we retain ZRC for USDZ following conventional usage. LSUPC = La Sierra University Photographic Collection.

Liopeltis tricolor—(n = 10): PHILIPPINE ISLANDS: PALAWAN; Iwahig (FMNH15054, CM 8810). JAVA; Kosterm, Bogor (FMNH 72453, ZRC 2.2847). SUMATRA (ZRC 2.2845). MALAYSIA: SELANGOR; Kepong (ZRC 2.2841); PENANG; Penang Hill (ZRC 2.2837); PAHANG; Pulau Tioman (BPBM 7528). NO DATA (UMMZ 67208, 201912).

Gongylosoma baliodeirum—(n = 16): MALAYSIA: SABAH; Lahad Datu District, Danum Valley Field Center (FMNH 246156–57), Sipitang District, Mendolong (FMNH 233172–73), Kiau District, Mt. Kinabalu (ZRC 2.2829). SARAWAK; 4th Division, Niah (FMNH 131590, 131592–93), Fourth Division, Kelabit Highlands (FMNH 131591, ZRC 2.4671), PENANG; Penang Hill (ZRC 2.2823), JOHOR; (ZRC 2.2826). JAVA: Bandung (ZRC 2.2833–34). SINGAPORE: Bukit Timah (ZRC 2.2609), Sime Road (ZRC 2.3534).

Gongylosoma longicauda—(n = 3): MALAYSIA: SABAH; Tenom District, Purulon Camp, Area III (FMNH 243930), Lahad Datu District, Danum Valley Field Center (FMNH 241282), SUMATRA; Lahat (FMNH 73841).

Gongylosoma mukutense—(n = 1): MALAYSIA: PAHANG; 0.5 km S of Kampong Mukut, Pulau Tioman. LSUPC-S3152–63.

Gongylosoma nicobariense—(n = 1): INDIA: NICOBAR ISLANDS, Kamorta (ZSI 7201, holotype of *Ablades nicobariense* Stoliczka, 1870).

Gongylosoma scriptum—(n = 5): THAILAND: NAKHON RATCHASIMA PROVINCE; Amphoe Pak Thong Chai, Sakaerat Experimental Station (FMNH 180114–17, 180128).

Gongylosoma "Borneo"—(n = 2): MALAYSIA: SABAH; Tenom District, Crocker Range National Park, Sungai Malutut Camp (FMNH 239904), SARAWAK; Third Division, Kapit District, Mengiong River, Nanga Tekalit Camp (FMNH 138672).

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A NEW SPECIES OF THE *GEOPHIS DUBIUS* GROUP (SQUAMATA: COLUBRIDAE) FROM THE SIERRA DE JUÁREZ OF OAXACA, MEXICO

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ABSTRACT: I describe a new species of the *Geophis dubius* group from the northern slopes of the Sierra de Juárez of Oaxaca, Mexico. The new species is most similar to *G. carinosus*. A previously unknown population of the *G. dubius* group from the Isthmus of Tehuantepec in Oaxaca is also reported.

Key words: Colubridae; *Geophis*; *Geophis carinosus*; *Geophis dubius* group; Mexico; New species; Oaxaca; Systematics

THE COLUBRID genus *Geophis*, with over 40 recognized species arranged in seven species groups, ranges from northern Mexico south and east through Central America to extreme northern South America (Downs, 1967; Restrepo and Wright, 1987).

In his monographic treatment of the genus, Downs (1967) placed *G. carinosus*, *G. dubius*, *G. fulvoguttatus*, *G. immaculatus*, and *G. rhodogaster* in the *G. dubius* group and defined the group by numerous morphological characters: head indistinct, or only slightly distinct, from the neck; snout long, bluntly pointed; rostral prominent, its visible length one-third or more its distance from the frontal; internasal large, rounded anteriorly; prefrontal short; anterior edge of the frontal sharply angulate; parietal short; supraocular small, triangular (absent in *G. rhodogaster*); eye small; postnasal enlarged; loreal short; anterior temporal absent; dorsal scales smooth or keeled, arranged in 17 rows; scales above the vent with paired apical pits ("apparently

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absent" in *G. rhodogaster*); 120–143 ventrals in males and 126–147 in females; 34–49 subcaudals in males and 27–43 in females; tail length equal to 16.0–23.9% of the total length in males and 13.6–19.5% of the same length in females. In addition, Downs (1967) defined the *G. dubius* group by several dentition characters: maxilla straight or slightly curved in lateral view, slenderest anteriorly, laterally compressed into moderate flanges at its posterior end; anterior extension of the maxilla greater than that of the palatine, attaining the suture between the first and second supralabials (second and third in *G. dubius*); 9–17 maxillary teeth; longest teeth in the posterior part of the row; first tooth at the anterior tip of the maxilla; anterior end of the ectopterygoid bifurcate (one branch short, blunt; the second long, compressed, blade-like); no postorbital bone.

Since the appearance of Downs' (1967) monograph, two species have been added to the *G. dubius* group, raising the number of its members to seven: *G. duellmani*, described by Smith and Holland (1969), and *G. anocularis*, resurrected by Campbell et al. (1983) from the synonymy of *G. dubius* where it had been placed previously by Downs (1967). An eighth taxon, *G. rostralis*, also has been intermittently recognized in the *G. dubius* group; however, its status is controversial. Whereas Bogert and Porter (1966) and Campbell et al. (1983) have maintained the distinctness of *G. rostralis*, Smith (1959), Downs (1967), Pérez-Higareda and Smith (1988), and Smith and Pérez-Higareda (1991) have regarded it as a synonym of *G. dubius*.

