripe sharply defined and two scales wide, occupying the middorsal row and half of the adjacent rows, extending from parietals well onto tail before becoming indistinct near its end; lateral stripe distinct, but paler than dorsal and on rows 2 and 3; lower labials, chinshields, gulars, and anterior ventrals cream colored; ventrals a lead grey and without dark spots except for a few irregular shaped and spaced spots edging onto the ventrals from the first scale row.

Lepidosis generally normal for the species, with nasal divided, anterior section largest, one loreal, one preocular, 3–4 postoculars, 1+2 temporals, supralabials 7-7, infralabials 11-12 with 5-6 on right side divided, scale rows 21-19-17, reduction to 20 rows above 14th ventral, ventrals 157, subcaudals 78, anal single; except for the ventrals, subcaudals, head, and temporal scales, all scales have keels.

COMPARISONS.—The reduction to 20 scale rows may occur from the 10th to the 19th ventral, with an average for the series of 13.73 ventrals. In the middorsal stripe the reduction occurs between 10–20 scales posterior to the parietals, with an average of 13.9 scales. A comparison of these data to specimens of *sirtalis* from all other areas of distribution in the United States provides a reduction usually by or before the 8th ventral. A series of 61 specimens from the Rio Grande valley of New Mexico (Valencia, Bernalillo, Socorro, Sierra, and Rio Arriba counties) gives the following on the reduction of the scale rows: above the 5–11 ventral, average 7.7; below the 7–14 scale in the middorsal stripe posterior to the parietals, average 9.6.

The reduction to 20 scale rows in the New Mexico series provides more variation than in other populations or subspecies (Table 1). Actually *T. s. dorsalis* is an intermediate segment of the species between *T. s. parietalis* to the north and *T. s. lowei* to the south. This is reflected in the reduction of the scale rows, number of subcaudals, and slight increase in supralabials and infralabials.

