SOME ABERRANT COLOR PATTERNS IN SNAKES*

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Among the various live snakes received from correspondents during the past two years certain specimens of Elaphe, Thamnophis, and Crotalus exhibit unusual aberrations in pattern and general coloration which do not appear to be mentioned in the literature. Descriptions of these peculiarities have been prepared, seriatim, because of their general interest as well as for the benefit of future students who will have access to the specimens, but to whom the original colorations would not otherwise be available. The most salient deviations from the normal conditions are emphasized by the use of italics.

Elaphe laeta (Baird and Girard)

Two specimens of the spotted rat snake (H. K. G. 3002, 9; 3003, ♂) ¹ from San Antonio, Texas, show departure from the normal pattern of the subquadrate blotches on a unicolored ground (Pl. C, Fig. 1) in having the blotches of the dorsal series either partially or entirely divided along the middorsal line, often forming H-shaped figures, and the ground color darkened between the lateral halves of the divided blotches, producing the general effect of two longitudinal stripes (Pl. C, Fig. 2). Anteriorly the divided spots become confluent. The blotches of the lateral series, which normally alternate with the dorsal, are irregularly broken up and also tend to run together. A condition of longitudinal striping involving both ground color and blotch pattern is thus approached.

This species is one of the forms of Elaphe which have no well-marked ontogenetic change in coloration. The ground color and the pattern of the adult are the same as those of the young. The two

* Contribution from the Zoological Laboratory of the University of Michigan.

¹ Catalog numbers with the initials H. K. G. refer to the personal collection of the writer. All such specimens, however, are to become the property of the Museum of Zoology, University of Michigan.
aberrant specimens here described are apparently mature but not unusually large individuals. In the snake pens of Texas reptile dealers I have seen numerous examples of this species, much larger than those in question, and have noted no tendency toward striping in presumably much older specimens. There is no apparent indication that in this species a pattern of stripes is related to age, nor is it suggested that the condition is prevalent in the Texas region.

In contrast to this is the development of the adult coloration in *Elaphe quadrivittata* (Holbrook), the four-lined “chicken snake” of southeastern United States. In young individuals of this species the ground color is a uniform gray, upon which is superimposed a pattern of grayish brown blotches. These become progressively obsolete with age, and the adult pattern of four brown longitudinal stripes is acquired by a gradual darkening of the ground color (Pl. CI, Fig. 1). I have observed indications of a similar ontogenetic change in coloration in certain specimens of *Elaphe obsoleta obsoleta* (Say), the pilot blacksnake, and *Elaphe guttata* (Linnaeus), the corn snake. Blanchard (1921, pp. 118–119, Fig. 40) has described and figured a similar phenomenon in one of the king snakes, *Lampropeltis calligaster* (Harlan). It seems, therefore, that the ground color and the pattern in such species are controlled by two independent sets of genetic factors, and that in the genus *Elaphe* a pattern of longitudinal stripes is to be regarded as a recent specialization, secondary in nature, showing up incipiently in *laeta*, *obsoleta*, and *guttata* and reaching its highest degree of development in *quadrivittata*.

*Thamnophis sauritus proximus* (Say)

A ribbon snake collected near Floresville, Texas (H. K. G. 3485, ♀; Pl. CI, Fig. 2) is remarkable in the possession of a brilliant red middorsal stripe instead of the usual yellow or greenish yellow and the presence of a conspicuous orange line on the midventral surface of the tail. A color description of the entire specimen follows: dorsal ground color “olivaceous black”; top of head similar but muzzle lighter with slightly more green; occipital spots “pale viridine yellow”; anterior tip of middorsal stripe “light green-yellow;” remainder of stripe “Morocco red”; lateral stripes “light green-yel-

[subscript]2 Color names in quotation marks are those of Robert Ridgway, *Color Standards and Color Nomenclature*. Published by the author, Washington, 1912.
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low”; ground color of scale rows 1 and 2 “olive-green”; ventral surface anteriorly cream, changing posteriorly to “pale green-yellow”; rostral, mental, and anterior labials “light buff”; remainder of supralabials “green-yellow”; remainder of infralabials, chin shields, and gulars white; a conspicuous, finely stippled, median line of “orange chrome” on the ventral side of tail, from anus to tip.

