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THE SNAKES OF THE GENUS *CHIRONIUS*
IN SOUTHEASTERN SOUTH AMERICA

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THE current confusion in the interpretation of forms of the genus *Chironius* has been remarked by several recent authors, Roze (1952: 104), Vanzolini (1948:381), Schmidt and Walker (1943:281-83), and Gage, Hartweg, and Stuart (1937:13), to mention only a few. During the years 1940-42 I collected in South America considerable data on specimens of *Chironius* from eastern and southern Brazil, Paraguay, and Argentina. This trip was made possible through an International Exchange Fellowship under the auspices of the Instituto Brasil-Estados Unidos, Rio de Janeiro, and the University of Michigan, Ann Arbor. In 1953-54 I was privileged to return to Brazil as a John Simon Guggenheim Memorial Foundation Fellow, and it was then possible to correct and amplify the earlier findings. For making these trips possible I am most grateful to the authorities of those institutions.

Many persons in South America have aided these investigations by facilitating examination of material under their care or by donating specimens. The collections of the Museu Nacional, Rio de Janeiro (MNR), were made available for study through the courtesies of Heloisa Alberto Torres, director, and Antenor Leitão de Carvalho, herpetologist. My debt to them is far greater than can be formally acknowledged, as their friendship and helpfulness have impressed themselves on every facet of my South American experiences.

Oliverio Pinto, director of the Departamento de Zoologia, São Paulo (DZSP, formerly a part of the Museu Paulista), granted permission to examine the material under his jurisdiction. This was placed at my disposal with every facility by my long-time friend and field companion, Frederico Lane, with his usual helpful co-operation. This collection has recently been rechecked, and localities for new materials have been recorded through the friendly offices of Paulo E. Vanzolini and Werner C. A. Bokermann.

Lauro Travassos, of the Instituto Oswaldo Cruz, Rio de Janeiro, generously presented me with the first specimen I ever saw of *Chironius laevicollis* Wied and aided me on many occasions both in the field and in the laboratory. Bertha Lutz, of the Museu Nacional and the Instituto Oswaldo Cruz, made available for study specimens from the Lutz private collection.

The Museo de Entre Ríos (MER), Paraná, Entre Ríos, Argentina, has an excellent local collection which was examined through the courtesy of the entomologist, M. Adalberto Rosillo. The collections of the Museo Argentino de Ciencias Naturales (MACN), Buenos Aires, were placed at my disposal by the director, Martin Doello-Jurado, and by Jorge A. Cranwell, then in charge of the herpetological section. Emiliano J. MacDonagh, now director of the Museo La Plata (MLP), La Plata, Argentina, graciously extended to me the privilege of examining the snake collection of his institution.

In Asuncion, Paraguay, the private collection of Andres Barbero was made available for examination by the owner and by Guillermo A. Schouten, of the Sociedad Científica del Paraguay.

In addition to these South American collections, those of the University of Michigan Museum of Zoology (UMMZ) have been studied and the results incorporated in the present paper through the continued generosity of Norman Hartweg and Charles Walker.

The range of the genus *Chironius* extends from eastern Argentina and southern Brazil to Nicaragua, but only the species in the southeastern part of the range are treated. This part includes the range of the genus south of about 10° south latitude and east of about 60° west longitude, or, roughly, the area southeast of a line following the northern border of Bahia to northeastern Mato Grosso to Asuncion, Paraguay, and eastern Argentina. Within this area I distinguish seven southeastern species. To what extent some of these may range beyond the geographical area under consideration has not been fully determined. From within the above-defined area two specimens (DZSP 2178 and 2191 from Aruana, Goias) are not identifiable with a southeastern species, but belong to a wide-spread Amazonian species which apparently penetrates the southeastern region along the Araguaia River. Final allocation of these specimens awaits more complete study of the Amazonian forms.

The characters utilized in this study are those previously found useful in systematic studies of snakes; they are listed below in approximate order of importance. (1) Number of dorsal scale rows on neck (minimum anterior), at mid-body or just anterior to it (maximum), and about two

head lengths anterior to vent. The position of change in scale-row number was determined as were the rows involved, but these data do not appear necessary or even useful for identification. (2) Condition of anal plate, single or divided. (3) Number of abdominal scales. These are counted, beginning with the most anterior scale of full width (objectively defined by Dowling, 1951) and ending with the last pre-anal scale. (4) Number of maxillary teeth. The count is made on one side only (usually the right). Great care in dissection and counting is necessary to insure accuracy. Allowance must be made for teeth removed in dissection, and for those in the process of replacement. Commonly, only every other tooth is firmly embedded. All empty sockets are counted. No true diastema occurs, and any anterior projection of the maxilla before the first visible tooth indicates (in *Chironius*) an incomplete series. The final tooth is far posterior on the maxilla and is directed almost straight backwards. (5) Pattern and coloration. In some forms life colors are greatly altered with preservation, but in *quadricarinatus* and *flavolineatus* this alteration is usually minimal. In some species a juvenile pattern of oblique light crossbars is evident, becoming more or less obscured in the adult. (6) Hemipenis; proportions, approximate number of spines, and type of calycular fringing. (7) Number of dorsal rows keeled and relative development of keels. Characteristics of the dorsal keeling are subject more than most characters in *Chironius* to variations due to age, sex, and preservation. The keels are best developed on, and in some species restricted to, the vertebral pair of rows; and in some species the vertebral rows may bear very high and sharp keels. Males show a much greater development in this character than do females. Young specimens of most species may have smooth scales. Specimens which are shrunken and hardened in preservation exhibit accentuated keeling compared with those in a more pliable and softer condition. (8) Number of temporals in the second row. (9) Number of supralabials and those entering orbit. (10) Distribution of scale pits on dorsal scales, particularly the condition on the vertebral pair of rows at mid- and posterior body. If scale pits are not apparent *in situ* under proper magnification, a complete loose scale removed and mounted wet on the thumb nail will indicate presence or absence of pits and degree of development. (11) Rostral proportions, height at center of scale in width at nasolabial sutures. (12) Number of postoculars. (13) Size of eye in relation to labial height below eye and to maximum interocular width. An important character, but one subject to tremendous ontogenetic variation as well as greatly affected by preservation. (14) Number of pairs of subcaudal scales. This character