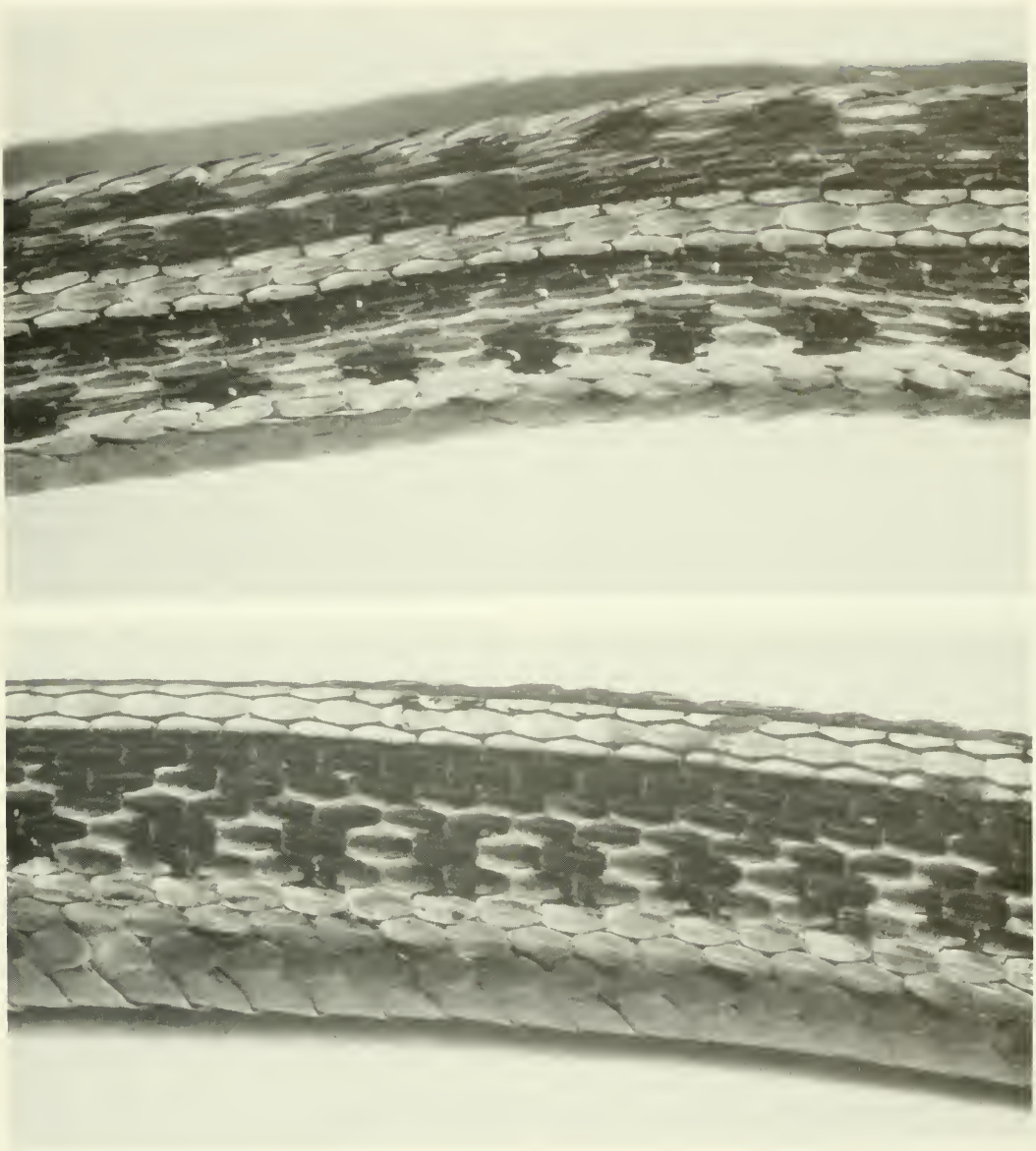

Fig. 1. A, dorsolateral view of the color pattern of the type of *Thamnophis sirtalis lowei*, UAZ 34879, taken at Yepómera, Chihuahua, Mexico, by T. R. Van Devender, 8 June 1972; B, dorsolateral view of a paratype of *Thamnophis sirtalis lowei*, UAZ 34881, Yepómera, Chihuahua, Mexico.

The color pattern is a variation between the diagrammatic drawings of Fitch and Maslin (1961) for *T. s. parietalis* (Fig. 3) and *T. s. ornata (dorsalis)* (Fig. 4). There is a reduction of the dark brown or black when compared to *T. s. parietalis* and considerably more than in *T. s. dorsalis* as previously described. A dark border two scales wide is lateral to the mid-dorsal stripe, in turn bordered by a narrow, broken, pink to reddish stripe, which usually separates the large lateral spots from the dark band between them and the dorsal stripe. In *T. s. dorsalis*, as described and figured by Fitch and Maslin (1961), the dark lateral spots are more often than not surrounded dorsally and laterally by the pink color, which may be a scale or more wide. In *T. s. lowei* there are irregular, small, dark extensions that may

TABLE 1. Scale pattern relationships between four subspecies of *T. s. sirtalis*. Scale row reductions occur above ventrals, with variations ranging from the 3rd to 19th.

Number examined	31	22	72	14
Subspecies	*s. sirtalis* (eastern U.S.)	*s. parietalis* (Kansas)	*s. dorsalis* (New Mexico)	*s. lowei* (Chihuahua)
Scale row reduction	3–8 (5.9)	5–10 (6.9)	5–11 (7.7)	10–19 (13.73)
Ventrals	♂ 10=144–159(152.0) ♀ 20–137–154(143.0)	11=152–161(157.3) 10=150–159(154.1)	17=159–178(166.0) 44=156–166(160.2)	3=158–166(160.6) 11=157–164(160.7)
Subcaudals	♂ 8=71–83(76.0) ♀ 18=55–70(63.7)	8=81–86(84.1) 8=69–77(74.3)	17=78–86(83.5) 32=65–78(72.6)	2=84–89(86.5) 5=73–78(75.4)
Supralabials	6–8 (7.0)	7–8 (7.08)	7–8 (7.15)	7–8 (7.43)
Infralabials	9–11 (9.77)	9–11 (9.85)	8–11 (10.0)	9–12 (10.2)

extend dorsally to connect the lateral spots to the dark band lateral to the median stripe. The dark lateral spots involve 4–7 scales and are separated from each other by at least one light (pink) scale. This is in contrast to most *dorsalis*, which have smaller spots involving 1–5 scales and more pink color between and dorsal to the spots (Fig. 2).