Geographically, the *G. dubius* group has been described as ranging from northern Puebla and central Veracruz south and east through southeastern Mexico and Guatemala to El Salvador (Downs, 1967). The only record from central Veracruz was based on the type locality of *G. fuscus* ("Jalapa"), a taxon placed in the synonymy of *G. dubius* by Downs (1967). However, the validity of the record from Jalapa was questioned by Bogert and Porter (1966) and Smith and Holland (1969).

The geographic distribution and variation of *G. carinosus* are inadequately understood. This species was reported to occur from the Sierra Madre Oriental in northern Puebla, Mexico, south and east on the Caribbean slopes of Veracruz and Chiapas to the Sierra de los Cuchumatanes in Guatemala (Downs, 1967). However, *G. carinosus* was known to Downs (1967) by only seven specimens, which came from widely separated areas: three were collected in Guatemala (the type series) and four came from east-central and southeastern Mexico: one from Yajalón, Chiapas; two from Volcán San Martín in the Sierra de los Tuxtlas, Veracruz; and one from about 16.1 km southwest of Villa Juárez in northern Puebla (Downs, 1967: Fig. 8). Thus, no specimens were known from the area between southern Veracruz and northern Puebla, which represents a wide gap in the distribution of the species as conceived by Downs (1967). Furthermore, although Downs (1967) found little variation among the specimens from Guatemala, Chiapas, and Veracruz, he detected variation between those specimens and the one from northern Puebla that suggested "the possibility of (taxonomic) differences between populations north of the Isthmus of Tehuantepec and those to the south." However, the paucity of specimens prevented him from drawing definite taxonomic conclusions about the Pueblan population. More recently, Pérez-Higareda and Smith (1988) reported on variation in four additional specimens of *G. carinosus* from the Sierra de Los Tuxtlas region and reevaluated the identity of the specimen from northern Puebla, concluding that it represents *G. dubius*.

My examination of two specimens possessing most of the defining characters of the *G. dubius* group from the Sierra de Juárez, Oaxaca (deposited in the Museo de Zoología of the Facultad de Ciencias, Universidad Nacional Autónoma de México [MZFC]), suggests that, although similar to *G. carinosus*, they represent an undescribed species. Two additional specimens from this population, kindly made available by Dr. Jonathan A. Campbell from the University of Texas at Arlington, confirm my assessment. In addition, my examination of several specimens of *G. carinosus*, including all except one of the specimens seen by Downs (1967), corroborates the evaluation by Pérez-Higareda and Smith (1988) that the specimen from northern Puebla belongs to the *G. dubius*/*G. rostralis* complex, rather than to *G. carinosus*.

Herein, I describe the new species from the Sierra de Juárez, Oaxaca, and provide addi-

tional information on the specimen from northern Puebla and geographic variation in *G. carinosus*. In addition, a specimen with the defining characters of the *G. dubius* group from a previously unknown population from the Isthmus of Tehuantepec in Oaxaca is reported.

Materials and Methods

I have examined all of the available museum specimens assigned to *G. carinosus* by Downs (1967), except for an uncatalogued specimen from Volcán San Martín in the Sierra de los Tuxtlas, Veracruz. In addition, I examined two other specimens of *G. carinosus* (one female and one male) from the Sierra de los Tuxtlas and one recently collected female with the defining characters of the *G. dubius* group, but of uncertain specific identity, from the lowlands of the Isthmus of Tehuantepec in Oaxaca. Morever, Dr. Hobart M. Smith kindly examined for me the most relevant characters for this work in two additional specimens of *G. carinosus* from "Beleú, Alta Verapaz, Guatemala" (Baleu, fide J. A. Campbell). A list of the specimens examined and their localities are given in Appendix I. Acronyms for museums and collections follow Leviton et al. (1985), except for the addition of MZFC, IBH-LT (Estación de Biología Tropical "Los Tuxtlas," Instituto de Biología, Universidad Nacional Autónoma de México, Los Tuxtlas, Veracruz), and IHN (Instituto de Historia Natural, Tuxtla Gutiérrez, Chiapas). The diagnosis was based on both the specimens examined and the relevant literature (Campbell et al., 1983; Downs, 1967; Pérez-Higareda and Smith, 1988; Restrepo and Wright, 1987). Nomenclature of scales follows Downs (1967). Color descriptions and codes follow Smithe (1975). In addition to the most common meristic and qualitative characters, 28 ratios were recorded (referred to by the following numbers hereafter): (1) rostral length from above/rostral–frontal distance, (2) internasal breadth/internasal length, (3) internasal length/prefrontals common suture length, (4) internasals common suture length/prefrontals common suture length, (5) prefrontal length/snout length, (6) prefrontals common suture length/frontal length, (7) frontal breadth/frontal length, (8) supraocular length/loreal length, (9) frontal–supraocular contact length/supraocular length, (10) frontal–supraocular contact length/prefrontal–supraocular contact length, (11) parietal length/tip of snout–posterior margin of parietal distance, (12) parietals common suture length/frontal length, (13) parietal length/parietal breadth, (14) postocular height/postocular length, (15) postnasal length/prenasal length, (16) (prenasal + postnasal) length/loreal length, (17) loreal length/loreal depth, (18) snout length/loreal length, (19) loreal length/eye horizontal diameter, (20) snout length/eye horizontal diameter, (21) eye vertical diameter/eye–lip distance, (22) fifth supralabial lip exposure/fourth supralabial lip exposure, (23) third supralabial lip exposure/second supralabial lip exposure, (24) mental breadth/mental length, (25) anterior chinshield length/anterior chinshield breadth, (26) anterior chinshield length/posterior chinshield length, (27) posterior chinshields common suture length/posterior chinshields length, and (28) tail length/total length. All scale dimensions were measured at their maximum. Measurements were taken with calipers to the nearest 0.1 mm. When the condition of a given character was not identical on both sides of the holotype, the conditions on the left and right sides are given, in this order, separated by a slash (/).