is probably of considerable significance, but its usefulness is impaired by the high frequency of incomplete tails. (15) Postcephalic scales. These are the scales immediately behind and in contact with the second row of temporals and the parietals. They are fewest in number in forms with few dorsals, postoculars, and temporals. As a taxonomic character they merit and require further study.

KEY TO THE SPECIES OF *Chironius* FROM SOUTHEASTERN BRAZIL,
PARAGUAY, AND ARGENTINA

The key for the identification of the southeastern species of *Chironius* is intended only as a guide and should be supplemented by the data in Tables I to III and by the descriptions of the species. The tables are part of the descriptions, since the variational data they contain are not repeated.

- 1 Anal plate single, 10 scale rows anteriorly 6
Anal plate divided, 12 scale rows anteriorly 2
- 2 Top of head, posterior dorsum, and tail uniform reddish brown; venter light throughout 5
Top of head dark, posterior dorsum and tail dark or crossbarred; venter more or less clouded with dark except in juveniles 3
- 3 Rostral twice as wide as high; an enormous scale pit on each scale of the vertebral pair of rows throughout length of body; frequently more than 2 postoculars; snout to vent to over 1400 mm.; ventral scales with dark posterior margins.....
..... *foveatus*, new species
Rostral less than twice as wide as high; scale pits lacking at mid-body; usually 2, seldom 3 postoculars; snout to vent less than 1100 mm. 4
- 4 Dorsal scales in 10 rows two head lengths before vent; maxillary teeth 30-41; abdominals 153-172; 1 or 2 temporals in the second row; vertebral rows usually with single supra-anal scale pits; usually a sharply defined dorsal stripe between the keels of the vertebral pair of rows; outer tips of the subcaudals black, forming a sharp line of demarcation with the light subcaudal surface. . *bicarinatus* (Wied)
Dorsal scales usually in 8 rows two head lengths before vent; maxillary teeth 24-28; abdominals 137-157; usually 2 temporals in the second row; scale pits absent posteriorly; dorsal stripe, if present, not sharply defined; outer tips of subcaudals not sharply contrasting with ventral tail color .. *pyrrhopogon* (Wied)
- 5 Anterior third of body with a well-defined middorsal light stripe bordered by the black sides; usually only 2 dorsal rows keeled; usually a single temporal in the second row; maxillary teeth 32-38; usually 9 upper labials and 3 in orbit; subcaudals 127-146 *flavolineatus* (Boettger)
Anterior third of body uniform gray or olive-gray; more than 2 rows of dorsal scales keeled; usually 2 temporals in the second row; maxillary teeth 26-32; most frequently 8 upper labials and rarely more than 2 in orbit; subcaudals 109-129 *quadricarinatus* (Boie)

- 6 Upper lips black; usually 12 scale rows at mid-body; abdominals 154-165; maxillary teeth 32-39 *laevicollis* (Wied)
 Upper lips light; 10 scale rows at mid-body; abdominals 141-153; maxillary teeth 41-45 *fuscus* (Linnaeus)

TABLE I

Frequency Distribution of Variations in Dorsal and Anal Scutellation and in Maxillary Tooth Number in Specimens of the Southeastern Species of *Chironius*

Species	<u>b</u> <i>icar</i> <u>inatus</u>		<u>f</u> <i>oveatus</i>		<u>pyrr</u> <u>hopogon</u>		<u>f</u> <i>lavolineatus</i>		<u>quadr</u> <u>icar</u> <u>inatus</u>		<u>laevicollis</u>		<u>f</u> <i>uscus</i>	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Sex														
Dorsal scale formulae	12-10	27	26											
	12-10-8			7	3	19	14	1	6	13	24			
	10-12-10											7*		
	10-12-10-8											5*	1	
	10-10											1		6
	10-8												5	
Anal	single									1**		14		11
	divided	53		10		35		13		36				
Number of teeth on maxillary	24					1								
	25					5								
	26					7			1					
	27					8			1					
	28				1	5			4					
	29				1				7					
	30	1			-				9					
	31	3			-				5					
	32	4			1			1	2			1		
	33	9			3			1				-		
	34	11			1			3				2		
	35	5			2			2				3		
	36	8						1				2		
	37	2						-				2		
	38	1						1				3		
	39	-										1		
	40	1												
	41	1												3
42													1	
43													-	
44													3	
45													1	
Total		46		9		26		9		29		14		8
Mean		34.3		32.4		26.4		34.6		29.6		36.0		42.8

* 2♂♂, 1♀ have a maximum of 11 rows.

