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BY

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[pg 291]

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Introduction

The common garter snake (*Thamnophis sirtalis*) has by far the most extensive geographic range of any North American reptile, covering most of the continental United States from the Atlantic to the Pacific and from south of the Mexican boundary far north into Canada and southeastern Alaska. Of the several recognized subspecies, the eastern *T. s. sirtalis* has the most extensive range, but that of *T. s. parietalis* in the region between the Mississippi River and the Rocky Mountains is almost as large. The more western *T. s. fitchi* occurring from the Oregon and California coasts east through the northern Great Basin, has the third largest range, while the far western subspecies *pickeringi*, *concinus*, *infernalis* and *tetrataenia*, and the Texan *T. s. annectens* all have relatively small ranges.

Since the publication of Ruthven's revision of the genus *Thamnophis* more than 50 years ago, little attention has been devoted to the study of this widespread and variable species, except in the Pacific Coast states ([Van Denburgh](#), 1918; [Fitch](#), 1941; [Fox](#), 1951). However, [Brown](#) (1950) described the new subspecies *annectens* in eastern Texas, and many local studies have helped to clarify the distribution of the species in the eastern part of the continent and to define the zone of intergradation between the subspecies *sirtalis* and *parietalis*. In our study attention has been focused upon *parietalis* in an attempt to determine its western limits and its relationships to the subspecies that replace it farther west.

Taxonomic History

Thamnophis sirtalis parietalis Say was described (as *Coluber parietalis*) in 1823 from a specimen obtained in what is now Washington County, Nebraska, on the west side of the Missouri River three miles upstream from the mouth of Boyer's River [Iowa], or approximately eight miles north of Omaha. Although the type locality was unequivocally stated in the original description, Nebraska was not mentioned since the state was not yet in existence. Because ^[pg 292]the mouth of Boyer's River, the landmark by means of which the type locality is defined, is in Iowa, the impression has been imparted that the type locality itself is in Iowa ([Schmidt](#), 1953:175), and to our knowledge the type locality has never been associated with Nebraska in the literature.

Like all the more western subspecies, *parietalis* is strikingly different from typical *sirtalis* in having conspicuous red markings. The relationship between the two was early recognized. Several of the other subspecies were originally described as distinct species. *Coluber infernalis* Blainville, 1835; *Tropidonotus concinnus* Hallowell, 1852; *Eutainia pickeringi* [Baird and Girard, 1853](#); and others now considered synonyms eventually came to be recognized as conspecific with *Thamnophis sirtalis*. [Ruthven](#) (1908:166-173) allocated all western *sirtalis* to either *parietalis* or *concinnus*, the latter including the populations of the northwest coast in Oregon, Washington and British Columbia.

Subsequent more detailed studies by later workers with more abundant material led to the recognition of some subspecies that Ruthven thought invalid and led to the resurrection of some names that he had placed in synonymy. [Van Denburgh and Slevin](#) (1918:198) recognized *infernalis* as the subspecies occurring over most of California and southern Oregon, differing from more northern populations in having more numerous ventrals and caudals and a paler ground color. [Fitch](#) (1941:575) revived the name *pickeringii* for a melanistic population of western Washington and southwestern British Columbia, restricting the name *concinnus* to a red-headed and melanistic population of northwestern Oregon, and restricting the name *infernalis* to a pale-colored population in the coastal strip of California.

These changes left most of the populations formerly included in *concinnus* and *infernalis* without a name, and [Fitch](#) (*op. cit.*) revived *Thamnophis sirtalis tetrataenia* (Cope) to apply to them. However, [Fox](#) (1951:257) demonstrated that the type of *T. s. tetrataenia* came from the San Francisco peninsula (rather than from "Pit River, California" as erroneously stated in the original description) and that the name was applicable to a localized peninsular population rather than to the wide-ranging far western subspecies, which he named *T. s. fitchi*. The range of *fitchi* includes California west of the Colorado and Mohave deserts (except for the narrow strip of coast occupied by *infernalis* and *tetrataenia*), Oregon except the northwestern [pg 293]part, Washington east of the Cascade Range, most of British Columbia, extreme southeastern Alaska (occurring farther north than any other terrestrial reptile of North America) and parts of Idaho.

Neither [Fox](#) (1951) nor [Fitch](#) (1941) defined the eastern limits of *fitchi* or discussed its relationship to the subspecies *parietalis*. [Wright and Wright](#) (1957:849) stated: "Fitch ... did not even mention the big scrap basket form *parietalis*, from which he pulled *T. s. fitchi* (old *tetrataenia*). That comparison remains to be made, and the east boundary of *fitchi* and the west boundary of *parietalis* are still nebulous." We have undertaken to define better than has been done before the ranges of *parietalis* and *fitchi* and to list the diagnostic characters separating these two subspecies. Freshly collected material of

both has been compared. At the time of his 1941 revision the senior author had never seen a live or recently preserved specimen of *parietalis*.

Discontinuity of Range

Wherever it occurs at all, the common garter snake is usually abundant. Because of its diurnal habits and the concentration of its populations along watercourses, it is not likely to be overlooked. There are few, if any, remaining large areas in the United States where herpetologists have not carried on field work. It may be anticipated that certain rare and secretive species will still be found far from any known stations of occurrence, and seeming gaps in the ranges of these species will eventually be filled. But for the common garter snake the negative evidence provided by the lack of records from extensive areas should be taken into account in mapping the range.