Because of the small available sample size, data were only analyzed qualitatively; no statistical tests for sexual, ontogenetic, or geographic differences were performed. Sex was determined by dissection and, in the case of the young male from the Sierra de Juárez, by examining the gonads previously prepared for histological study using conventional paraffin embedding techniques and stained with hematoxylin and eosin.

Systematic Account

Geophis ***juarezi*** sp. nov.

Holotype.—MZFC 2236, an adult female from the vicinity of Metates, municipality of Santiago Comaltepec, Sierra de Juárez, Oaxaca, Mexico; 17° 39′ 03″ N, 96° 21′ 26″ W; 900 m elevation; purchased in April 1986 from unrecorded local collectors.

Paratypes.—Three; two adult females (UTA-R 12320 and R-25817, obtained in July 1983 and 1986, respectively, from unrecorded

local collectors) and one juvenile male (MZFC 4523, purchased from local collector Pedro García in April 1986); all from the vicinity of Metates.

Diagnosis.—*Geophis juarezi* may be distinguished from all species in the *G. championi* and *G. semidoliatus* groups and most species in the *G. sieboldi* group (*G. brachycephalus*, *G. damiani*, *G. downsi*, *G. hoffmanni*, *G. laticollaris*, *G. nigroalbus*, *G. petersi*, *G. pyburni*, *G. russatus*, *G. sallaei*, and *G. talamancae*) by dorsals arranged in 17 rows (dorsals in 15 rows in the other species) and from the remaining species in the *G. sieboldi* group as follows: from *G. dunni*, by having an uniform dark grayish brown dorsum (dark brown crossbands on a yellowish dorsum in *G. dunni*); from *G. nasalis*, by having comparatively numerous subcaudals (49 and 55 in the only female with a complete tail and single known male, respectively, versus 23–33, $n = 141$ and 29–37, $n = 169$, in females and males, respectively, of *G. nasalis*), and from *G. sieboldi* by having comparatively few ventrals (118–124, $n = 3$, in females and 114 in single known male versus 147–153, $n = 2$ and 132–147, $n = 5$, in females and males, respectively, of *G. sieboldi*).

Geophis juarezi differs from the species in the *G. omiltemanus* group by having the fifth supralabial and parietal scales in contact (fifth supralabial and parietal scales separated by an anterior temporal in members of the latter group); from the species in the *G. chalybeus* and *G. latifrontalis* groups by having paired apical pits well developed at least on the posterior half of the body (apical pits absent in species of the latter groups); and from the species in the *G. chalybeus* and *G. latifrontalis* groups, and all the species in the *Geophis dubius* group except for *G. carinosus*, by having strongly keeled dorsal scales on at least the posterior half of the body and tail (dorsals smooth or only faintly keeled above the vent in the other species).

Geophis juarezi may be distinguished from *G. carinosus* by having the frontal and supraocular scales separated or in much narrower contact (ratios 9 and 10, Table 1), posterior chinshields usually separated or in narrow medial contact anteriorly (posterior chinshields in broader contact anteriorly in *G. carinosus*; ratio 27, Table 1), fewer ventrals (118–124, $n = 3$, in females and 114 in single known male versus 125–136, $n = 8$ and 116–123, $n = 6$, in females and males, respectively, of *G. carinosus*), and more subcaudals (49 and 55 in the only female with a complete tail and single known male, respectively, versus 37–43, $n = 8$ and 45–49, $n = 6$, in females and males, respectively, of *G. carinosus*).

Description of holotype.—Head scales are illustrated (Fig. 1). Head indistinct from neck (neck damaged on right side); snout bluntly pointed from above, projecting anteriorly well beyond lower jaw; rostral slightly wider than high, only slightly produced posteriorly between internasals, portion visible from above 0.44 times as long as its distance from frontal, about 1.5 times as long as internasals common suture, with posterior end at level of posterior margin of nostrils; internasals slightly wider than long (breadth/length ratio = 1.15), rounded anteriorly, contacting anterior and posterior nasals laterally, their length and common suture 0.65 and 0.40 times as long as prefrontal common suture, respectively; prefrontals contacting postnasal and loreal laterally, their length 0.68 times length of snout, their common suture 0.57 times frontal length; frontal about as broad as long (breadth/length ratio = 0.98), angulate anteriorly, in exceedingly narrow contact with supraocular (length of frontal-supraocular suture 0.20 times supraocular length, 0.22/0.18 times prefrontal-supraocular suture length); supraocular small, approximately triangular (contact with postocular narrow; that with frontal reduced to a point), slightly smaller than eye, 0.39/0.38 times as long as loreal, forming little more than posterior half of dorsal margin of orbit; parietals 1.5 times as long as broad, their length approximately one-half head length, their common suture 0.86 times as long as frontal; one postocular, 1.60/1.40 times as high as long, slightly smaller than supraocular; nasal divided; postnasal 1.20/1.27 times as long as prenasal; combined length of prenasal and postnasal approximately equal to length of loreal (prenasal + postnasal combined length/loreal length ratio = 0.94/1.03); loreal short, 2.05/1.86 times as long as deep, contained 1.97/2.19 times in snout length, 2.00/2.13 times as long as eye horizontal diameter, dorsal margin straight; eye small, contained 4.5 times in snout length, its vertical diameter 0.56 times its distance from lip; supralabials

TABLE 1.—Variation in ratios and lengths in specimens of *Geophis* from Mexico and Guatemala. See text for description of ratios; snout–vent length (SVL) and tail length (TL) in mm.