** The type of *flavescens* also has a single anal (see text).

TABLE II

Frequency Distribution of Variations in Abdominal Scutellation
in Specimens of the Southeastern Species of Chironius

Species	<u>bicarınatus</u>		<u>foveatus</u>		<u>pyrrhopygon</u>		<u>flavolineatus</u>		<u>quadricarinatus</u>		<u>laevicollis</u>		<u>fuscus</u>	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Abdominal scales					2									
137					-									
138					-									
139					-				1					
140					2				-					
141					2				-					1
142					-				-					-
143					3				-					-
144					1	1			2				1	-
145					2	1			-				1	2
146					2	2			-	1			-	-
147					-	1		1	1	3			1	2
148					2	1	1	-	-	-			1	1
149					-	2	-	-	4	3			-	-
150					2	-	-	-	-	3			-	-
151					1	-	3	-	1	2			-	-
152						2	1	1	1	2			-	-

TABLE III

Frequency Distribution of Variations in Head Scutellation
in Specimens of the Southeastern Species of *Chironius*

Species		<u>bicarınatus</u>	<u>foveatus</u>	<u>pyrrhopogon</u>	<u>flavolineatus</u>	<u>quadricarınatus</u>	<u>laevicollis</u>	<u>fuscus</u>
Number of	8, 4-5	1		4		50	1	1
upper lab-	8, 4-6	1	2	-		-	-	2
ials and	9, 4-6	93	17	48	22	3	22	14
labials in	9, 5-6	-	-	4	2	20	5	1
orbit	10, 5-7	7	1	4	1	-		
other		4		4		1		
Lower lab-	9, 6	4	2		4	25	9	2
ials and	10, 6	74	14	48	16	37	13	14
labials	11, 6	4	4	7	1	1	-	
contacting	11, 7	16		9	3	1	4	
genials	other	6		6	2	10	2	
Post-	2	94	9	66	22	74	28	18
oculars	3	12	10	4	4			
	4		1					
Posterior	1	52	5	14	23	4	28	18
temporals	2	54	15	56	3	70		
	4						1	
	5	1		1	1		2	
Postcephalics	6	4		3	3		3	-
(scales on neck	7	13		6	1	3	6	5
contacting par-	8	19	8	6	4	5	1	2
ietals and	9	8	1	11	2	19		
posttemporals)	10	5		3		6		
	11			1		2		
	12			1				
Mean		7.8	8.1	8.3	7.3	9.0	6.3	6.8

Chironius bicarınatus (Wied)

Coluber bicarınatus Wied 1820: 181-82; 1825: 284; 1831, color plate (pages and plates unnumbered).

TYPE LOCALITY.—Near the Rio Jacú a few miles south of Victória, Espírito Santo.

RANGE.—Espírito Santo and eastern Minas Gerais, Brazil, southwest

to Misiones, and the Rio Uruguay (Prov. Entre Ríos), Argentina. A species of the forested regions of southeastern South America.

DIAGNOSIS.—Dorsal formula 12–10 in both sexes; anal divided; scale pits absent at mid-body on vertebral rows; vertebral pair of rows keeled (frequently additional rows in ♂ ♂); postoculars usually 2; posterior temporals 1 or 2; maxillary teeth 30–41; a light stripe between vertebral keels; subcaudals with a sharp line of demarcation setting off black outer tips.

DESCRIPTION.—Subcaudals 128 to 154. Vertebral pair of dorsal rows keeled, very strongly so in large males which may have 2–4 additional rows weakly keeled. Rostral usually 1.6–1.7 times as wide as high. Scale pits present on neck and usually on vertebral pair of rows above vent and on tail; absent at mid-body.

Dissected hemipenis 6–8 subcaudals in length; about 70–100 spines opposite second and third subcaudals, decreasing in length distally and merging into calyces which have foliate fringes; no terminal open space, sulcus terminating subapically.

Maximum size ♂ 1090 mm., ♀ 985 mm. snout to vent length.

Top of head dark; rostral, nasal, loreal, and upper lips light. Chin and anterior throat yellow in life. Adult color above, dark bluish olive (greenish in life), usually with a light dorsal stripe between keels, beginning about two head lengths behind parietals, fading out near the vent, the stripe sharply bordered by darker. Occasionally the median stripe is poorly developed and a series of light diagonal bars is present on the sides (especially in Minas Gerais). Ventral ground color lighter, bluish gray, paler anteriorly. Usually a light streak along angles of abdominal scales and along mid-ventral line. Subcaudal surface yellowish, sometimes from a point a little anterior to vent, or sometimes overcast with bluish anteriorly. A series of dark dots at median tip of each subcaudal or a line along median subcaudal sutures produces a zigzag pattern down the center of the tail. Outer tips of subcaudals dark forming a smooth border to the lighter undertail surface.

DISCUSSION.—This species was very briefly treated in the original description. It was more completely described and figured in the author's later publications (Wied 1825: 284; 1831). The type specimen was said to have 155 abdominals and 137 pairs of subcaudals. Measurements and scale counts for four specimens are detailed in the *Beiträge* (1825), but none of these has the subcaudal count ascribed to the type.

It is apparently a rather common species and attains a more southerly distribution than any other species in the genus.