Most large collections of garter snakes contain misidentified specimens. The diagnostic differences in color and pattern are often obscured, especially if the specimens are poorly preserved. Many specimens deviate from the scalation typical of the form they represent, and key out to other species. Isolated records should therefore be accepted with caution. A case in point is Colorado University Museum No. 46, from Buford, Rio Blanco County, Colorado, originally identified by [Cockerell](#) (1910:131) as *Thamnophis sirtalis parietalis*. This specimen, and another, now lost, from Meeker in the same county seemingly served as the basis for mapping the range of *sirtalis* across the western half of Colorado, for there seem to be ^[pg 294]no other records from this part of the state. However, a re-examination of the specimen from Buford shows it to be an atypical individual of another species, *T. elegans vagrans*. A specimen of *T. radix haydeni* (Col. U. Mus. No. 3165) was the basis for [Maslin's](#) (1959:53) record of *parietalis* in Baca County on the north fork of the Cimarron River in southeastern Colorado. [Brown](#) (1950:203) has mentioned the difficulty of defining the range of *sirtalis* in the southern Great Plains because of misidentifications of the similar *T. radix*.

The range of the common garter snake has never been adequately mapped in the Rocky Mountain and Great Basin states. Recent general works ([Smith](#), 1956:291; [Wright and Wright](#) 1957:834; [Stebbins](#) 1954:505; [Conant](#) 1958:328) which have shown maps of the over-all range of *sirtalis*, differ sharply as to the extent of its distribution in Texas, New Mexico and Arizona, but all show its distribution as continuous over the more northern Great Basin and Rocky Mountain states. However, specimens and specific locality records from this extensive area seem to be scarce and some are based on early collections of doubtful provenance. Throughout this region the low rainfall, fluctuating and uncertain water supply, and general lack of mesic vegetation along many of the streams render the habitat rather hostile to garter snakes in general. *Thamnophis elegans*

vagrans, highly adapted to conditions in this region and generally distributed over it, doubtless offers intensive competition to the species *sirtalis* wherever they overlap and perhaps constitutes a limiting factor for *sirtalis* in some drainage basins.

Convincing records of *sirtalis* are lacking from all of Colorado—except for those in the drainage basins of the South Platte, and the Río Grande east of the Continental Divide—from the eastern half of Utah (east of the Wasatch Range), from New Mexico except for the Río Grande drainage (with one record each for the Canadian and Pecos river drainages), from southwestern Wyoming (at least that part in the Colorado River drainage basin), from the western half of Oklahoma, and from Texas, except the eastern and extreme western and northern parts. The species occurs in Nevada only near that state's western and northern boundaries. The range is therefore much different than it has been depicted heretofore, with the populations living east of the Continental Divide widely separated from those to the west for the entire length of the Rocky Mountains south of the Yellowstone National Park region. The populations of northern Utah, southern Idaho, and Nevada, which have [pg 295]been considered *parietalis* are thus far removed from the main population of that subspecies to the east and are isolated from them by the barrier of the Continental Divide and arid regions farther west.

Although some of the records published for *Thamnophis sirtalis* are erroneous, being based on misidentifications of other species, various outlying records, including those in western Kansas, the Panhandle of Texas, and southeastern New Mexico probably represent localized relict populations that have survived from a time when the species was more generally distributed in this region. The population of *T. sirtalis* in the Río Grande drainage of New Mexico is geographically isolated and remote from other populations of the species. Except for a few isolated and highly localized populations the species is absent from the Republican, Smoky Hill, Arkansas, Cimarron, Canadian, Red, Brazos, Colorado and Pecos rivers and their tributaries west of the one hundredth meridian in the arid High Plains.

Streams in this region of High Plains are in most instances unsuitable habitats because they are in eroded channels, have a variable and uncertain water supply, and have poorly developed riparian communities. The marsh and wet meadow habitat preferred by *sirtalis* in most parts of its range is almost absent. *T. radix* and *T. marcianus*, well adapted to conditions in this region, perhaps provide competition that is limiting to *T. sirtalis*. However, several well-isolated populations of *sirtalis* have survived as relicts in the southern Great Plains, presumably from a time several thousand years ago when mesic conditions were more prevalent, perhaps in an early postglacial stage.