	Geophis juarezi Sierra de Juárez				*Geophis carinosus*										
					Los Tuxtlas				Guatemala					*Geophis* sp. Chalchijapa	*Geophis* sp. Puebla
Ratio	MZFC 2236 ♀♀	UTA-R 25817 ♀♀	UTA-R 12320 ♀♀	MZFC 4523 ♂♂	KU 57995 ♀♀	RCV 9565 ♂♂	MZFC 10552 ♀♀	Yajalón IHN 530 ♀♀	UMMZ 120003 ♀♀	UMMZ 89082 ♂♂	UMMZ 120004 ♂♂	UCM 44661 ♂♂	UCM 44611 ♀♀	MZFC 10631 ♀♀	KU 39642 ♂♂
1	0.44	0.58	0.56	0.47	0.53	0.37	0.64	0.43	0.39	0.40	0.38	—	—	0.43	0.74
2	1.15	1.07	1.20	1.20	1.16	1.00	1.14	1.13	1.00	1.15	1.15	—	—	1.00	1.12
3	0.65	0.66	0.77	0.71	0.68	0.72	0.78	0.65	0.67	0.65	0.70	—	—	0.82	1.13
4	0.40	0.33	0.46	0.50	0.35	0.41	0.44	0.44	0.50	0.45	0.48	—	—	0.59	0.67
5	0.68	0.68	0.66	0.61	0.61	0.70	0.64	0.61	0.62	0.67	0.66	—	—	0.67	0.60
6	0.57	0.57	0.42	0.43	0.54	0.57	0.43	0.60	0.58	0.53	0.55	—	—	0.50	0.34
7	0.98	1.02	1.06	1.09	1.12	0.98	0.96	1.21	1.13	0.95	1.14	—	—	1.05	0.88
8	0.39, 0.38	0.38, 0.42	0.40, 0.27	0.43, 0.42	0.44, 0.48	0.48, 0.50	0.48, 0.48	0.60, 0.60	0.48, 0.48	0.38, 0.38	0.68, 0.52	—, —	—, —	0.42, 0.42	0.55, 0.55
9	0.20, 0.20	—*, 0.35	0.09, —*	0.27, 0.33	0.66, 0.60	0.73, 0.80	0.81, 0.77	0.64, 0.64	0.71, 0.71	0.60, 0.66	0.66, 0.66	0.66†	0.66†	0.71, 0.71	0.59, 0.63
10	0.22, 0.18	—*, 0.44	0.14, —*	0.36, 0.50	1.20, 1.20	1.20, 1.20	—, —	0.57, 0.57	0.93, 0.93	1.10, 1.20	1.25, 1.31	1.25†	1.66†	1.18, 1.00	1.25, 1.25
11	0.50	0.50	0.54	0.53	0.50	0.46	0.48	0.51	0.49	0.50	0.47	—	—	0.48	0.49
12	0.86	0.88	0.70	0.86	1.00	0.75	0.97	1.11	0.96	0.90	0.77	—	—	0.73	0.87
13	1.50	1.65	1.77	1.82	1.86	1.58	1.50	2.13	1.60	1.88	1.47	—	—	1.66	1.82
14	1.60, 1.40	—, 1.33	1.60, 1.40	1.29, 1.25	1.44, 1.44	2.00, 2.00	1.55, 1.55	1.25, 1.11	1.38, 1.38	1.75, 1.80	1.44, 1.44	—, —	—, —	1.64, 1.70	1.00, 1.20
15	1.20, 1.27	1.13, 1.30	1.17, 1.17	1.25, 1.11	1.35, 1.44	1.30, 1.20	1.61, 1.44	1.30, 1.18	1.38, 1.36	1.28, 1.21	1.36, 1.25	—, —	—, —	1.42, 1.21	1.46, 1.38
16	0.94, 1.03	1.00, 1.03	0.92, 1.00	0.96, 1.08	1.12, 1.12	1.05, 1.14	1.02, 0.95	1.00, 1.09	1.17, 1.08	1.04, 1.12	1.10, 1.18	—, —	—, —	1.00, 1.00	1.28, 1.28
17	2.05, 1.86	2.00, 2.00	1.88, 1.94	1.81, 1.72	1.61, 1.61	1.58, 1.12	1.59, 1.58	2.00, 2.09	1.62, 1.52	1.61, 1.16	1.70, 1.54	—, —	—, —	2.00, 2.06	1.44, 1.28
18	1.97, 2.19	1.97, 2.30	2.25, 2.50	2.17, 2.26	2.48, 2.30	2.04, 2.18	2.11, 2.33	2.09, 2.39	2.40, 2.40	2.24, 2.35	2.45, 2.45	—, —	—, —	2.11, 2.11	2.60, 2.80
19	2.00, 2.13	1.95, 1.91	1.67, 1.79	1.76, 1.88	1.59, 1.65	1.83, 1.83	2.13, 1.94	1.57, 1.53	1.66, 1.66	1.90, 1.90	1.93, 1.93	—, —	—, —	1.73, 1.73	1.67, 1.50
20	4.50, 4.50	4.18, 4.27	4.22, 4.10	3.78, 4.00	3.65, 4.18	3.87, 4.37	4.44, 4.42	3.57, 3.53	3.87, 4.00	4.00, 4.37	4.27, 4.47	—, —	—, —	3.82, 3.66	4.33, 4.00
21	0.56, 0.56	0.71, 0.77	0.82, 0.75	0.73, 0.82	0.79, 0.78	0.86, 0.78	0.64, 0.68	0.80, 0.80	0.66, 0.79	0.86, 0.86	0.75, 0.71	—, —	—, —	0.80, 0.80	0.59, 0.69
22	0.94, 1.06	1.20, 1.13	1.17, 1.40	1.00, 1.08	1.55, 1.61	1.44, 1.39	1.39, 1.41	1.20, 1.20	1.21, 1.35	1.40, 1.36	1.15, 1.15	—, —	—, —	1.50, 1.50	1.50, 1.50
23	1.50, 1.50	1.70, 1.64	1.11, 1.11	1.58, 1.38	1.18, 1.11	—, 1.47	1.19, 1.07	1.33, 1.33	1.06, 1.19	1.18, 1.50	1.17, 1.17	—, —	—, —	1.11, 1.10	—, 1.33
24	2.17	1.86	1.66	1.90	1.47	2.27	1.46	2.22	1.92	2.00	1.93	—	—	2.10	1.47
25	1.39	1.66	1.53	1.39	1.47	1.67	1.46	1.58	1.66	1.40	1.52	—	—	1.66	2.30
26	1.28	1.66	1.38	1.32	1.26	1.29	1.26	1.17	1.20	1.22	1.37	—	—	1.20	1.53
27	—	—	—	0.11	0.22	0.24	0.27	0.33	0.28	0.39	0.26	0.23	0.17	0.20	0.48
28	NA	NA	0.22	0.25	0.18	0.23	0.19	0.19	0.19	0.23	0.24	0.24	0.19	0.23	0.16
SVL	219	228	166	111	140	174	254	173	221	182	210	—	—	187	153
TL	56	47‡	47‡	36	31	52	58	41	52	54	66	—	—	57	29