The following material has been examined:

BRAZIL: *Espirito Santo*, Santa Teresa, 700–810 mts. (MNR 571, 575–77). *Minas Gerais*, Mariana (DZSP 678); Passa Quatro (MNR 1839). *Rio de Janeiro* (UMMZ 57698), Maromba, Itatiaya (DZSP 2442); Teresopolis (MNR 569–70, 574, 1861); Barro Branco, 20 km. NE of Distrito Federal (MNR 566, 572); Serra de Petropolis (MNR 568); Tinguá (MNR 1842, 1860); Paratí (MNR 573); Caxias (MNR 1868). *Distrito Federal* (DZSP 1945, 2340–41), Tijuca (UMMZ 103082); Pão de Fome, Jacarepaguá (MNR 567, 1843); Realango (MNR 1842, 1862–64, 1869–74). *São Paulo* (DZSP 674, 676, UMMZ 62829–30, 62833, 79653), São Paulo (DZSP 2434, 2585, 2968); Perus (DZSP 667, 672–73); Alta da Serra (DZSP 1621); Raiz da Serra (DZSP 669); Piracicaba (DZSP 691); São Sebastião (DZSP 670); São Miguel Arcanjo (DZSP 1674); Itanhaém (DZSP 666); Cabralia (UMMZ 79655); Botucatu (DZSP 1956, 2436); Lefevre (DZSP 2866–67), locality not identified. *Paraná*, Paula Freitas (UMMZ 103083). *Santa Catarina*, Avençal (UMMZ 79654). *Rio Grande do Sul* (DZSP 677, 694), Costa, Rio Uruguay (MACN 7461), not identified, probably not a specific locality.

ARGENTINA: *Misiones* (MACN 8460), *Entre Rios*, Isla Rica, Dept. Uruguay (MER 20).

Chironius foveatus, new species

HOLOTYPE.—MNR 1840, adult male, Rio Fortuna, Ilhéus, Bahia.

RANGE.—Definitely known from Bahia to Santa Catarina, along the coast. Apparently scarce south of Bahia.

DIAGNOSIS.—Dorsal formula 12–10 in females, 12–10–8 in males; vertebral pair of rows strongly keeled in large males, a very large pit present on each scale of the vertebral pair throughout length of body. Postoculars usually 3; posttemporals usually 2; rostral very broad, about twice as wide as high; tail very long.

DESCRIPTION.—The holotype has the dorsal formula 12–10–8 with reductions opposite ventrals 90 and 113, through loss of the third row each time. Abdominals number 165, anal divided, subcaudals 165 (possibly not quite complete). Upper labials 9, fourth to sixth in orbit; lower labials 10, five in contact with anterior and sixth in contact with the posterior chin shields. Rostral twice as wide as high; loreal twice as long as high; internasal suture nearly equal to the prefrontal; frontal bell-shaped, slightly shorter than the distance from the tip of the rostral and shorter than the parietals which are nearly as wide as long.

The vertebral pair of rows bears very strong keels, but the other rows are smooth. Large single scale pits are present on several rows on the neck, and these continue on the vertebral rows until only two dorsal caudal rows remain. Tracings of a series of mounted and projected scales of the left vertebral row of a paratopotype (DZSP 1268) are shown in Figure 1, illustrating the enormous size and clarity of the scale pits.

The hemipenis (dissected) measures 6 subcaudals in length and bears long spines opposite subcaudals $1\frac{1}{2}$ to about 4, in 14 diagonal and about 8 longitudinal rows, thus making about 92 spines. The spines are short basally and longest just before the merging into distal calyces, which is accomplished by joining the bases of the spines and reducing their length. The calyces are large and deeply fringed except near the opening of the sulcus where they are very shallow and imperfect.

Maxillary teeth 33.

MEASUREMENTS (in mm.).—Snout to vent 1444, tail 823, head length 51.5 (to mandibular-pterygoid-quadrangle junction), posterior interorbital width 19, length of orbit 10, least depth of upper lip below eye 5.

Rostral, nasals, labials (except the tops of those behind eye), and chin light. Top of head and dorsum dark, the latter slightly lighter between the vertebral keels. Venter lighter, a dark olive, with prominent dark scale edgings to abdominals and subcaudals.

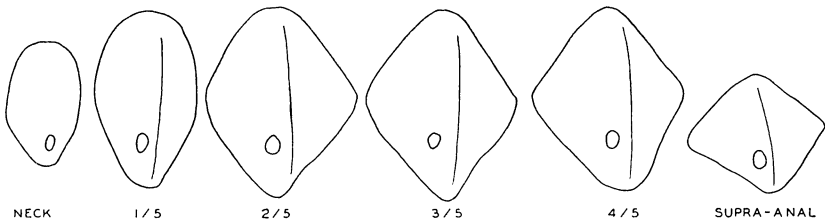


FIG. 1. Tracings of projected series of scales taken from successive fifths of the left vertebral row of *Chironius foveatus*, new species, topotype, DZSP 1268. Largest scale approximately 1 cm. long.

VARIATION.—Variation in almost all meristic characters is given in the foregoing tables. The subcaudals are numerous; most of the tails, however, are incomplete. Complete tails have 165 and 170 and incomplete tails 131, 153, 158, 162, 165, 168 subcaudals, which indicate that the subcaudal number is probably about equal to the abdominal number. The keels on the vertebral rows are weak in females, and weak or absent in juveniles. Juveniles show indistinct diagonal bars on the back in shades of brown, but the dark edgings of the ventral scales are as in the adult. The scale pits are large and distinct and have the same distribution in juveniles that they do in adults. The hemipenis of DZSP 675, from São Paulo, agrees with that of the type except that it is a subcaudal shorter (basally, as the spines are lower as measured in subcaudals), and the spines number about 100; the lips of the sulcus are distinctly papillate along the calyculate area.