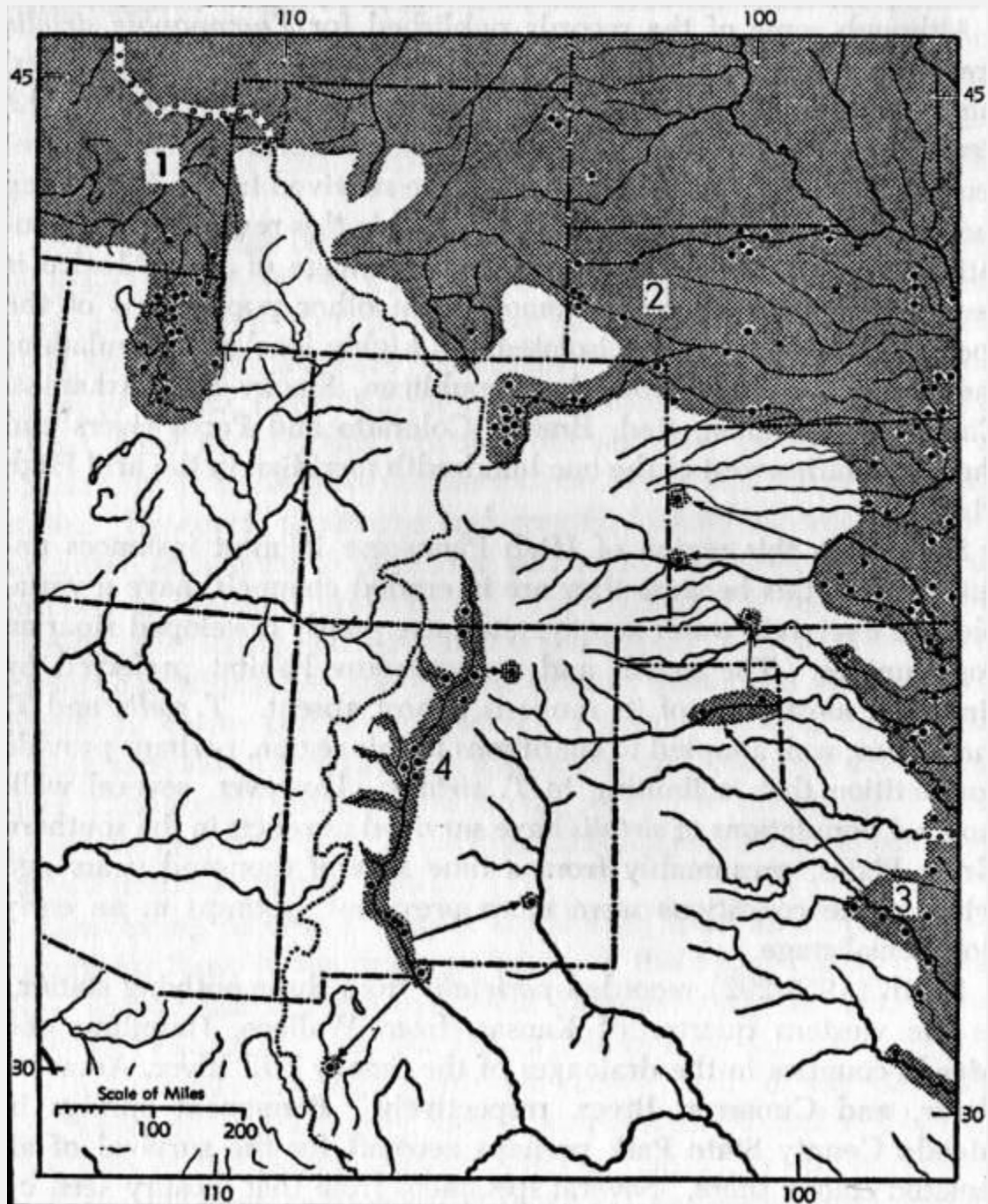


FIG. 1. Map of a part of the United States in the region of the Great Plains and Rocky Mountains, and adjacent northwestern Mexico showing supposed range (shaded) and localities of authenticated occurrence (dots) of *Thamnophis sirtalis*. 1. *T. s. fitchi*, 2. *T. s. parietalis*, 3. *T. s. annectens*, 4. *T. s. ornata*. Records from Idaho and Wyoming are based on specimens in the University of Kansas Museum of Natural History collection. Other records are based on [Woodbury](#) (1931) for Utah, [Hudson](#) (1942) for Nebraska, [Maslin](#) (1959) for Colorado, [Smith](#) (1956) for Kansas, R. G. Webb (MS) for Oklahoma, [Brown](#) (1950) and [Fouquette and Lindsay](#) (1955) for Texas, Cope (1900), [Van Denburgh](#) (1924), [Little and Keller](#) (1937) for New Mexico, and [Smith and Taylor](#) (1945) for Mexico.

[Smith](#) (1956:292) recorded *parietalis* from three outlying stations in the western quarter of Kansas, from Wallace, Hamilton and Meade counties in the drainages of the Smoky Hill River, Arkansas River, and Cimarron River, respectively. Permanent springs in Meade County State Park perhaps account for the survival of an isolated colony there. Several specimens from that locality seen by Fitch in August, 1960, when recently collected by a University of Michigan field party, seemed to be of the Texas subspecies *annectens*, as their dorsal stripes were reddish orange, and markings on the dorsolateral area were pale yellow rather than red. Specimens from the Texas Panhandle, from Hemphill County ([Brown](#), 1950:207) and nine miles east of Stinnet, Hutchison County ([Fouquette and Lindsay](#), 1955:417) likewise are most nearly like *annectens* [pg 296] judging from the authors' descriptions. The specimens from nine miles east of Stinnet averaged large; the two largest would have attained or slightly exceeded four feet in length if they had had complete [pg 297] tails. No *sirtalis* so long as four feet has been recorded elsewhere.

Records are lacking from the drainages of the Republican, North Canadian, Brazos and Colorado River drainages in the High Plains, but possibly isolated populations occur in some of these also. The only record from the Pecos River drainage is that of [Bundy](#) (1951:314) from Wade's Swamp near Artesia, Eddy County, New Mexico. This locality is separated by some 140 miles from any other known station of occurrence.

From extreme southern Colorado south across New Mexico to the Mexican border *T. sirtalis* occurs in continuous or nearly continuous populations in the Río Grande Valley, and has been recorded from many localities. It has been recorded from relatively few localities of tributary streams (Los Pinos, Abiqui, Santa Fe) all near the main valley. There is one record from the Ocate River, a headwaters tributary of the Canadian River, in the Sangre de Cristo Mountains near other localities in the Río Grande drainage. The southwestern-most known locality of occurrence is Casas Grandes in the Mexican state of Chihuahua some 130 miles southwest of El Paso, Texas, and near the Continental Divide. The Río Casas Grandes must have once been a tributary of the Río Grande, but now its desert drainage basin is isolated.