* Frontal and supraocular scales separated.
† Measurements taken on only one unspecified side.
‡ Tail incomplete.

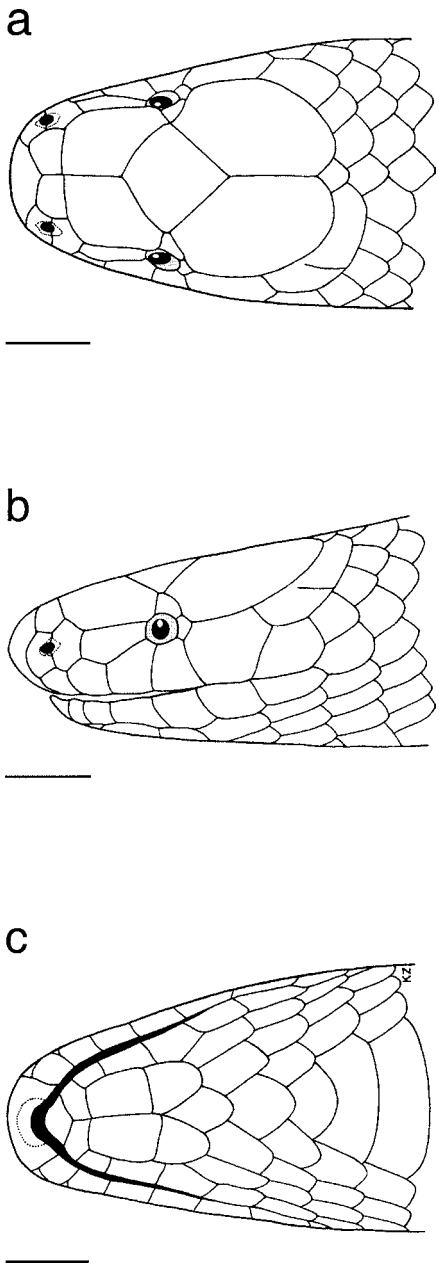

FIG. 1.—*Geophis juarezi*, holotype (MZFC 2236). Head scales in (a) dorsal view; (b) left lateral view, and (c) ventral view. Horizontal lines = 2 mm.

6/6, first and second contacting postnasal, second and third contacting loreal, third and fourth entering orbit, fifth largest, contacting parietal; lip exposure of third supralabial 1.5 times that of second supralabial; lip exposure of fifth supralabial 0.94/1.06 times that of fourth supralabial, 0.78/0.88 times that of sixth supralabial; anterior temporal absent; one posterior temporal, separating sixth supralabial from parietal; posterior temporal fused with four nuchals of left side, with one nuchal on right side; mental 2.17 times as broad as long, acuminate anteriorly, separated from chinshields by first infralabials; infralabials 6/6, first to third contacting anterior chinshield, third and fourth contacting posterior chinshield; anterior chinshield 1.39 times as long as broad, 1.28/1.36 times as long as posterior chinshields; posterior chinshields nearly in medial contact at their anterior ends, separated from each other by one gular scale; three central gular scales; small, poorly developed chin tubercles on mental, infralabials, chinshields, and gulars; numerous tubercles present on mental and first infralabials, gradually disappearing posteriorly.

Dorsals in 17-17-17 rows, smooth on neck and anterior one-third of body, gradually becoming strongly keeled on posterior end of body and tail; paired apical pits absent on neck (anterior 16 dorsal rows or anterior one-eighth of body), gradually becoming evident and widespread posteriorly, well developed on posterior half of body and tail; ventrals 121; anal scale single; few, poorly developed tubercles on dorsal scales above vent region between levels of antepenultimate ventral and second subcaudal; paired subcaudals 44 (tail incomplete).

Color (in preservative).—Dorsal surface of head dark grayish brown (Color 20), not noticeably darker than lateral surface; ventral surface cream (Color 54); dorsal margin of infralabials and medial margins of first chinshields with medium neutral gray (Color 84) pigment; dorsal surface of body and tail dark grayish brown (Color 20), gradually becoming pale ventrally on first two dorsal scale rows; scales in first row with slightly more pale spot in center; ventral background cream (Color 54); anterior half of each ventral raw umber (Color 23), such crossbands narrower, sometimes interrupted, on mid venter at posterior third of body; anterior two-thirds of each subcaudal burnt umber (Color 22) at anterior end of tail, such crossbands becoming gradually wider posteriorly, covering nearly entire surface of each subcaudal at posterior end of tail.

TABLE 2.—Variation in selected meristic characters in specimens of *Geophis* from Mexico and Guatemala.