It is quite possible that red-striped individuals are more numerous than published descriptions indicate. The various tones of red fade rapidly in formalin and alcohol, and descriptions based largely upon preserved material would be unlikely to include this variation. Ruthven’s mention of a “rarely reddish, occasionally brown” dorsal stripe in this form (1908, p. 98) may refer to such specimens.

**Crotalus confluentus confluentus** (Say)

Nearly twenty-five hundred prairie rattlesnakes were captured in central South Dakota by Mr. A. M. Jackley of Pierre during the seasons of 1932 and 1933. All specimens of unusual coloration, together with several hundred others, were sent to me. In the normal coloration of this species in the northern portion of the Great Plains Region the ground color varies from pale brownish gray to greenish gray or grayish green. There is a distinct pattern of brownish gray or greenish gray blotches (Pl. CII, Fig. 1). The degree of contrast between the ground color and the pattern of blotches varies somewhat. The proximal crossbands of the tail are of the same color as the blotches of the body, but the distal ones are darker and the two or three immediately preceding the rattle are black. The top and the sides of the head are usually prominently marked.

One of the aberrant specimens (H. K. G. 3512, ♀; Pl. CII, Fig. 2) collected in Stanley County, South Dakota, four miles northwest of Van Meter, conspicuously lacks certain features in pigmentation. The green element in the general coloration is entirely wanting, and the brown pigment of the blotches is much reduced. The dorsal ground color is pale gray, the ventral surface white. The blotches of the dorsal series are pale grayish brown, irregular in form, and lack the usual more or less distinct borders. The lateral blotches are similar in color, but even less distinct. The ventral surface is laterally flecked with light gray.

There is no trace of head pattern. The pigmentation of the iris is apparently normal. The tongue, however, instead of being jet black
as is characteristic with this species, is bright pink with white tips. The proximal tail rings have completely disappeared and the terminal rings are blended together forming, with the basal segment of the rattle, a conspicuous black tip. The ventro-lateral portion of the tail in the region of the anus is suffused with pale orange.

The only peculiarity in lepidosis is the irregularity of the scales of the muzzle. The internasals, usually in contact with the rostral, are separated from it by six small scales (Pl. CII, Fig. 2). The left side has two loreals; the right, one. Total length 500 mm.; tail length 30 mm.; scale rows 27–27–19; ventrals 180; caudals 20; supralabials 15–15; infralabials 15–15.

A very similar specimen collected near Gem, Thomas County, Kansas (No. 6549, $\ominus$), in the private collection of Mr. L. M. Klauber, has been examined and compared with the one just described. In coloration it much resembles the South Dakota specimen except that the dorsal blotches are more distinct, there is a suggestion of a head pattern, and the tip of the tongue is black. No trace of orange is visible in the preserved specimen, but Mr. Klauber stated that when fresh a tinge of that color was noticed near some of the blotches. The scutellation of the head is much more symmetrical than that of the other, and the four internasals are in direct contact with the rostral. Total length 745 mm.; tail length 57 mm.; scale rows 27–27–21; ventrals 180; caudals 30; supralabials 16–16; infralabials 16–17; loreals 1–1.

A few other examples from Sully County, South Dakota, show certain tendencies toward a similar condition. One (H. K. G. 3737, $\mathcal{O}$) has little or no green in its coloration, although the blotched pattern is distinct. The head markings are obscure, the proximal tail bands indistinct, and the distal ones fused into a conspicuous black tip. The tongue is black, but spotted with pink. Three others (H. K. G. 3384, $\mathcal{O}$; 3738, $\mathcal{O}$; 3739, $\mathcal{O}$) have more or less typical coloration, but black tongues with pink tips. Another (H. K. G. 3740, $\sigma$) with normal coloration has the tongue alternately blotched with black and pink.