Re-description of a Subspecies from New Mexico

Most specimens of a population of *sirtalis* occurring in New Mexico are recognizably different from most specimens of other populations. This New Mexican population is therefore here recognized as a distinct subspecies:

***Thamnophis sirtalis ornata* Baird**

Eutaenia ornata [Baird](#), 1859:16.

Eutaenia sirtalis dorsalis [Cope](#), 1900:1076.

Thamnophis sirtalis parietalis (part) [Van Denburgh](#), 1924:222.

Type.—U. S. Nat. Mus. No. 960, obtained at El Paso, Texas, at some time in the eighteen fifties by Col. J. D. Graham.

Range.—Río Grande and vicinity, from Conejos and Costilla counties in extreme south-central Colorado south across New Mexico to Mexican border. Records from neighboring drainage systems, Casas Grandes in Chihuahua and Artesia and Ocate River in New Mexico, probably also pertain to *ornata*.

Description.—A specimen in the University of New Mexico Natural History Museum (E. D. Flaherty No. 560, obtained one mile west and one-half mile south of Isleta, Bernalillo County, New Mexico, on May 31, 1959) was described as follows while its colors were still but little altered by preservatives: Top of head olive, supralabials pale gray, edged with black posteriorly; chin milky white, with dark edges posteriorly on fifth, sixth and seventh infralabials; [pg 298]dorsal stripe yellow; including middorsal row of scales and little more than adjacent half of row on either side of it; dorsolateral area olive-brown with row of black spots on its lower half, these spots elliptical, averaging about size of one scale on anterior part of body, smaller posteriorly; adjacent spots separated by interspaces of approximately their own length, irregular black markings on upper half of dorsolateral area not forming definite spots but fused longitudinally to form continuous black border to dorsal stripe; crescent-shaped red markings in areas between scale rows three to nine, these markings invading edges of scales, and themselves having ill-defined edges blending into the darker ground color; lateral stripe pale, yellowish gray, limited to scale rows two and three for most of its length, but including rows four and five in neck region; row of irregular black marks low on each side, with each mark centering on anterior part of lower half of scale of first row but overlapping onto corners of adjacent ventrals; approximately every other scale of first row so marked; ventral surface pale, suffused with bluish tint; most of ventrals marked on anterior edges with pair of semicircular black spots, each situated about two-thirds of distance from mid-line to lateral edge of ventral; these marks diminishing in size and finally disappearing on posterior part of body; ventral surface otherwise immaculate.

Lepidosis normal for genus and species, with preoculars single on each side, supralabials 7-7, infralabials 8-8, ventrals 159, anal entire, subcaudals 77 (including terminal spine), paired except for second, third and fourth; scale rows 19 from neck slightly beyond mid-body, fifth on left side ending opposite 86th ventral; length from snout to vent 670 mm., tail 202 mm.

Comparisons.—From *T. s. parietalis*, *T. s. ornata* differs in its consistently pale ground color, olive instead of dark brown or black. In respect to color-pattern *ornata* stands in approximately the same relation to *parietalis* as, farther west, *T. s. infernalis*, a pale subspecies of the California coast, stands in relation to *T. s. fitchi*. Nevertheless, *fitchi* consistently has a dark ground color, whereas *parietalis* is highly variable, and the color of an occasional specimen (for example KU 17032 from Douglas County, Kansas) matches *ornata* in olive coloration. These unusually pale specimens of *parietalis* differ from *ornata* in not having a continuous black edge along each side of dorsal stripe; black pigment of this area is concentrated into rows of spots alternating with those of lower series. From *T. s. infernalis*, *ornata* differs in having paired black spots on the ventrals and in having more than three series of red crescents on dorsolateral area of each side.

Remarks.—The type of *ornata* seems to have been lost, and the available information concerning it is far from satisfactory. In the original description, Baird listed three specimens, purportedly from "Indianola, Texas" (J. H. Clark, 438), from the Río Grande, Texas (J. H. Clark, 768), and from near San Antonio, Texas (Dr. Kennerley, no number). None of these three specimens could have been *ornata* as conceived of by us because all were collected outside the geographic range of *ornata*. However, there was also included a plate with a drawing of a specimen and a reference to an earlier paper ([Baird and Girard](#), 1853) in which a specimen obtained by Col. Graham "Between San Antonio and El Paso" was described. [Smith and Brown](#) (1946:72) have presented evidence that this specimen [pg 299]figured (rather than any of the three specifically mentioned) served as a basis for the plate, and they therefore considered it to be the holotype of *ornata*, even though [Baird](#) referred this specimen to "*Eutaenia parietalis* Say" in the same paper (1859) in which the original description of *ornata* was published. [Cope](#) (1900:1079) listed under *Eutaenia sirtalis parietalis* a specimen, U. S. Nat. Mus. No. 960, from El Paso, obtained by Col. Graham, and referred to it as a type (without specifying of what it was the type). [Smith and Brown](#) (*loc. cit.*) interpreted this statement by Cope as further evidence that the specimen in question should be considered the type of *ornata*, and they restricted the type locality, originally stated as "between San Antonio and El Paso" to "El Paso." Actually all valid records of the species *sirtalis* from the vicinity of the Río Grande are from the El Paso region or from farther north.

It is with some misgivings that we herewith accept the interpretation proposed by Smith and Brown regarding the applicability of the name *ornata* and the designation by these authors of the now missing specimen from the region of El Paso as the holotype of that form. The evidence linking the name *ornata* with the New Mexican subspecies is tenuous; there is some doubt as to the provenance of U. S. Nat. Mus. No. 960 (the

supposed type), and even more doubt as to whether this is the specimen depicted in the plate that formed part of the original description.