	Geophis juarezi Sierra de Juárez				*Geophis carinosus* Los Tuxtlas				Guatemala					*Geophis* sp. Chalchijapa	*Geophis* sp. Puebla
Characters	MZFC 2236 ♀♀	UTA-R 25817 ♀♀	UTA-R 12320 ♀♀	MZFC 4523 ♂♂	KU 57995 ♀♀	RCV 9565 ♂♂	MZFC 10552 ♀♀	Yajalón IHN 530 ♀♀	UMMZ 120003 ♀♀	UMMZ 89082 ♂♂	UMMZ 120004 ♂♂	UCM 44661 ♂♂	UCM 44611 ♀♀	MZFC 10631 ♀♀	KU 39642 ♂♂
Supralabials	6/6	6/6	6/6	6/6	6/6	5/6	6/6	6/6	6/6	6/6	6/6	—	—	6/6	5/6
Infralabials	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/7	—	—	6/6	6/6
Gulars	3	3	3	3	3	3	3	3	3	2	3	—	—	2	1*
Ventrals	121	124	118	114	126	122	125	130	132	120	123	120	132	119	132
Subcaudals	44†	34†	49	55	42	48	41	43	42	45	47	49	42	47	35

* A widened scale present immediately posterior to the first gular was taken as the first ventral; however, this scale was split vertically asymmetrically near its right border, as though there were a gular and a ventral scales placed side by side.

† Tail incomplete.

Measurements (in mm).—Snout–vent length (SVL) 219; tail length (incomplete) 56; head length 7.3.

Variation.—Described below are character conditions found in the paratypes that differ from those observed in the holotype. Variation in morphometric and meristic characters is summarized in Tables 1 and 2, respectively.

Portion of rostral visible from above 1.6 times as long as internasals common suture in MZFC 4523, its posterior end at level of mid-nostrils in all paratypes. Supraocular slightly less than one-half as large as eye on both sides in MZFC 4523 and left side in UTA-R 12320 and UTA-R 25817 (forming about posterior half of orbit in the latter); supraocular on right side in UTA-R 12320 exceedingly small, elongate (about 3× as long as wide), separated from frontal and postocular, less than one-fourth as large as eye, forming slightly less than posterior half of orbit; supraocular on right side in UTA-R 25817 roughly four-sided (about twice as long as wide), albeit posterior edge curved (postocular absent), separated from frontal, about one-half as large as eye. Postocular absent on left side, about half as large as supraocular on right side, in UTA-R 25817; postocular about as large as supraocular on both sides in MZFC 4523; about 3× as large as supraocular on right side in UTA-R 12320. Dorsal margin of loreal slightly concave on both sides in UTA-R 25817. Posterior temporal fused with two nuchals on left side in UTA-R 25817; one nuchal on opposite side in this and remaining specimens. Mental rounded anteriorly in MZFC 4523. Only fourth infralabial contacting second chinshield on left side in MZFC 4523. Posterior chinshields broadly separated anteriorly in UTA-R 12320; in narrow contact (Table 1) in MZFC 4523. Chin tubercles rather sparse in UTA-R 12320.

Apical pits absent on about anteriormost median five dorsal scale rows in UTA-R 25817 and MZFC 4523, on about anteriormost 11 median dorsal scale rows in UTA-R 12320; pits marked with dark gray spots on indigo (Color 73) background in MZFC 4523. Tubercles on dorsal scales above vent region only between levels of penultimate ventral and first subcaudal in UTA-R 12320; absent in MZFC 4523.

Color in preservative.—Dorsal color in preservative uniform; indigo (Color 73) in juvenile male (MZFC 4523); sepia (Color 119) in two females.

Dentition.—In this study, only the maxilla and the associated anterior end of the ectopterygoid were considered for examination. However, upon examining the holotype, I found that the maxilla on the left side had been removed; unfortunately, this maxilla could not be located. This loss, and the difficulties encountered in the removal of a maxilla in one of the paratypes without undue damage to the bone, precluded any attempt at removal of the remaining maxilla in the holotype. Thus, some characters of the dentition in this specimen could not be examined. The description below is based on the dentition on the right side in the holotype and one of the paratypes (UTA-R 12320), and the number of maxillary teeth in another paratype (UTA-R 25817). Maxilla extending anteriorly to nearly level of mid-length of second supralabial (anterior extension about equal to that of palatines), narrowest anteriorly,

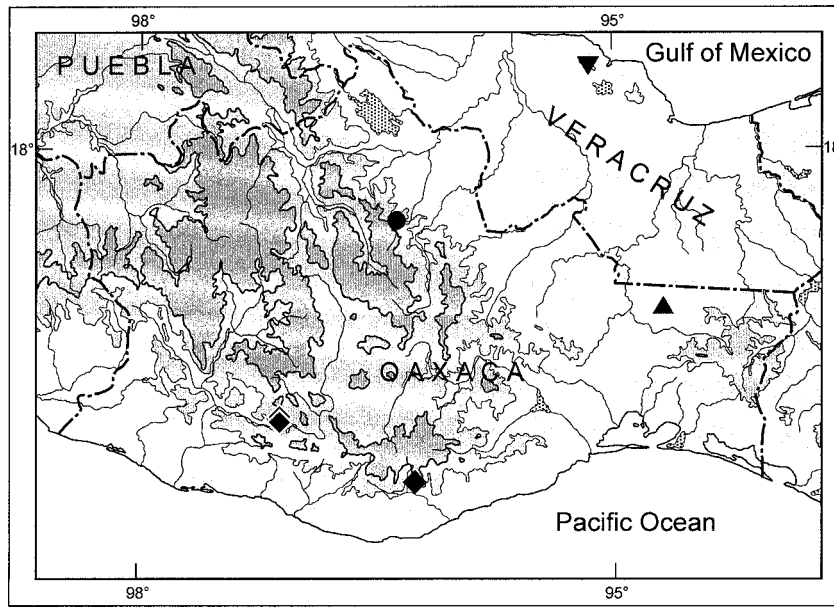

FIG. 2.—Generalized map of Oaxaca, Mexico, and adjacent regions. Discontinuous lines represent state limits. Paler, uniformly shaded areas represent elevations between 1000 and 2000 m; darker uniformly shaded areas represent elevations ≥2000 m. Stippled areas represent bodies of water. The circle represents the type locality of *Geophis juarezi*. Inverted triangles and diamonds represent locality records of *G. carinosus* and *G. rostralis* (fide Bogert and Porter, 1966; Campbell et al., 1983), respectively. The triangle represents the record of *Geophis* sp. from Chalchijapa, Oaxaca.