REMARKS.—Few species in North America have as wide a distribution as *Thamnophis sirtalis* (Fitch 1980). This has contributed to a series of variations not only in lepidosis but also in color pattern, resulting in the description of a number of subspecies. The study by Fitch and Maslin (1961) and the catalogue report by Fitch (1980) provide the most recent analysis of the species and establish a basis for a further examination of the populations now extant in the midsection of its distribution (Kansas, Colorado, Utah, Idaho, New Mexico, and Chihuahua, Mexico). The present study is concerned only with those populations occurring in Chihuahua and New Mexico.

The habitat requirements of *sirtalis* (streams, meadows, etc.) have produced in some areas (Rio Grande valley of New Mexico, Wasatch Front area of north central Utah, as well as central Chihuahua) a degree of isolation that appears to have limited these populations to little if any contact with populations in neighboring river valleys. This isolation has resulted since the recent pluvial period, and its effect on the variation between populations is only now, with an increase in available specimens, becoming evident. There is at present a wide area of desert separating the Chihuahua and New Mexico populations. Indications are that these populations have, through the slow desiccation since the recent Ice Age, been forced from the desert valleys to the more suitable mesic areas south or north of the northern basins of the Río Casas Grandes, and Río Santa María. Indications are that much of southern New Mexico originally served as a connection between populations in Chihuahua and New Mexico. At present the major concentration of the Chihuahua population appears to be in tributaries of the Río Papigochic near Yepómera and the basin of the Laguna de Babicora northwest of Gómez Farías. The populations in the Río Casas Grandes and Río Santa María are now seemingly restricted to areas south of Nuevo Casas Grandes and Galeana. Dams and diversions for agricultural purposes permit little stream flow to the north. Specimens UAZ 34434 from 0.5 km N of Nuevo Casas Grandes and USNM 46371 from Casas Grandes are similar to the population at or near Yepómera and may represent at present the northern extent of the *lowei* population. Furthermore, the southern headwaters of the Río Casas Grandes lie directly north of the Yepómera-Babicora area and may have provided for a natural migration lane from the Río Casas Grandes basin into the southern basins.

The population in the Río Santa María basin is presently isolated from the population in the Río Casas Grandes basin. Apparently, this has been the case since the desiccation separated the two basins, each now having separate closed lake basins terminating in separate inland dead lakes (Laguna de Santa María and

Laguna de Guzmán). This isolation has produced variation between the two *sirtalis* populations of Chihuahua. Three specimens from south of Galeana have fewer ventrals (151 and 152) and less pink laterally.

I have seen the three specimens from 1–3 miles S of Galeana. All other Chihuahua specimens have ventrals ranging from 154 to 166. In the one provided by Dr. Conant (1 mile S) the reduction to 20 scale rows and color pattern is similar to *lowei;* in the others the scale rows reduce above 7–9 ventral, and the color pattern is darker, with a noticeable reduction of the pink that tends to obscure the dark lateral spots so prominent in *lowei.* Until additional specimens are available, it is impossible to determine if the population in the Río Santa María basin has the basic characters relating it to either *lowei* or *dorsalis* or if it may represent a distinct population that should be recognized as a subspecies.

The subspecies *T. s. dorsalis* is, according to Fitch and Maslin (1961), Fitch (1980), and Stebbins (1985), recognizable by its color pattern. This subspecies designation at present includes only specimens occurring in the Rio Grande basin of New Mexico. An examination of New Mexico specimens, however, indicates that there are two distinct color patterns, one occurring in the southern counties (southeastern Valencia, Socorro, and Sierra) and one to the north (northwest Valencia, Bernalillo, and north into Rio Arriba). A typical color pattern for *dorsalis* (Fig. 2) consists of small spots above the lateral stripe, involving 1–5 scales and with a light space (with pink or blended colors) between them and a narrow dark stripe lateral to the middorsal stripe. This pattern gives specimens a much lighter ground color than is seen in specimens from northern New Mexico or in the subspecies *parietalis* or *lowei.*

In specimens from the northern counties, the pattern consists basically of a series of dark brown columns extending from the lateral line dorsad to fuse with a wide, dark area lateral to the dorsal stripe. Between these columns is a series of 3 or 4 oblong pink spots (Fig. 3). In only a few specimens are there additional light or pink spots radiating dorsad into the dark area as is common in *parietalis.* This pattern has a distinctness not often seen in other subspecies, but one that is easily related to *parietalis.*