[Cope](#) (1900:1076) recognized as a distinct subspecies, *Eutaenia sirtalis dorsalis*, the same population that we recognize herein as *T. s. ornata*, and [Smith](#) (1942:98) considered the name *dorsalis* to be a synonym of *T. s. parietalis*. However, it is almost certain that both authors misapplied the name, since the type of [Baird's and Girard's](#) (1853:31) *Eutainia dorsalis* was obtained in Coahuila, Mexico, between Monclova and the Río Grande, far south of the known range limits of *T. sirtalis* in Texas. The description does not fit *T. sirtalis* and almost certainly pertains to another species.

Specimens examined.—Univ. of Kansas Mus. Nat. Hist. (hereafter abbreviated to "KU") Nos. 5479 to 5497, from the north end of Elephant Butte Reservoir, Sierra County, New Mexico, and 8592 and 8593 from near Las Lunas, Valencia County, New Mexico; Univ. of New Mexico Mus. Nos. 571 and 572 (J. S. Findley) from 2 miles west and 1/4 mile north of Albuquerque, Bernalillo County, New Mexico, and No. 4021 (E. D. Flaherty) from 1 mile west and 1/2 mile south of Isleta, Bernalillo County, New Mexico.

Description of *T. s. parietalis*

From most of the vast area occupied by *parietalis*, material has not been available to us, and our concept of this subspecies is based chiefly on specimens and living material from Kansas and northeastern ^[pg 300]Colorado. A total of 520 live *parietalis* has been examined from the University of Kansas Natural History Reservation some 130 miles south and a little east of the type locality in Nebraska. These probably differ but little from typical specimens. The range of individual variation in pattern is especially notable. In those from the Reservation, the ground color varies from dull olive-brown to almost jet black. The markings on the dorsolateral area vary in color, in shade and in extent. These marks are chiefly confined to the skin between the scales of rows three to nine. Although most typically these marks are of some shade of red (hence the name "red-sided garter snake"), they may be pale buff, or pale greenish yellow, or may even have a bluish tint. In approximately ten per cent of the specimens from the Reservation there is no red at all in the pattern, which hence is similar to that of *T. s. sirtalis* in the eastern United States. Only a minority have all the dorsolateral marks red, and in some of these specimens the marks higher on the sides are progressively paler red, having a bleached out appearance. Most typically the marks between rows three to six are some shade of red while the smaller marks between rows six to nine are pale—yellowish, greenish, or buffy. In some the pale area of the lateral stripe is in varying degrees

suffused with red, which may extend onto the edges of the ventrals and even to the underside of the tail.

T. s. parietalis may be diagnosed, on the basis of these snakes from northeastern Kansas, as follows: Size medium large (length 23.5 to 34.5, or, exceptionally 43.5 inches in adult males; 32.5 to 46.0 inches in adult females), dorsolateral color olive to black. Approximately every other scale of the third row is bordered above and anteriorly by a crescent-shaped area of scarlet colored skin. Similar crescent-shaped areas border the scales of the fourth and fifth rows and often two adjacent crescents meet at the ends of an intervening scale and fuse forming an H-shaped mark. Placed alternately with these markings are similar but smaller crescent-shaped markings on the skin of the upper half of the dorsolateral area on each side bordering every other scale of the sixth, seventh and eighth rows. The crescents of this upper series also may fuse to form series of H-shaped markings alternating with those of the lower series. The dorsal stripe is yellow with a faint dusky suffusion; it involves all of the middorsal scale row and approximately the adjacent half of the row on either side. The lateral stripe is faint, yellowish gray, chiefly on the upper half of the second scale row, lower half of third, and the intervening skin, and is often invaded or suffused by the red marks of the dorsolateral area. The first scale row, adjacent corners of the ventrals, [pg 301] and lower half of the second scale row are suffused with dark pigment and appear dusky, but this area is often marked with black, setting off the paler area of the lateral stripe. The ventrals are dull, whitish, faintly suffused with yellowish, greenish or bluish, each ventral having a black dot usually of semicircular shape on its anterior margin near the anterolateral corner.

Comparison of *T. s. parietalis* and *T. s. fitchi*

Like most widely ranging subspecies, *parietalis* and *fitchi* vary geographically and local populations often are noticeably different from typical material. It is possible that future revisors will recognize additional subspecies, but in the variant populations known to us the degree of differentiation is slight as compared, for instance, with that in the subspecies of *Thamnophis elegans*. Scallation is remarkably uniform in all the subspecies of *sirtalis*, but coastal and northern populations tend to have fewer ventrals and subcaudals than do their counterparts farther inland and farther south. In their geographic variation the ventrals and subcaudals follow clines, and do not in themselves warrant subspecific divisions. Variation occurs chiefly in the color and pattern including the intensity of dark pigmentation of the dorsolateral area, head, ventral surface and lower edge of the lateral stripe; in extent, position and shade of red or pale colored markings on the dorsolateral area; in presence and extent of reddish suffusion on the head, in the region of the lateral stripe, and on the ventral surface of the tail. Most of these same characters [pg 302] vary within the subspecies *fitchi*, but the range of

variation is relatively minor. [Fitch](#) (*op. cit.*:582-584) described typical populations and also described briefly several small series from British Columbia, Idaho, Oregon, and California which were not entirely typical. Most ^[pg 303]frequent variation was in heavy reddish suffusion on the sides of the head not found in typical *fitchi*. In each local population of this subspecies the characters seem to be remarkably uniform and stable.

