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COMMENTS ON RING-NECK SNAKES (GENUS
DIADOPHIS), WITH DIAGNOSES OF
NEW FORMS¹

BY FRANK N. BLANCHARD

In the course of a study of the ring-neck snakes, genus *Diadophis*, it has been found necessary to alter considerably the present systematic arrangement of the western forms and to propose several new names for the designation of subspecies hitherto unrecognized.

Diadophis regalis regalis (Baird and Girard)

1853 *Diadophis regalis* Baird and Girard, Cat. N. Amer. Rept., pt. 1, Serpents, p. 115.

A study of all the specimens and records of ring-neck snakes from western Texas to Arizona makes it appear highly probable that two races inhabit this territory, an eastern form, essentially without the neck ring, ranging to southeastern Ari-

¹Contribution from the Department of Zoology of the University of Michigan.

zona, northern Sonora, and probably southern Utah. That the case is not wholly clear is readily admitted for there is some evidence that ringed specimens may occur in the eastern range, but the geographical distribution of the ringed and ringless specimens is so suggestive of two races that it is deemed advisable to open the question by the proposal of a name to represent a western form of *D. regalis* distinguishable from an eastern form by the presence of a neck ring. This western race may be known as

***Diadophis regalis arizonae*, new subspecies**

Diagnosis: Like *Diadophis regalis regalis* Baird and Girard except for the possession of a broad ring of lighter color behind the head.

Type Specimen: United States National Museum, number 62568, collected by G. Hofer.

Type Locality: Sabino Cañon, Arizona.

Range: Central Arizona to northern Sonora.

Description of Type Specimen: ventral plates, 219; anal plate divided; caudal scutes, 65 pairs; upper labials, 7; lower labials, 8; preoculars, 2; postoculars, 2; temporals, 1+1+2 (labials, oculars, and temporals the same on each side); dorsal scale rows, 17, changing near the posterior end of the body to 15. General color above (in alcohol) a deep glaucous-gray,² extending on the sides over about half of the lowermost row of scales; below cream color forward over the chin and including the lower portions of the upper labials, suffused with reddish towards the posterior end of the body and under the

² Colors are based on Ridgway's Color Standards and Color Nomenclature, 1912.

tail; neck ring $2\frac{1}{2}$ to 3 scales wide, ivory yellow, margined before and behind with black; head above much darker than the general dorsal surface; lower labials, chin shields, and ventral scutes prominently spotted with black; caudal plates with black extensions from their postero-lateral corners. Total length, 591 millimeters; tail length, 109 millimeters. Sex, male.

Diadophis amabilis amabilis (Baird and Girard)

1853 *Diadophis amabilis* Baird and Girard, Cat. N. Amer. Rept., pt. 1, Serpents, p. 113.

The specimens from San Jose, California, to which the name *D. amabilis* was first given were originally regarded as representing a form distinct from the only other then known specimen of the genus from this state, but later writers have more often regarded these two as the same, and, indeed, have included under this name all specimens subsequently found in the west coast states. That this was an assemblage of several distinct but related races was early evident to the writer, and now, after a study of all the material available, it is evident that not only must the two forms originally described be regarded as distinct but that, in addition to these, four others must be recognized if we are to attempt an understanding of the genus in this region.

The subdivisions of this complex are based largely upon the number of dorsal scale rows, width of neck ring, maculation of the ventral surface, and the extent of the encroachment of the ventral color upon the dorsal scale rows.

The name *D. amabilis amabilis* is here restricted to those snakes of the genus inhabiting the San Francisco Bay region and the valleys of the San Joaquin and Sacramento rivers. The characteristics of this race are a narrow neck ring that is

sometimes interrupted, dorsal scales in 15 rows often becoming 13 towards the posterior end of the body, ventral color usually extending onto the lower part of the second row of dorsal scales, and numerous small black spots scattered over the belly.

Diadophis amabilis similis, new subspecies

Diagnosis: Similar to *D. amabilis amabilis*, but with the light color of the ventral surface extending over only one-third to two-thirds of the lowermost row of dorsal scales. Other distinctive features are the moderate amount of black spotting on the belly, the dorsal scales in 15 rows throughout, or dropping to 13 towards the posterior end of the body, and the generally light olive color of the dorsal surface.