In northeastern Valencia and extreme southern Bernalillo counties, some specimens do not conform to either of the above patterns. In this relatively narrow area, seemingly centered near Isleta and Los Lunas, specimens of either pattern and all gradations between occur. A typical intergrade has more pink and light colors between the spots that are partly or narrowly separated from the dark area lateral to the dorsal stripe. Some specimens have larger spots and a narrower dark area lateral to the dorsal stripe or various gradations in which lighter or darker patterns occur. Usually specimens with intergrading color patterns have more red in the pattern than *parietalis* and less than in *dorsalis.*

It is not a rarity for subspecies to have variable color patterns (*Sonora semiannulata* or *Lampropeltus getulus californiae*) nor to have narrow areas of intergradation. However, in this case there may have been other factors involved. All evidence indicates that *Thamnophis sirtalis* was once more widespread in south central United States and adjoining Mexico than at present. Based on present isolated populations in this wide area and data from the specimens available, one is inclined to wonder if the present population in the Rio Grande basin of New Mexico was derived from two *sirtalis* invasions into the basin.

There is reason to believe that much of Colorado and northern New Mexico was not a suitable habitat for *sirtalis* during the last pluvial period. This is not because of cool or cold temperatures, for *sirtalis* is well adapted to these conditions. Instead, it would seem that the mountains extending from southern Colorado into northeastern New Mexico served as a barrier during the Ice Age; thus, *sirtalis* may at that time have entered the Rio Grande valley by moving south along the western edge of the Great Plains. To the south an entirely different and suitable habitat must have been present, particularly in most of northern Chihuahua, western Texas, and southern New Mexico. These southern valleys served as catchment basins for the streams flowing south from New Mexico and north from the mountains in central and western Chihuahua. Apparently, *sirtalis* inhabited a wide area while these valleys were the recipient of major stream flow that provided suitable habitat along streams, lakes and adjoining meadows. As desiccation slowly changed