COMPARISONS.—The present species is subject to confusion with *bicarinatus* and *pyrrhopogon*, occupying a position intermediate between these two in certain morphological characters such as dorsal formula and maxillary tooth number. In its large size, high subcaudal number, wide rostral, shortness of hemipenis, development of vertebral scale pits, and high frequency of more than two postoculars it is extreme for these three species.

The following material has been examined:

No data (MACN 2 specimens). BRAZIL: *Bahia*, Itabuna (DZSP 1271–72); Ilhéus (DZSP 1268); Ilhéus, Rio Fortuna (MNR 1840). *Espirito Santo*, Santa Leopoldina, Porto Cachoeira (DZSP 679). *Rio de Janeiro*, Tinguá (MNR 2889). *São Paulo* (DZSP 675). *Santa Catarina*, Humboldt [now Hansa] (MNR 583).

Chironius pyrrhopogon (Wied)

Coluber pyrrhopogon Wied 1825:291; 1831, color plate (pages and plates unnumbered).

TYPE LOCALITIES.—Great forests of Rio Iritiba or Benevente, Espírito Santo.

RANGE.—Bahia to Santa Catarina, Brazil; along the coastal strip. The same or a closely related form has been examined from western Mato Grosso (probably Amazonian watershed).

DIAGNOSIS.—Dorsal formula 12–10–8 in both sexes (occasionally 12–10 in females); scale pits present only on neck; vertebral rows weakly keeled; postoculars and posterior temporals usually 2 on each side; maxillary teeth 24–28; dorsal stripe absent or not sharply defined; no sharp line of color contrast along outer tips of subcaudals.

DESCRIPTION.—Subcaudals 135–156+. Vertebral pair of scale rows rather weakly keeled in adults, smooth in some juveniles; rostral about 1.6–1.7 times as wide as high. Scale pits single (occasionally double), on anterior part of body only.

Dissected hemipenis long (8–10 subcaudals); spines more numerous (100–120) and more distally inserted (opposite third to fifth subcaudals) than in *bicarinatus* or *foveatus*; calyces begin opposite the end of the fifth subcaudal, arranged in about ten rows, more finely fringed than in *bicarinatus*; sulcus terminating on a clear space near the tip.

Maximum size ♂ 880, ♀ 992 mm. snout to vent length.

Top of head dark, rostral and upper lips light, chin and throat light. Dorsal ground color olive brown frequently with an indistinct yellowish median stripe, but the stripe more irregular than in *bicarinatus* and not confined between keels. Diagonal light bars becoming transverse posteriorly are often present on every other or every third transverse row extending onto tips of abdominals. These are most

distinct on juveniles or small adults, but usually traces are retained giving a somewhat spotted appearance. Ventral surface grayish, bluish, or olive, paler than dorsum; subcaudal with a dark diffuse median streak along scale sutures.

DISCUSSION.—This species along with the two preceding ones has been identified in the catchall "*carinatus*" in modern literature. It is readily distinguished from *bicarinatus* by the number of maxillary teeth, abdominal scales, dorsal rows anterior to the vent, but usually the coloration will suffice. Distinction from *foveatus* is more difficult but the narrower rostral, absence of posterior pits on vertebral rows and lower abdominal scale, and maxillary tooth numbers should serve to place doubtful specimens. The ecological interrelationships of the three species need investigation.

A single specimen which I tentatively refer here was collected by the Rondon-Roosevelt expedition to western Mato Grosso. No precise data are available, but it is presumed to have come from Amazonian Mato Grosso. The species recorded recently by Schmidt and Walker (1943:281) as *Chironius carinatus* from Peru is either this or a very closely related form. All other specimens examined are from the narrow littoral forest of southeastern Brazil, except for one labeled "interior São Paulo" and perhaps some from that state without locality. One locality, "Santo Antonio de Vargem Alegre, Minas Gerais," could not be identified positively. There are three such localities, all in southern Minas Gerais, listed in the Brazilian *Guia Postal* (1931).

The following material has been examined:

BRAZIL: *Bahia* (UMMZ 56300), Barragem do Bananeiral, Cachoeira (DZSP 2445). *Espírito Santo*, Santa Tereza, 680 mts. (MNR 578). *Minas Gerais*, Santo Antonio de Vargem Alegre (DZSP 687-88). *Rio de Janeiro*, Petropolis (UMMZ 103084); Petropolis, Alto da Serra (MNR 579); Joaquim Leite (UMMZ 103086); Itatiaya (MNR 580); Caxias (MNR 581). *Distrito Federal*, Gavea (MNR 582); Manguinhos (UMMZ 103087); Realango (MNR 1844-45); Jacarepaguá (MNR 1846). *São Paulo* (DZSP 692-93; UMMZ 62825, 62831-32, 62835), interior (DZSP 680); São Paulo (DZSP 681, 2432, 2565, 2802-03); Ypiranga (DZSP 690); Itanhaém (DZSP 682, 689, 698-99); Santos (DZSP 684); São Vicente, near Santos (DZSP 1369); Iguape (DZSP 671); Poço Grande, nr. Santo Antonio de Juquiá (UMMZ 103085, DZSP 1959); Botucatu (DZSP 2437); Boracéia (DZSP 1881, 2422, 2443-44). *Santa Catarina*, Joinville (MNR 585-86); Humboldt [now Hansa] (MNR 584). *Mato Grosso*, Rondon expedition (MNR 224).