Type Specimen: Museum of Zoology, University of Michigan, number 57897, collected by L. M. Klauber in the spring of 1923.

Type Locality: Carmel, Monterey County, California.

Range: From southwestern San Bernardino County south into the San Pedro Martir Mountains in Lower California.

Description of Type Specimen: Ventral plates, 189; anal plate divided; caudal scutes in 59 pairs; upper labials, 7; lower labials, 7; preoculars, 2; postoculars, 2; temporals, 1+1+2 (labials, oculars, and temporals the same on each side); dorsal scales in 15 rows, becoming 13 near the posterior end of the body; neck ring $1\frac{1}{2}$ scales wide, not interrupted; ventral color covering about one-half of the lowermost row of dorsal scales on each side. The colors of the specimen in life were as follows: Below, orange, fading anteriorly to a Capucine buff on labials and anterior chin shields, and becoming a little redder

at the posterior end of the body; under the tail, Brazil red; neck ring about scarlet, bordered posteriorly by a few specks of black; dorsal color behind neck ring, olive; head olivaceous black above. Total length, 291 millimeters; tail length, 59 millimeters. Sex, male.

***Diadophis amabilis vandenburgii*, new subspecies**

Diagnosis: The distinctive features are: an uninterrupted, moderately wide neck ring ($1\frac{1}{2}$ to $2\frac{1}{2}$ scales in width); 17 rows of dorsal scales anteriorly (at least near the head), becoming 15 posteriorly; the ventral color extending over from $1\frac{1}{2}$ to 2 rows of dorsal scales; and the black spots on the belly unusually few and small.

Type Specimen: California Academy of Sciences, number 13748; collected by Joseph Slevin; June 20, 1907.

Type Locality: Carmel, Monterey County, California.

Range: Ventura County to Santa Cruz County, California.

Description of Type Specimen: Ventral plates, 201; anal scute divided; caudal plates, 71; upper labials, 8; lower labials, 8; preoculars, 2; postoculars, 2; temporals, 1+1+2 (labials, oculars, and temporals the same in number on each side); dorsal scales in 17 rows, changing a little past the middle of the body to 15; neck ring about $1\frac{1}{2}$ scales wide, not interrupted; ventral color covering about $1\frac{2}{3}$ of the lowermost rows of dorsal scales. The coloration in alcohol is about as follows: Above, brownish olive; head a little darker; neck ring, cinnamon buff; beneath, pinkish-buff, a little lighter anteriorly, and a little more reddish posteriorly and under the tail; lower labials and chin spotted with black; on belly only a very few scattered black spots except for a line of them along each side

on the ends of the ventrals, and one on the posterior end of most of the dorsal scales of the lowermost row on each side. Total length, 377 millimeters; tail length, 81 millimeters. Sex, male.

Diadophis amabilis occidentalis, new subspecies

Diagnosis: The chief characteristics of this form are a relatively broad, uninterrupted neck ring, $1\frac{1}{2}$ to 2 scales in width, ventral color extending over $1\frac{1}{2}$ to 2 of the dorsal scale rows, flecks of black on the first two rows of dorsal scales, belly lightly spotted with black, and the dorsal scales in not more than 15 rows. This form is intermediate between *D. amabilis vandenburgii* and *D. amabilis pulchellus*. From the former it differs in possessing not more than 15 rows of dorsal scales, in having a neck ring that averages slightly wider, and in having the ventral color extending on the average a little higher on the sides. From *D. amabilis pulchellus* it differs chiefly in having the light colored dorsal scale rows flecked with black; it also differs from this form in having on the average more black spots on the belly, a slightly narrower neck ring, and a lesser extent of ventral color on the sides.

Type Specimen: Museum of Vertebrate Zoology, University of California, number 7260; collected by H. E. Wilder, May 30, 1919.

Type Locality: Bridgeville, Humboldt County, California.

Range: From Sonoma County northward through Mendocine County, California, and perhaps to the Columbia River.