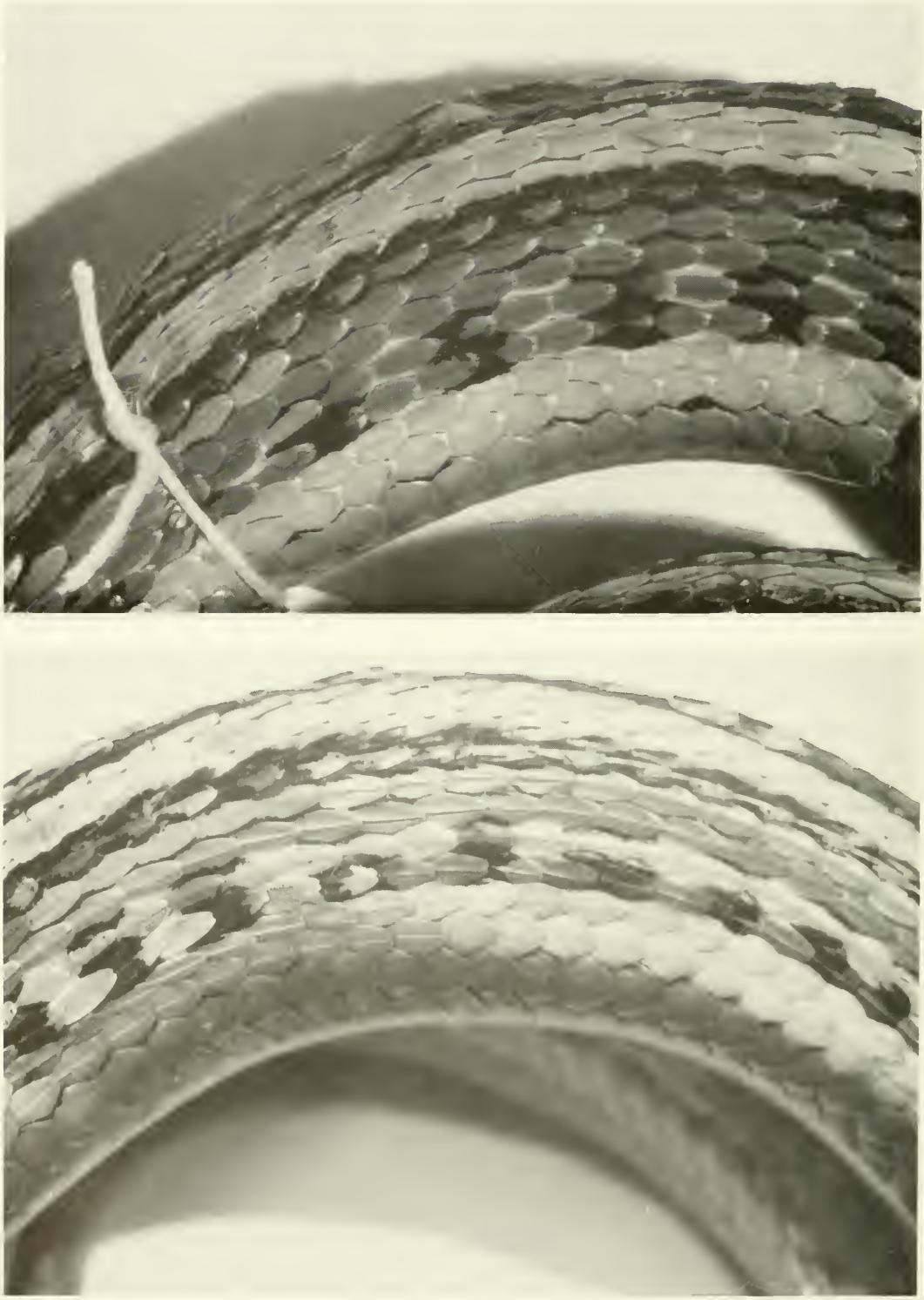

Fig. 2. Dorsolateral views of the color pattern of *Thamnophis sirtalis dorsalis:* A, UNM 15464, collected 3 miles S Isleta (Hwy. 47), Valencia County, New Mexico; B, UNM 32523, collected at Basque del Apache headquarters, Socorro County, New Mexico.