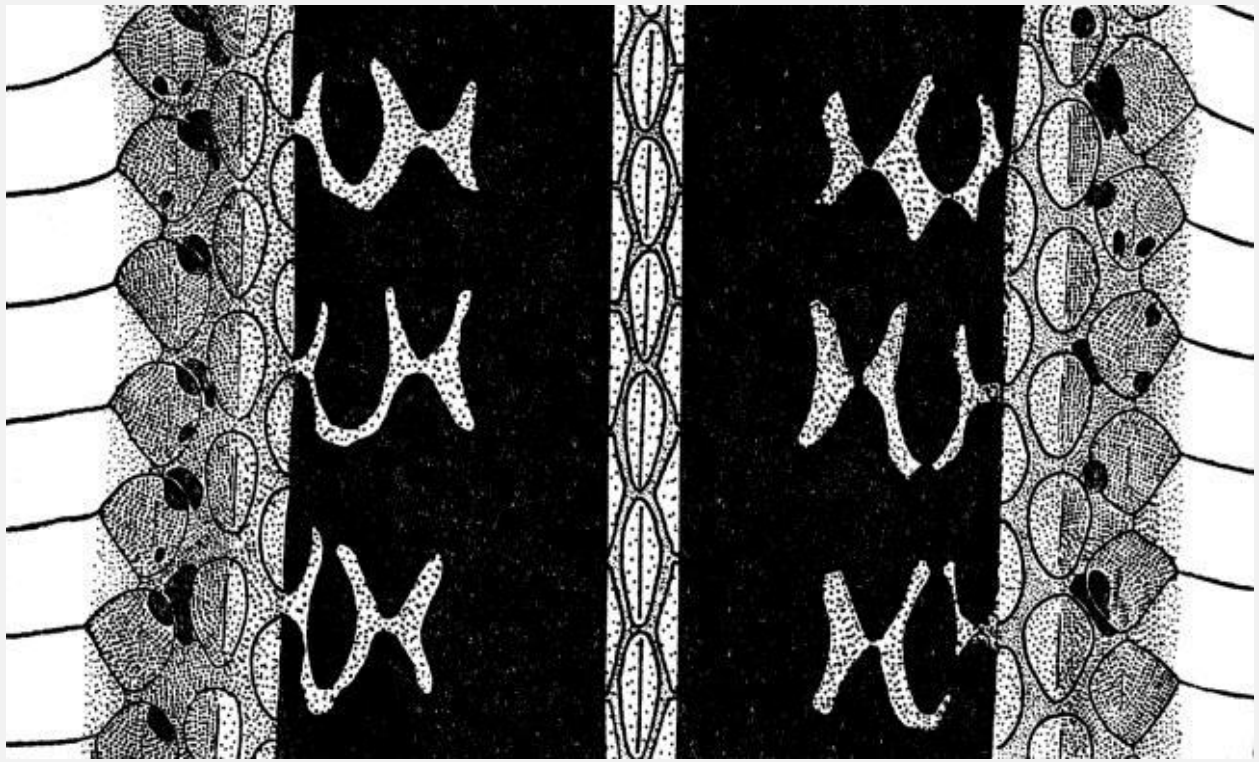


FIG. 2. Diagrammatic drawing of pattern in stretched skin of *T. s. fitchi*; the pale markings on the black dorsolateral area are scarlet ($\times 2\frac{1}{2}$).