Description of Type Specimen: Ventral plates, 197; anal plate divided; caudal scutes, 55; upper labials, 7; lower labials, 8 on the left side and 7 on the right; preoculars, 2; postocu-

lars, 2; temporals, 1+1+2 (upper labials, oculars, and temporals the same in number on each side); dorsal scales in 15 rows throughout the body length; neck ring, 1½ scales wide, not interrupted, but a slight median projection of its posterior black border present; ventral color covering about 1½ of the lowermost rows of dorsal scales on each side. The coloration, as preserved in alcohol, is as follows: Above, about a dark olive-gray, darker posteriorly; head a little darker above; neck ring about cream color; ventral color a massicot yellow, becoming reddish posteriorly and under the tail; ventral scales irregularly and rather prominently spotted with black, the light colored dorsal scales flecked with black, and the tail with only a very few small black spots. Total length, 442 millimeters; tail length, 76 millimeters. Sex, female.

KEY TO THE WESTERN FORMS OF DIADOPHIS

The ringneck snakes of the *regalis* and *amabilis* groups may nearly always be distinguished from all other forms of the genus in the United States by the possession usually of more than 180 ventral plates, and by the encroachment of the ventral color upon one or more of the lowermost rows of dorsal scales.

Within these groups most specimens may be identified by the following key:

- a₁ Ventrals in males more than 206, in females more than 220.
 - b₁ Neck ring present, 2 to 4 scales in width.....
*D. regalis arizonae*, subsp. nov.
 (Central Arizona, south into Sonora.)
 - b₂ Neck ring absent, or much reduced.....
*D. regalis regalis* (Baird & Girard).
 (Central Texas to southeastern Arizona.)
- a₂ Ventrals in males less than 206, in females less than 220.
 - c₁ Scale rows, 17-15 (rarely 15-15).

- d₁ Ventral color not covering more than $\frac{3}{4}$ of the lowermost row of dorsal scales; belly usually conspicuously spotted with black. *D. amabilis modestus* (Dumeril and Bocourt). (San Bernardino Mountains, Los Angeles County, and Santa Catalina Island, California.)
- d₂ Ventral color covering from $1\frac{1}{2}$ to 2 of the lowermost rows of dorsal scales; belly usually only lightly spotted with black. *D. amabilis vandenburgii*, subsp. nov. (Ventura to Santa Cruz counties, California.)
- c₂ Scale rows, 15-15 or 15-13 (rarely 17-15 or 15-17-15).
- e₁ Ventral color covering from $\frac{1}{3}$ to $\frac{2}{3}$ of the lowermost row of dorsal scales; neck ring only rarely interrupted; color above usually olive or bluish slate.
 *D. amabilis similis*, subsp. nov. (Southwestern San Bernardino County, California, south into the San Pedro Martir Mountains.)
- e₂ Ventral color covering usually more than $\frac{2}{3}$ of the first row of dorsal scales.
- f₁ Neck ring from 1 to $1\frac{1}{2}$ scales in width, often interrupted; ventral color covering from $\frac{1}{2}$ to $1\frac{1}{2}$ rows of dorsal scales; belly well sprinkled with small black spots; dorsal color usually dark.
 *D. amabilis amabilis* (Baird & Girard). (San Francisco Bay and the San Joaquin and Sacramento River valleys, California.)
- f₂ Neck ring from $1\frac{1}{2}$ to 3 scales wide, not interrupted; ventral color covering from $1\frac{1}{2}$ to 2 or more rows of dorsal scales; belly never heavily spotted with black.
- g₁ Two lowermost rows of dorsal scales flecked with black; belly rather conspicuously, although sparsely, marked with small black dots.
 *D. amabilis occidentalis*, subsp. nov. (Sonoma County north through Humboldt County, California, to the Columbia River.)
- g₂ Two lowermost rows of dorsal scales unicolor (not flecked with black); belly almost or quite unspotted.
 *D. amabilis pulchellus* (Baird and Girard). (Western slopes of the Sierra Nevada, south, perhaps, to Tejon Pass in California, and north to southern Oregon.)

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