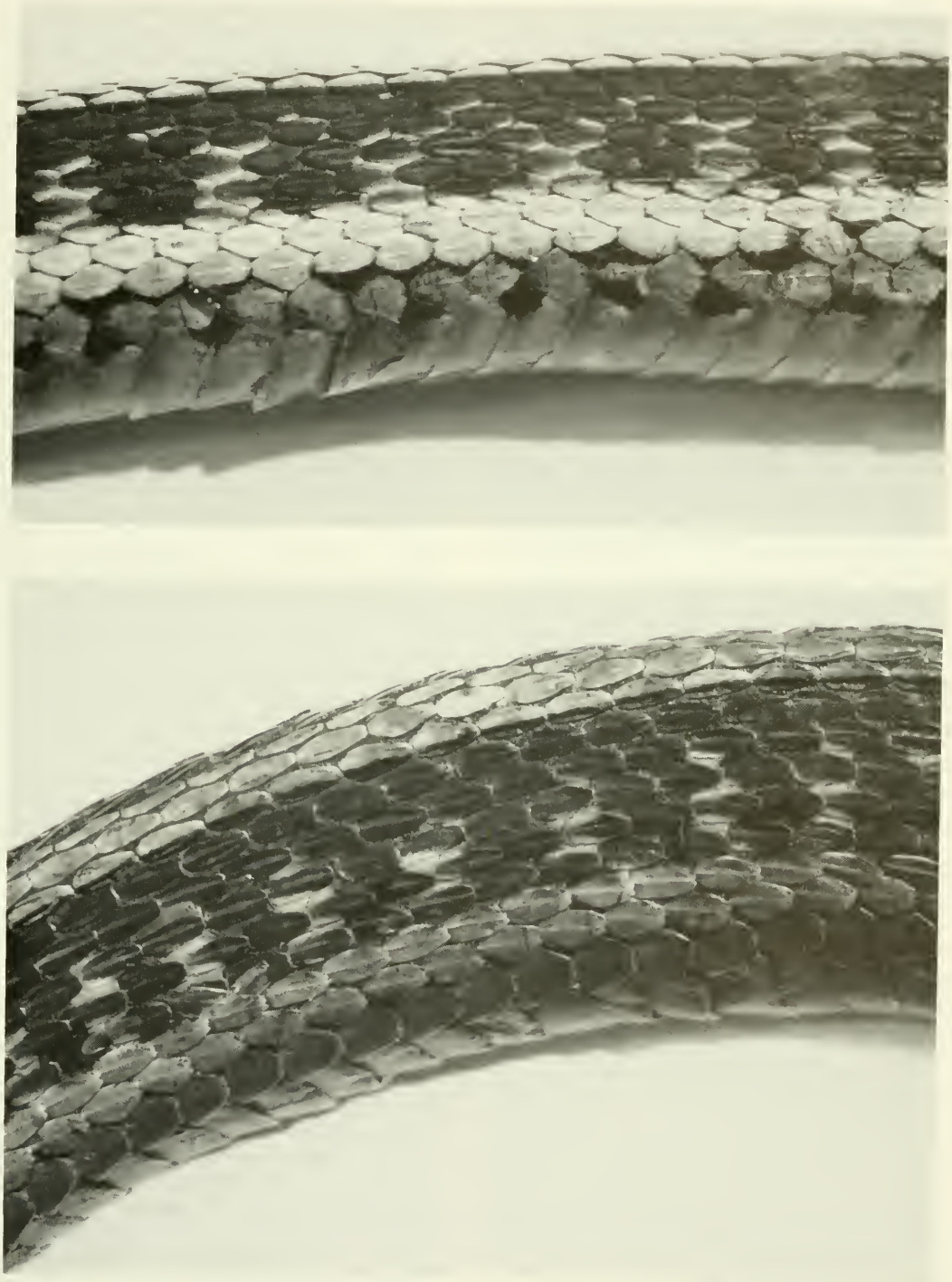

Fig. 3. Lateral and dorsolateral views of *Thamnophis sirtalis parietalis:* A, UNM 15583 2 miles S junction Hwy. 85/45, Bernalillo County, New Mexico; B, UNM 14697, 1.5 miles S junction NM Hwy. 54 and U.S. Hwy. 85, Valencia County, New Mexico.

this area into desert, *sirtalis* moved into the major drainage basins. In Chihuahua, two basins, Río Santa María and Río Casas Grandes, were inhabited and in southern New Mexico the Rio Grande to the north. It appears that the southern population of *sirtalis* was divided into north (Río Casas Grandes and Río Santa María) and south (Yepómera area) populations at an early date, and later the northern segment subdivided into the two river basins in northern Chihuahua.

The population in south central New Mexico (*dorsalis*) and the population in west central Chihuahua (*lowei*) show several relating characters. The color pattern is easily derived from either (*dorsalis* from *lowei* or *lowei* from *dorsalis*). Available data suggest that the ancestral population present during or immediately after the pluvial period was spotted, not with dark lateral columns as in the northern population of New Mexico or as is seen in some *parietalis*. Also, the dorsal rows are reduced to 20 rows more often at 9–11 ventrals than in the northern New Mexico population or *parietalis*.

The northern population seems closely related to *parietalis*. The similar color pattern may have come from *parietalis* entering the Rio Grande basin at a later period when conditions in northeastern New Mexico permitted a movement from eastern valleys (Arkansas or Canadian) into the headwaters of the Rio Grande. Such an invasion by *parietalis* would explain the color pattern differences and provide at least a tentative explanation for the divergence in pattern seen in the Rio Grande basin of central New Mexico.

If we conclude that the southern segment of the New Mexico population of *sirtalis* is a recognizable subspecies and retain it as the subspecies *dorsalis* based on what has been described by previous authors as a color pattern variable in the species, then it becomes necessary, based on available data, to deal with it as a subspecies and provide a diagnosis distinguishing it from *lowei*, to the south, and *parietalis*, to the north.

Thamnophis sirtalis dorsalis (Baird & Girard)
Rio Grande Garter Snake

DIAGNOSIS.—A subspecies with 19-19-17 or occasionally 21-19-17 scale rows, supralabials 7 or occasionally 8, ventrals 156–178, males 159–178 (166.0), females 156–166 (160.2), subcaudals 65–87, males 78–87 (83.5), females 65–78 (72.6), dorsal and lateral light stripes distinct on two scale rows, dorsal stripe edged laterally by a narrow dark area, irregular on its lateral edge, varying from 1 to 1 1/2 scales wide and with a wide area of pink or olive to light brown on both skin and scales separating the dark dorsal area from the small, lateral, dark spots (Fig. 2). Lateral spots small, involving 1–5 scales but not usually involving an entire scale, and usually in contact with the lateral stripe; ventrals and first row of scales with small, irregular, dark spots but not uniformly spaced.