Chironius flavolineatus (Boettger)

Coluber carinatus var. *flavolineata* Jan 1863:80 (*nomen nudum*).

Herpetodryas flavolineatus Boettger 1885:234.

TYPE LOCALITY.—Paraguay.

RANGE.—From central and western Bahia and northeastern Mato

Grosso to São Paulo, Paraguay, and central Bolivia. A species of the savanna lands of central South America.

DIAGNOSIS.—Dorsals in 12 rows at mid-body; head region reddish brown; body anteriorly black with a very distinct median yellow stripe, becoming unicolor gray at about mid-body; usually only median pair of dorsals keeled; usually a single posterior temporal and 9 upper labials; maxillary teeth 32–38.

DESCRIPTION.—Subcaudals 127–146. Keels usually restricted to the vertebral pair of rows, rarely the adjoining pair weakly keeled. Scale pits large and single on neck and anterior fifth of body, and on the vertebral pair of rows in the region of the vent, where each pit is nearly central rather than apical in position; absent elsewhere.

Dissected hemipenis 6–7 subcaudals in length with numerous (100 ± 15) spines on the middle third of organ, the spines longest centrally, merging into forked then fringed calyces on the distal third. Sulcus with papillate lips, opening onto a clear space.

Maximum size ♂ 652, ♀ 766 mm. snout-vent length.

A darkish blotch behind eye, chin and labials light. Head and neck for about three scales reddish brown; body with a bright yellowish stripe anteriorly between vertebral keels fading out at about mid-body and bordered by black sides above the second scale row, most intense dorsally, also fading out at mid-body. Posterior part of body and tail reddish brown. Ventral surface light, shaded with darker at scale overlaps and with a light line along the angle of the ventrals.

DISCUSSION.—This and the following species are a closely related grassland pair, which appear almost completely sympatric. They are amply distinct and may prove to have other relatives in the savanna areas farther north. *C. flavolineatus* seems rather more closely related to the three foregoing species in its longer tail, single pair of keeled rows, nine upper and ten lower labials, many-spined hemipenis, and numerous teeth. Most of those characters, however, are probably specialized conditions among colubrid snakes, though nearly average for *Chironius*.

In the first usage of the specific name Jan listed several varieties of *carinatus*, among which is *flavolineata* from Brazil and Bahia. No descriptive matter served to distinguish any of the forms listed; accordingly, his varietal names must be considered *nomina nuda*.

In the *Iconographie* (Livr. 31, Taf. 2, Fig. 3) the present species is figured by Jan and Sordelli but is indicated only as a variety of *carinatus*, the name *flavolineata* having been dropped. Boettger finally described in detail two specimens from Paraguay under the name

Herpetodryas flavolineatus, which he credited to Jan. Boettger, however, is clearly responsible for the first description of the species and should stand as its author.

The following material has been examined:

BRAZIL: *Bahia* (UMMZ 56299), Barreiras (UMMZ 103081); *Januaria* (UMMZ 103080). *Mato Grosso* (MLP 191a), Mouth of Tapirapé River (MNR 588-89); *Miranda* (MLP 198-200, 211a, 285a); *Aquidua* (MNR 1511). *São Paulo*, São Paulo, *Ypiranga* (DZSP 733); *Botucatu* (DZSP 2838); *Emas* (DZSP 1912, 1894). *Goiás*, *Goiania* (DZSP 1932).

Chironius quadricarinatus (Boie)

Erpetodryas 4 dricarinatus Boie 1827:548.

Phyllosira flavescens Cope 1862:349 (holotype, USNM 5813, a juvenile specimen from the Page collection, hence from Paraguay or northern Argentina).

TYPE LOCALITY.—Originally in the Leyden Museum; no type locality given. Here restricted to Asuncion, Paraguay.

RANGE.—Northern Mato Grosso to central Bolivia, central Paraguay, and vicinity of São Paulo city. Like the last, a species of the savanna country of central South America.

DIAGNOSIS.—Dorsals in 12 rows at mid-body; head and neck reddish brown; body anteriorly bluish gray changing before mid-body to reddish brown; usually more than 2 dorsal rows keeled; usually 2 posterior temporals and most frequently 8 upper labials; maxillary teeth 26-32.

DESCRIPTION.—Subcaudals 109-129; keels usually apparent on 8 or 10 dorsal rows in males and 4-6 rows in females, best developed dorsally but median pair not greatly enlarged. Scale pits usually present and single anteriorly, absent elsewhere. Eye smaller than in *flavolineatus*.

Dissected hemipenis about 8 subcaudals long ($7\frac{1}{2}$ - $9\frac{1}{2}$), about 45 spines inserted opposite the first to third or fourth subcaudal, decreasing in length after the second transverse row; calyces in about 24 transverse rows, large, fringed, and occupying about twice as extensive an area as the spines. Lips of sulcus papillate. Compared to the hemipenis of *flavolineatus* the organ is longer, with $1\frac{1}{3}$ - $1\frac{1}{2}$ the number of spines and larger and more extensive calyces.

Maximum size ♂ 657, ♀ 763 mm. snout to vent length.

Head and neck for about 3-4 scales reddish brown grading into an olive or bluish gray body; most of upper lips and chin light (yellowish); a darkish streak on postoculars and anterior temporal. Body bluish gray anteriorly merging into reddish brown on posterior half and tail.