straight in lateral view, posterior end (not examined in holotype) laterally compressed into moderate flange; maxillary teeth 11–13 (11 and 12 teeth in place in holotype and UTA-R 12320, respectively; two gaps presumably corresponding to empty sockets in each; 13 teeth in UTA-R 25817), recurved, subequal in length; first tooth at anterior tip of maxilla. Anterior end of ectopterygoid (not examined in holotype) bifurcate; one branch very short, blunt; other long, compressed, blade like.

Remarks.—The single male differed from the females in several features. In addition to the expected differences in ventral and subcaudal scale counts, the posterior chinshields were in short contact anteriorly in the male, whereas they were separated in females. Also, the dorsum was much paler in the male than in females, and the dark anterior margin of each ventral and subcaudal scale was more faintly pigmented in the male than in females. In contrast, apical pits were encircled by dark spots contrasting with the more pale background color in the male, whereas they did not differ from the dark background color in females. It is unknown whether these differences reflect ontogenetic, sexual, or individual variation.

Distribution and ecology.—*Geophis juarezi* is known only from the vicinity of the type locality (Fig. 2). The village of Metates is located about 17.7 km south of Valle Nacional (approximately at Km 65 on the Tuxtepec–Oaxaca Road), at about 900 m elevation on the northeastern slopes of the Sierra de Juárez in north-central Oaxaca. Vegetation ranging throughout most of the Atlantic lowlands of Oaxaca, and in pure form up to about 800 m in the adjacent mountains, is Tropical Evergreen Forest; between about 800 m and about 1250 m is an ecotone with Cloud Forest (Binford, 1989). Complete descriptions of Tropical Evergreen Forest and Cloud Forest in Oaxaca, including photographs, lists of the most important plants, and climatic conditions where the plants occur, were presented by Binford (1989). Tropical Evergreen Forest has been heavily affected by logging and the slash-and-burn method of agriculture, and it is unlikely that any virgin forest remains (Binford, 1989). Most of the forest today is, in reality, only second growth. At Metates, much

of the forest has been replaced by coffee fincas.

Etymology.—The specific name is a patronym for Don Benito Juárez (1806–1872), the Zapotec Indian President of Mexico born in San Pablo Guelatao in the Sierra de Juárez, Oaxaca.

Variation Among Other Specimens Examined

Variation between specimens from northern Puebla, southeastern Mexico, and Guatemala.—The juvenile male from northern Puebla (KU 39642) differed from the specimens from Los Tuxtlas, Chalchijapa, Yajalón, and Guatemala (condition in these latter samples in parentheses) in having the mental in broad contact with the anterior chinshields (mental and first chinshields separated by the first infralabials), only one gular (2–3), no chin tubercles (from few, inconspicuous, to fairly numerous, evident tiny tubercles on the mental, most infralabials, chinshields, and gulars in males), 132 ventrals (120–123 in males), 35 subcaudals (45–48 in males), dorsal scales smooth on approximately the anterior two-thirds of the body and only weakly keeled on the posterior one-third and the tail (smooth at most on the anterior one-third of the body, becoming gradually strongly keeled posteriorly), and apical pits only slightly visible on scattered scales near the vent level (apical pits present, common and/or well developed, at least on the posterior three-fourths of the body in males).

The specimen from northern Puebla also differed, slightly to markedly, from the populations in southeastern Mexico and Guatemala in numerous ratios (numbers 1, 3–7, 16, 18, 25, and 27–28; Table 1). Finally, the male from northern Puebla differed from the populations from southeastern Mexico and Guatemala (condition in parentheses) in having the scales in all the dorsal rows uniform brown in preservative (first two dorsal rows slightly paler than remaining rows); dark pigment uniformly distributed on the chin (dark pigment mainly distributed along the scale margins), and ventral and subcaudal scales immaculate (anterior border of each ventral and subcaudal scale darker than other areas of these scales).

Variation among samples from southeastern Mexico and Guatemala (excluding the Isthmus of Tehuantepec).—Some variation was found among the samples from Los Tuxtlas, Yajalón, and Guatemala. Variation in morphometric characters is summarized in Table 1. The only specimen from Yajalón differed by having four ratios larger (numbers 7, 12, 13, and 17) than in all of the remaining specimens, while four other ratios (numbers 10, 19, 20, and 26) were slightly to markedly smaller. Variation in meristic characters is summarized in Table 2. The number of ventrals increased gradually from west to east in females from Los Tuxtlas (125–126), Yajalón (130), and Guatemala (132), whereas the same number in males and the number of subcaudals in both sexes showed no geographic variation.

Regarding the qualitative characters, in the specimen from Yajalón the anterior margin of the frontal was rounded and the snout was pointed in dorsal view (sensu Downs, 1967), whereas the anterior margin of the frontal was slightly angulate or angulate and the snout only bluntly pointed in the remaining specimens. In the only female from Guatemala, apical pits were absent on the anterior two-thirds of the body and only moderately developed on some scales on the posterior third, whereas they were absent only on the anterior one-third of the body at best, and moderately to well developed posteriorly, in the remaining females. The female from Los Tuxtlas had poorly developed tubercles on the chin and dorsal scales above the vent, whereas tubercles were absent in females from Yajalón and Guatemala.