These specimens, it seems, must be regarded as exhibiting tendencies toward albinism. That complete albinism has not occurred in those in which the peculiarities described are most manifest is indicated by the fact that the eyes show almost normal pigmentation. An impairment or loss of the genetic factors for certain features
of coloration, particularly the greens of the skin pigments, appears to have occurred.

Although instances of seemingly true albinism in rattlesnakes have been reported, \(^3\) I know of no records of such occurrences in *Crotalus confluentus confluentus* (Say). I have observed tendencies toward flavescence in specimens from New Mexico and have been told of two cases of melanism in this species. Mr. W. A. Bevan of the Witte Memorial Museum, San Antonio, Texas, related having seen a specimen taken in the foothills of the mountains southwest of Fort Collins, Colorado, and Dr. E. C. O’Roke, assistant professor of Forest Zoology, University of Michigan, described a very similar specimen which he saw in the Black Hills region near Spearfish, South Dakota. In both these snakes, according to my informants, there was sufficient black pigment to obscure the pattern almost completely.

Another prairie rattlesnake obtained by Mr. Jackley in Stanley County, South Dakota, twelve miles west of Fort Pierre (H. K. G. 4174, \(^3\)) exhibits an aberration in which the pattern consists of stripes anteriorly instead of blotches, whereas the ground color seems to be unaffected (Pl. 111, Fig. 1). The top of the head is practically unmarked, but the essential features of the lateral head pattern can be traced. The ground color is pale olive gray, lighter on the sides, and pale greenish white on the ventral surface. The pigment which normally produces the dorsal series of blotches is arranged in two longitudinal brownish green stripes beginning just back of the occipital region and extending posteriorly for about two fifths of the total length. Each stripe is a little more than three scales in width and narrowly outlined with pale greenish white. A median stripe of ground color is slightly wider than the middorsal scale row. Posterior to the longitudinal stripes are eleven indistinct, irregularly placed blotches of the same color. No lateral blotches are present. The posterior portion of the body and the proximal two thirds of the tail

are unmarked, and the black bands of the distal part of the tail are blended together.

There are no special peculiarities in the scutellation of this specimen. Total length 610 mm.; tail length 50 mm.; scale rows 25–25–19; ventrals 178; caudals 29; supralabials 15–15; infralabials 14–15.

Since evidence obtained in my recent studies suggests that there may have been a striped ancestral stage in the evolution of rattle-snake patterns, I am inclined to regard as atavistic in nature the appearance of a striped pattern in occasional specimens, such as this one and the next one described.

*Crotalus horridus* Linnaeus

In the timber rattlesnake the black chevron-shaped crossbands of the normal pattern are frequently divided in the middle or variously broken up into irregular blotches, which sometimes are confluent in the neck region and have a tendency to form longitudinal stripes. A complete rearrangement of the transverse pattern had occurred in an individual of this species which was captured in Franklin County, Pennsylvania, in July, 1933. I was unable to see this specimen, but from a photograph (Pl. CIII, Fig. 2) furnished by Mr. Henry E. Clepper of the Pennsylvania Department of Forests and Waters and from some notes and sketches received from Mr. J. T. Rothrock of Pine Grove Furnace, Cumberland County, Pennsylvania, and Mr. M. Graham Netting of the Carnegie Museum, I learned that no traces of the transverse bands remained, all of the black pattern having been lost. The seal-brown middorsal stripe which is present in many specimens of this species occupied its usual position on the median row of scales and the inner half of each adjacent row. The outer half of each of these rows was of cream color, forming a light border for the median stripe. A similar light-bordered seal-brown stripe was found on each side occupying approximately scale rows 3 to 6, continuous anteriorly but broken up into narrow elongate blotches on the posterior half of the body. The ground color was grayish brown. Marked irregularity of pattern is characteristic of this species, but in the several hundred specimens of *C. horridus* which I have studied no instance of a color pattern differing so fundamentally from the normal has been encountered.
The normal pattern of the San Lucan diamond rattlesnake is characterized by a conspicuous dorsal series of dark brown, diamond-shaped blotches, each of which is sharply outlined by a border of yellowish white scales, and one or two series of smaller and less distinct blotches on each side. The top of the head is grayish brown, darker on the muzzle, and with scattered dark brown blotches posteriorly. There is a yellowish white spot or dash on each supraocular shield. A lateral dark brown stripe conspicuously bordered with yellowish white extends from the eye obliquely backward to the mouth. The rostral shield is narrowly bordered with white. The dorsal ground color ranges from yellowish white to olivaceous, with no minute dark brown or black punctations. The ventral surface is cream-colored or yellowish white. The tail is grayish white, with four or five transverse black bands.