Ventral surface immaculate yellow merging smoothly into dorsal color on tips of ventrals.

REMARKS.—Since the original description of this species is brief and difficult to obtain it is quoted below:

Erpetodryas

.....
6. 4 dricarinatus Fitzing. spec. inedit.

Ein Exemplar im Leydener Museum einfarbig bräunlich, nach verlornen Epidermis grün-bläulich, unten gelblich. Auf der Seite der beyden Occipitalschilder, 3 Temporalschilder, von denen das hinterste kaum grosser als die Nachenschuppen. Zwei hintere und ein vorderer Augenrandschild. Obere Randschilder heller als der Kopf. Bauchschilder nicht geknicht, 151 + 118.

Although there was no type locality every detail of this description fits; the color, temporal formula, and ventral scutellation—all point to this species. The low subcaudal count, if we may assume a complete tail, is particularly indicative. From the specific name we are justified perhaps in concluding that four dorsal scale rows were keeled, although that particular is not mentioned in the description, and this point strengthens the case in favor of Boie's name.

Dr. Doris Cochran has graciously supplied me with additional data on the type specimen of *Phyllosira flavescens* Cope, which was poorly described and has remained something of a puzzle. Dr. Cochran informed me that the anal plate is single but that there are 12 dorsal rows anteriorly and at mid-body (instead of 10 as stated by Cope), reducing to 9 before the vent. In other characters it agrees with the population described above, to wit: ventrals 149, upper labials 8, 4–5 in orbit, at least 26 maxillary teeth, 2 posterior temporals, 2 median rows keeled anteriorly and 4 posteriorly, and coloration as described by Cope: "Color yellowish brown anteriorly, posteriorly brownish yellow. Below yellow." I have observed intraspecific variation in the anal plate only in this species, one specimen beside the type of *flavescens* having it single, and one having it semidivided. The type of *flavescens* is a juvenile, now flabby and faded almost white; it has a tear in the ventral series, and the tail is broken at the 80th subcaudal. If it can be shown that the name *quadrifaratus* is not available *flavescens* could replace it.

This species has frequently been called *sexcarinatus* Wagler (in Spix 1824:35, Pl. 12) in the past because of the presence of more than two rows of keeled dorsal scales. The type description of *sexcarinatus* from the Amazon Valley leaves much to be desired, but three characters

stand out as distinguishing it from *quadricarinatus*. These are the high number of ventrals, 202, which exceeds anything reported for the genus, 13 maxillary teeth, far fewer than for any known species of *Chironius*, and the coloration "*supra nigrofusca, immaculata, subtus pallidior.*" In regard to these characters it can be pointed out that there is a species of *Chironius* in the Amazon Valley with a high ventral number, for under the name *carinatus* Gomes (1918:66) has recorded from the state of Pará specimens with as many as 193 ventrals. The maxillary tooth number is in all likelihood an error, as the teeth are described as "distant," and probably only about every other tooth was in place when examined, a condition which is relatively frequent. The uniform dark dorsal coloration could be the result of discoloration through preservation, but the plates in the *Serpentum Brasiliensium* as a group show rather faithful color reproduction, and several species in the genus do have a nearly uniform dorsal coloration in the adult. It seems most unlikely that the type of *sexcarinatus* is identical with *quadricarinatus*, although it may prove to be a closely related and valid form. On the other hand, it is not at all certain that Wagler's species is a *Chironius*.

In several respects *quadricarinatus* is the most generalized species of *Chironius* under treatment. The following features merit brief comment and summary: (1) Keeling of dorsal scales most normal. Several rows keeled without extreme development of the median pair of keels. (2) Shortest upper and lower labial series; relatively short maxillary tooth series. (3) Least enlargement of postcephalic scales. (4) Relatively short tail. (5) Relatively small eye. Other probably generalized features shared with other species: (6) 12 scale rows and divided anal. (7) 2 posttemporals. (8) 2 postoculars. (9) Small size.

These characters in combination are sufficient to establish for this species a generalized position among the species treated and probably in the genus as a whole.

The following material has been examined:

BRAZIL: *Minas Gerais*, Santo Antonio de Vargem (DZSP 714-715); Vespasiano (DZSP 2777); Lagôa Santa (MNR 1824-26); Rio Casca (MNR 1967); Carmo do Rio Claro (MNR 1841); Pomba (Lutz). *Mato Grosso*, Mouth of Tapirapé River (MNR 587). *São Paulo* (UMMZ 62823-28), Botucatu (DZSP 2435, 2439-40); Emas (DZSP 1893); Cachoeira (DZSP 723-24); Franca (DZSP 721); Itapetininga (DZSP 1917); Itatiba (DZSP 1567); Campo Limpo (DZSP 722); Piquete (DZSP 719); Piracicaba (DZSP 1564); Jardim da Comissão (DZSP 716-17); Ypiranga (DZSP 700-02, 704-09, 711-13).

PARAGUAY: *Asuncion* (Barbero, 3 specimens).

Chironius laevicollis (Wied)

Coluber laevicollis Wied 1825:296.

TYPE LOCALITY.—Fazenda of Muribeca on the lower Rio Itabapoana, the state border of Espírito Santo with Rio de Janeiro.

RANGE.—Known from central Espírito Santo to Paraná.