DISTRIBUTION.—Sierra County: 18 specimens from Elephant Butte Reservoir are badly darkened by preservative. By submerging in clear fluid most show small lateral spots and a narrow dark edging lateral to the dorsal stripe. In a few the color pattern cannot be clearly seen. At least 13 can be determined to have the *dorsalis* color pattern (KU 5479–5497). Socorro County: 2 miles S Belen (UNM 17800); 7 1/2 miles S 1/2 mile W San Antonio (UNM 15965); Basque del Apache headquarters (UNM 32523, 35795). Valencia County: (UNM 383 no data); Isleta Marsh (UNM 14818–9, 14873); 3 miles S Isleta Hwy. 47 (UNM 15464–5); 2.4 miles S intersection Coors and U.S. 85 (UNM 19747); 8 miles N Belen Hwy. 6 (UNM 33922); (UNM 39597 no data). Bernalillo County: 3.5 miles S junction NM Hwy. 45 and US 85 (UNM 15212).

The specimens from southeast Valencia County have a color pattern characteristic of *T. s. dorsalis* as described by Fitch (1980). The lateral spots are small, involving 5 or fewer scales and spots not contacting the narrow dark margin lateral to the dorsal stripe. The body spots range from 75 to 88 and average 80 spots. This is a noticeable increase when compared to either *lowei* or *parietalis*.

The following specimens from Valencia and Bernalillo counties do not have the *dorsalis* color pattern as seen in Figure 3. I consider them to be either *dorsalis-parietalis* intergrades or a southern extension of *parietalis;* Valencia County: 2 miles N Los Lunas on Hwy. 85 (UNM 4631); marsh 4 miles N and 1/2 mile E Los Lunas (UNM 5224-6); 1 1/2 miles SE Belen (UNM 7606); 4 miles N Los Lunas (UNM 10897–9); 2 miles N Los Lunas (UNM 10962); 3 miles N Isleta marshes (UNM

15130); Los Lunas (UNM 11410); 14.7 miles from UNM S Hwy. 10 at Isleta Pueblo (UNM 11552); 1.5 miles S junction NM 45 and US 85 (UNM 14696–7); 4 miles N Peralta on Hwy. 47 (UNM 19777); 20 miles S Alb swamps along Hwy. 85 (UNM 19782); 10 miles N junction Hwys. 6 and 57 (UNM 31653–4); 3 miles N Lunas Hwy. 85 (UNM 32709); Hwy. 47 14 miles N junction 6 and 47 (UNM 37813). Bernalillo County: (UNM 375 no data); Albuquerque, Perea Rd. (UNM 384); 1 km N central on US 66 (UNM 5440); Albuquerque, W Rio Grande near Rt. 66 (UNM 8414); 2 miles S junction Hwys. 45 and 85 (UNM 15583); 3 miles SW Isleta along Hwy. 85 (UNM 5429–32); Pyle Beach, Albuquerque (UNM 10238–9); Isleta Indian Reservation (UNM 11063–4); 10 miles S Hwy. 66 on Hwy. 45 (UNM 11101); S Hwy. 55 bridge (UNM 11317–20); 9 miles N Albuquerque (UNM 12137); Beach Road NW Albuquerque (UNM 12314); Isleta Reservation (UNM 12209); Isleta Pueblo (UNM 12981); 3/4 mile S Coors intersection Hwy. 95 (UNM 12986); Hwy. E Coerales Bridge (UNM 14820); and 2 miles S junction Hwys. 85 and 45 (UNM 15583). Rio Arriba County: Espanola (UNM 31908); Riverside Lake, Espanola (UNM 36458–9).

The New Mexico populations do not vary significantly in scale patterns and are summarized as a unit in Table 1. Although the series is small for the subspecies *sirtalis* and *parietalis*, an east to west cline in all scale patterns is evident. In *dorsalis* and *lowei* the cline is north to south. These clines may be best expressed by percentages in the reduction of the dorsal scale rows to 19. The *sirtalis* from eastern U.S. all reduce by or before the 8th ventral; in 22 specimens from Kansas (*parietalis*), 1 reduces at the 10th ventral, the rest (95%) before the 10th; in 72 specimens of *dorsalis*, 10 reduce at the 10th ventral (approx. 14%), while all others at the 9th or before; and in *lowei* 93% reduce between the 10th to 19th ventral, with one reducing at the 9th. A relationship between *parietalis*, *dorsalis*, and *lowei* is not only indicated by the scale patterns but also by trends in color pattern, particularly in the similar pattern between the northern New Mexico populations and *parietalis* as well as *dorsalis* in southern New Mexico and *lowei* in Chihuahua.

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