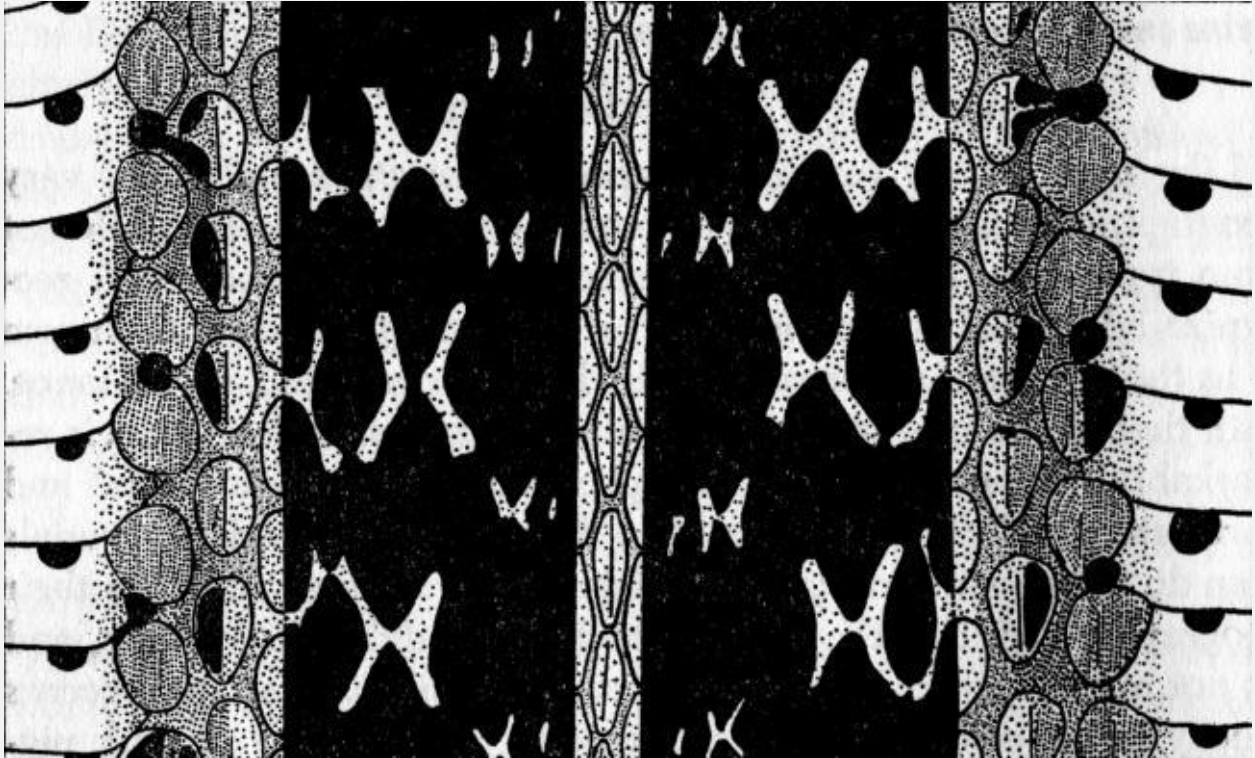


FIG. 3. Diagrammatic drawing of stretched skin of *T. s. parietalis*; the scarlet markings extend farther dorsally than in *T. s. fitchi* and black spots are prominent on the ventrals laterally. Some individuals of *parietalis* have much paler ground color, resembling *ornata* except in minor details ($\times 2\frac{1}{2}$).

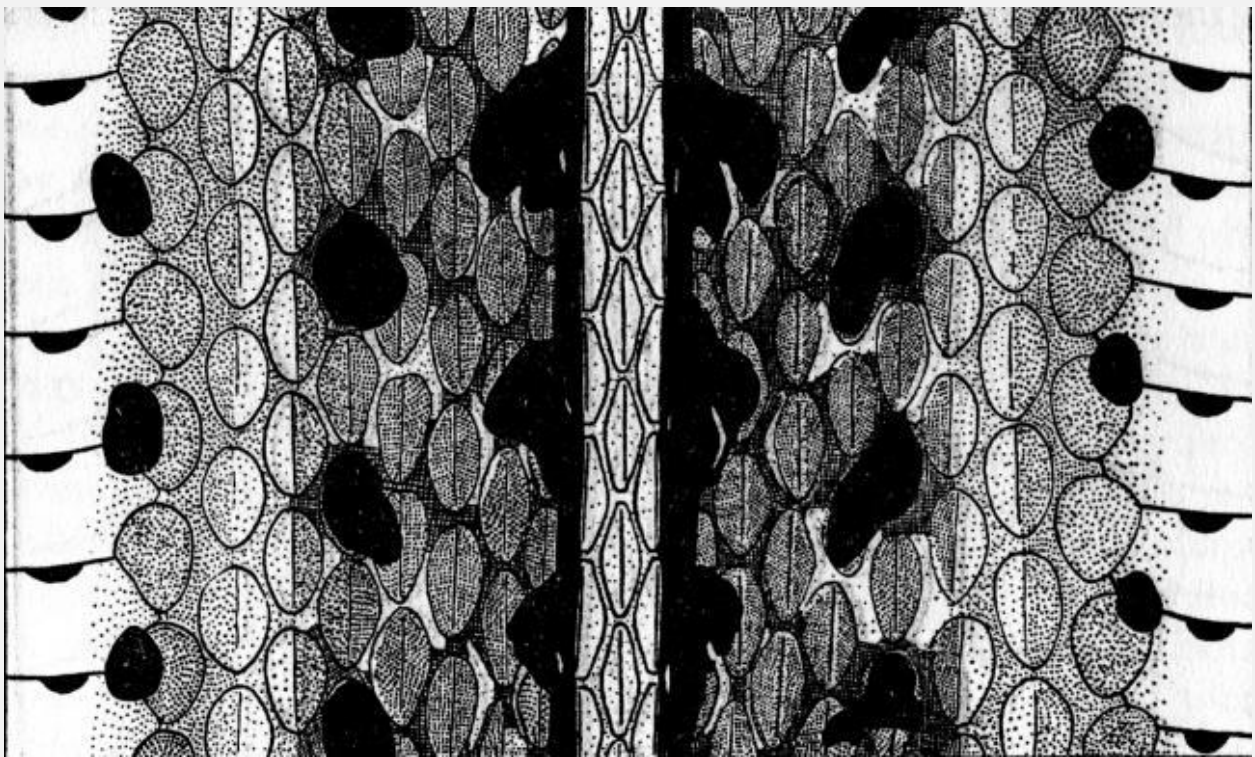


FIG. 4. Diagrammatic drawing of stretched skin of *T. s. ornata*. The ground color is like that of *parietalis* but paler with a continuous black area bordering the dorsal stripe ($\times 2\text{-}1/2$).

T. s. parietalis differs from *fitchi* in several trenchant characters, and there are additional slight or average differences between the two. In approximate order of their importance the differences are as follows: 1) The red (or pale yellow or green or buffy) marks on skin between the scales on the upper half of the dorsolateral area (that is between the sixth and seventh, seventh and eighth and eighth and ninth scale rows) present in *parietalis* are missing in *fitchi* or are represented by only an occasional small fleck. 2) The dorsolateral area is black or nearly so in *fitchi* but averages paler in *parietalis*, in which a wide range of shades may be found from black to olive brown. 3) The red of the dorsolateral area frequently invades the lateral stripe, which sometimes is mostly red, and may even invade the ventrals in *parietalis*, but in *fitchi* the red marks are usually confined to the dorsolateral area, and do not invade the lateral stripe. 4) The prominent paired black dots or semicircular marks on the anterior edge of each ventral in *parietalis* are largely lacking in *fitchi*, which rarely has any dark marks on the ventral surface. 5) The dorsal stripe consistently involves the middorsal scale row and the adjacent half of the next row on each side, and is bright yellow in *fitchi*, but in *parietalis* it may be slightly wider, may be duller with more dusky suffusion, and its edges may be less sharply defined.