DIAGNOSIS.—Dorsal formula usually 10–12–10 in females, 10–12–10–8 in males; head above lip line black, body dark anteriorly, light posteriorly; abdominals 156–165; only paravertebral rows keeled and these not strongly so; maxillary teeth 32–38.

DESCRIPTION.—Tail relatively short; 109–116 pairs of subcaudals; vertebral pair of rows weakly keeled; others smooth. Extent of more than 10 dorsal rows extremely variable; 2 specimens show only 10 rows as a maximum, 3 have 11 (in 2 of these the mid-body extent of the extra row is only 5 scales), and the other 9 have 12 with the extra rows varying from 19 to 38 scales long in 3 males and 21 to 101 scales in 5 females (irregular and short extent in 1 female). Least depth of lip 1.3–2.4 times in diameter of eye. Scale pits apical, present on anterior part of body only.

Hemipenis (UMMZ 62834) 6½ subcaudals long; spines begin opposite second subcaudal and merge into fringed calyces; spines in about 16 longitudinal rows, about fourth row from base the longest and even these have connected bases. Another specimen (MNR 1837) has the hemipenis everted: 5 subcaudals long; about 100 spines in about 20 rows of 5 each, none especially enlarged, merging into calyces as above.

Maximum length examined ♂ 1076, ♀ 1375 mm. snout to vent length. (Type about 1300 mm.)

Top of head including upper lips black continuing onto dorsum where the ground color becomes increasingly variegated with light; at about the anterior third of the body the ground color is finely mottled with pale olive and light gray, each scale edged with darker; tip of tail somewhat darkened. Chin yellow, abdomen olive with posterior abdominals and subcaudals finely margined with black. Variation observed seems largely a matter of over-all darkening due to preservation.

DISCUSSION.—This species has been completely ignored since it was clearly described by Wied. Because of the variation in dorsal scale rows at mid-body it has probably been identified both as *carinatus* and *fuscus*. The single anal plate, 10 rows on the neck, weak keels, 2 post-oculars, 1 posterior temporal, and other characters all indicate its close affinity to *fuscus* with which it is in part sympatric. It is readily dis-

tinguished from other southeastern species by the black lips.

The following material has been examined:

BRAZIL: *Espírito Santo*, Porto Cachoeira, Santa Leopoldina (DZSP 695); Santa Teresa (MNR 593, 1834, 1838). *Rio de Janeiro*, Itaipava, Petropolis (MNR 594); Angra dos Reis (UMMZ 103079); Japuiba, Angra dos Reis (DZSP 1946); Caxias (MNR 1833, 1835-37, 2752); Tinguá (MNR 1858 and 1 unnumbered). *São Paulo* (UMMZ 62834), Porto Marcondes, Rio Parapanema (DZSP 1854).

Chironius fuscus (Linnaeus)

Coluber fuscus Linnaeus 1758:222-23.

TYPE LOCALITY.—Asia, in error.

RANGE.—Complete range unknown. Specimens assigned to *fuscus* in this paper from coastal region of Brazil, from east-central Bahia to São Paulo. Other specimens from the Rondon expedition, presumably brought from western Mato Grosso.

DIAGNOSIS.—Dorsal scales in 10 (♀) or 10-8 (♂) rows, anal single; vertebral keels very weak or absent; upper lips light all around; ventrals 144-153; maxillary teeth 41-45.

DESCRIPTION.—Subcaudals 114-135+; vertebral pair of rows with keels weakly developed, if at all; other rows smooth; least depth of lip 2.3-2.5 times in diameter of eye; scale pits on anterior body only.

Dissected hemipenis 6½ subcaudals long with about 110 spines merging into perfect fringed calyces; a pair of enlarged basal spines opposite sulcus.

Maximum length examined ♂ 921, ♀ 730 mm. snout-vent length.

Coloration apparently rather variable, reminiscent of *pyrrhopogon*. Two specimens from Barro Branco, just north of Rio de Janeiro are dark above with traces of crossbars about every four scales. A São Paulo specimen is similar, and one from Bahia has the light bars sufficiently distinct that 31 may be counted to a point above the vent. Two specimens presumably from western Mato Grosso are uniformly dark above except that one has a median light stripe edged with darker.

The top and upper sides of the head are dark and rostral-upper lip margins light in all. Ventral surface light anteriorly, darker posteriorly with dark scale margins.

DISCUSSION.—The status of the name *fuscus* is most unsatisfactory, but until a better understanding of all the populations with such characters as 10 scale rows and a single anal is to be had I prefer not to substitute one uncertainty for another. I have no doubt that restriction of the name will prove necessary when all the pertinent facts are at

hand. The species called *fuscus* here may even be composite if the Rondon specimens are found to agree with a distinguishable Amazonian form. There can be no question, however, that my *fuscus* is distinct from *laevicollis* and other southeastern species.

In dorsal scutellation and number of maxillary teeth *fuscus* is extreme among the studied species.

The following material has been examined:

BRAZIL: *Bahia*, Itabuna (DZSP 1270). *Espirito Santo* (DZSP 696); Refugio, Sooretama (DZSP 2462). *Rio de Janeiro*, Barro Branco, 20 km. NE of Distrito Federal (MNR 634-635); Caxias (MNR 1848-49); Tinguá (MNR 1859). *Distrito Federal*, Trapiceiro (DZSP 1947); Realango (MNR 1847). *São Paulo*, Itanhaém (DZSP 697, 1910). *Mato Grosso*, Rondon expedition (MNR 223, 248).

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