Mr. Klauber has kindly permitted me to describe here an abnormal rattlesnake of this species from the Cape Region of Baja California (L. M. K. 2243, $\sigma$). In this specimen both the ground color and the pattern are unusually pale and nonuniform. All the blotches of the pattern are reduced in relative size and, with the exception of a few near the middle of the body, are irregular or almost obsolete. A straggling row of small irregular brown spots is all that remains of the dorsal blotches on the anterior portion of the body. Posteriorly the pattern fades out until it is scarcely distinguishable from the ground color. Only with the larger and more regular blotches are the yellowish white borders distinctly evident. The top of the head is unmarked save for two small, indistinct brown spots on the muzzle and an irregular, transverse brown patch crossing the occipital region and extending forward above the angle of each jaw. The stripes on the sides of the head are not sharply defined, and the rostral shield lacks white borders. The ventral ground color is yellowish white, as in normal specimens. The grayish white tail is crossed by five indistinct black bands, some of the pigment of which has encroached in a diffused fashion on the light interspaces.

A comparison of this rattlesnake with other material which I have examined and with the diagnostic characters published by Klauber (1930, p. 11) reveals no aberrations in structural features. Total length 1255 mm.; tail length 75 mm.; scale rows 32–27–23;
ventrals 194; caudals 26; supralabials 16–16; infralabials 17–18; first pair of infralabials divided transversely, upper preocular narrowly in contact with postnasal.

It seems probable that in this specimen, as in some of the *Crotalus confluens confluentus* (Say) described above, we have a case of partial albinism. The loss of normal pigmentation is expressed in both the ground color and the pattern.

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**LITERATURE CITED**


**Note**—All photographs, with the exception of that for Figure 2 of Plate CIII, were made by the author with panchromatic films and a Wratten K–2 yellow filter.
Fig. 1. *Elaphe laeta* (Baird & Girard). Normal color pattern. H.K.G. 2371, Ottawa, Kansas

Fig. 2. *Elaphe laeta* (Baird & Girard). Aberrant pattern. H.K.G. 3002, San Antonio, Texas
Fig. 1. *Elaphe quadrivittata* (Holbrook), showing adult pattern of longitudinal stripes formed by darkening of the ground color and replacing the juvenal pattern of blotches. H.K.G. 3834, Pine Crest, Florida

Fig. 2. *Thamnophis sauritus proximus* (Say). A brilliant red middorsal stripe was the chief characteristic of this specimen. H.K.G. 3485, Floresville, Texas
Fig. 1. *Crotalus confluentus confluentus* (Say). Normal coloration. H.K.G. 3727, Sully County, South Dakota

Fig. 2. *Crotalus confluentus confluentus* (Say). Partial albino. H.K.G. 3512, Stanley County, South Dakota, four miles northwest of Van Meter
Fig. 1. *Crotalus confluens confluens* (Say). An aberrant striped pattern instead of the usual series of blotches. H.K.G. 4174, Stanley County, South Dakota, twelve miles west of Fort Pierre.

Fig. 2. *Crotalus horridus* Linnaeus. Normal pattern of black cross bands replaced by longitudinal brown stripes. Franklin County, Pennsylvania. Photograph by courtesy of Pennsylvania Department of Forests and Waters.