Intermediate and Atypical Populations

Of many specimens examined from eastern Oregon, Idaho, Utah, Wyoming and Colorado, few were typical of either *parietalis* or *fitchi*. Many were intermediate in some respects or showed a composite of characters of the two subspecies. No well-defined belt of intergradation exists, but the transition extends over more than a thousand miles, with local populations somewhat isolated and slightly differentiated along divergent lines. In view of this situation some plausibility could be claimed for any of several dividing lines between the subspecies. However, by far the most logical division is the Continental Divide; south of the Teton Range it constitutes a broad barrier separating eastern and western populations. Across Montana and Canada also it constitutes a more or less formidable barrier, with high altitudes and cold climates that probably are limiting to garter snakes. With few exceptions the snakes from east of the Continental Divide are more nearly like *parietalis* in the sum of [pg 304]their characters whereas those from west of the Divide are more nearly like *fitchi*.

In the Teton Range and in Yellowstone National Park these garter snakes occur in headwater streams up to the Continental Divide. KU 27956 from Two Ocean Lake 3-1/2 miles northeast of Moran, Teton County, Wyoming, agrees in its characters with *fitchi*, having the red lateral marks small and inconspicuous, discernible only on

the anterior half of the body. The dorsolateral area is dark, almost black. The ventrals lack dark markings.

In Utah, populations of *sirtalis* occur in the drainages of the Bear, Weber and Sevier rivers and other smaller streams of the western half of the state. Obviously the species invaded Utah from the north, probably at a time when Lake Bonneville, the predecessor of the present Great Salt Lake, drained into the Snake River of Idaho. [Van Denburgh and Slevin](#) (1918:190) separated from their western "*concinus*" and "*infernalis*" and allocated to *parietalis* the populations of Utah and southeastern Idaho, but presumably these authors were not familiar with typical *parietalis* of the Mid-west. Subsequent authors ([Wright and Wright](#), 1957:834; [Stebbins](#), 1954:505; [Conant](#), 1958:328) have followed this arrangement. A re-examination of specimens from Utah, including living individuals collected at Bear Lake in the summer of 1959, indicates that they should be assigned to *fitchi* rather than to *parietalis*.

Likewise various specimens from the drainage basin of the Snake River in Idaho are predominantly *fitchi* in the sum of their characters, although they differ from that subspecies in its most typical form and resemble *parietalis* in some respects. KU 23133 from two miles east of Notus, Canyon County, Idaho, has the red crescents on the lower part of the sides (between scale rows six and seven) consistently developed on the anterior half of the body. KU 21873, a large female from Bannock County, Idaho, is exceptional in having small lateral black spots on the ventrals, resembling *parietalis* most closely in this respect. Also, it has the red lateral crescents unusually well developed; the first three series are conspicuous, those of the fourth series are consistently developed, and those of the fifth series show occasionally.

Forty-five specimens in the University of Colorado Museum from northwestern Colorado were subjected to pattern analysis. In three specimens the dorsolateral black area between the dorsal stripe and the lateral stripe on each side has no markings, and in eight others there is only an occasional fleck or crescent on the skin between the [pg 305]sixth and seventh scale rows. All others have the normal complement of dorsolateral crescents or flecks between the scales of rows three and four, four and five, and five and six. But, these specimens vary in extent of development of the crescents in the upper half of the dorsolateral area on each side—between scale rows six and seven, seven and eight, and eight and nine. Only six snakes show traces of the crescents of the uppermost series (between scale rows eight and nine). Development of these crescents is variable but in all the specimens the crescents are confined to the anterior half of the body. The crescents between rows six and seven and between seven and eight are present in 20 specimens and in ten of these the crescents are conspicuous and regularly arranged, often meeting and consequently form H-shaped markings. In most of the snakes the crescents are best developed in the second fifth of the body and disappear posteriorly. In five of the twenty, crescents between rows six and seven are fairly regular, but those

between rows seven and eight are few and appear only sporadically. In eight specimens there are no crescents between either rows seven and eight or eight and nine. In eight others the crescents between rows six and seven are likewise absent, and only the crescents between rows three to six are present.

These specimens from Colorado also differ from typical *parietalis* in having the black spots on the anterolateral edges of the ventrals less developed. In three of the 45 these spots are lacking entirely and in four others they are few and small. In the majority of specimens the spots are from 1/4 to 1/5 the length of the ventrals. In approximately one-third of the specimens the spots are absent posterior to mid-body. In five specimens obtained at Sheridan Lake, Pennington County, South Dakota, in the Black Hills in August, 1960, dorsolateral areas are dark with red crescents small and inconspicuous, and with black spots either lacking from the ventrals or only faintly developed. In two specimens from Sundance, Crook County, northeastern Wyoming, the red crescents are small and inconspicuous also. In one of these specimens, KU 28028, small black spots are present in the corners of the ventrals, but in the other, KU 23654, the spots are absent.

In having the dorsolateral area consistently black, with the three uppermost series of red crescents reduced or absent, and in having the ventral black spots reduced or absent, these specimens from Colorado, Wyoming, and South Dakota differ from more eastern and more typical *parietalis*, and tend toward *fitchi*, even more strongly than some Idaho specimens tend toward *parietalis*. Nevertheless, [pg 306]all things considered, the Continental Divide is the most logical boundary between the two subspecies, even though occasional individuals and even local populations deviate from the general trend of characters from east to west.

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