Variation between the specimen from the Isthmus of Tehuantepec and other specimens from southeastern Mexico and Guatemala.—In the only specimen from Chalchijapa, two ratios (numbers 3 and 4, Table 1) were moderately larger than in the specimens from Los Tuxtlas, Yajalón, and Guatemala. Also, this female had fewer ventrals and more subcaudals (119 versus 125–132 and 47 versus 41–43, respectively) than females from the other populations. Furthermore, apical pits in the female from Chalchijapa were conspicuous, darker than the background color, whereas they were indistinguishable from the background color in the other specimens (males and females).

Discussion

Distinctness of Geophis juarezi

Separation of *G. juarezi* from *G. carinosus* is most consistently supported by the presence of fewer ventrals and more subcaudals in *G. juarezi* than in *G. carinosus* (see above). However, my measurements also suggest morphometric differences between these two species. In *G. juarezi*, the frontal and supraocular scales were separated (in 25% of the cases) or in narrower contact than in *G. carinosus*. Although corresponding ratios 9 and 10 (Table 1) of these taxa did not overlap, ratio 10 was only slightly higher in at least one specimen of *G. carinosus* (from Yajalón) than in those of *G. juarezi* (0.57 versus 0–0.50). Similarly, the posterior chinshields were always in medial contact anteriorly in *G. carinosus*, whereas they were separated in all females ($n = 3$) of *G. juarezi*. However, the posterior chinshields were in medial contact anteriorly in the only male of *G. juarezi*, although the contact was narrower than in specimens of *G. carinosus* (0.11 versus 0.17–0.39; ratio 27, Table 1).

In addition, the only known male of *G. juarezi* differed from males of *G. carinosus* in having apical pits darker than the background color and no tubercles on the dorsal scales above the vent (apical pits undistinguishable from the background color and tubercles on the dorsal scales above the vent present in males of *G. carinosus*). Females of *G. juarezi* differed from those of *G. carinosus* in having dorsals keeled to some extent only on the posterior two-thirds of the body (dorsals keeled to some extent at least on the posterior three-fourths of the body in females of *G. carinosus*). However, because of the small number of samples available at this time, it is not possible to assess whether these differences represent intraspecific (individual or ontogenetic) or interspecific variation.

The above data support the notion that *G. juarezi* is similar to, yet distinct from, *G. carinosus*. This notion also is suggested by the fact that the Sierra de Juárez is a well known region of endemism. Many species of amphibians and reptiles endemic to this region have been described, including frogs and a recently described salamander (Brodie et al., 2002; Campbell and Duellman, 2000), and some others remain to be described (see below). These endemic amphibians and reptiles include several species of salamanders (*Cryptotriton adelos*, *Pseudoeurycea saltator*, *Thorius arboreus*, *T. aureus*, *T. boreas*, *T. insperatus*, *T. macdougalli*, *T. smithi*, a recently described species of *Lineatriton* [Brodie et al., 2002], and an undescribed species each of *Pseudoeurycea* and *Chiropterotriton* [Parra-Olea et al., 1999]), anurans (*Eleutherodactylus polymniae*, *Duellmanohyla ignicolor*, *Hyla calvicollina*, *H. celata*, *H. cyanomma*, *H. echinata*, *H. sabrina*, and *Ptychohyla acrochorda*), lizards (*Abronia mitchelli*, *Anolis polyrhachis*, and an undescribed species of *Xenosaurus* [Nieto-Montes de Oca et al., unpublished data]), and snakes (*Cryophis hallbergi*, *Geophis duellmani*, and *G. laticinctus albiventris*), although several of these species are known only from the highest elevations of the mountains. Additional species of amphibians and reptiles known only from the Sierra de Juárez and the Sierra Mixe include *Pseudoeurycea juarezi*, *Bufo spiculatus*, *Hyla cyclada*, *H. nephila*, and *Exiliboa placata*. The highlands of the Sierra de Juárez and Sierra Mixe are isolated from highlands to the east and northeast in southeastern Mexico by the lowlands of the Isthmus of Tehuantepec. Thus, *G. juarezi*, occurring at about 900 m on the Sierra de Juárez, is likely isolated from the populations of *G. carinosus* at 700–1500 m (Downs, 1967; Pérez-Higareda and Smith, 1988) on the Sierra de Los Tuxtlas, northern highlands of Chiapas, and Guatemala by the Isthmus of Tehuantepec.

Definition of the Geophis dubius *Group and Taxonomic Placement of* G. juarezi

The *G. dubius* group defined by Downs (1967) contained only five species (see above). However, the subsequent addition of *G. duellmani* (Smith and Holland, 1969), *G. anocularis* (Campbell et al., 1983), and *G. juarezi* to the group, and the documentation of additional variation in *G. dubius* (Campbell et al., 1983) and *G. carinosus* (Pérez-Higareda and Smith, 1988), render Downs' (1967) definition of the group obsolete. According to this definition, in the *G. dubius* group, the internasals and prefrontals are distinct; the supraoculars are small, triangular (absent in *G. rhodogaster*); there are 120–143 ventrals in males and 126–147 in females, and 34–49

subcaudals in males and 27–43 in females; and the tail length is equal to 16.0–23.9% of the total length in males and 13.6–19.5% of the same length in females. However, the internasals and prefrontals usually are fused in *G. dubius* (Campbell et al., 1983); both *G. anocularis* and *G. duellmani* lack supraoculars (Campbell et al., 1983; Smith and Holland, 1969); there are from 114 ventrals in the only male know of *G. juarezi* and 116 in males of *G. carinosus* (Pérez-Higareda and Smith, 1988) to 146 in males of *G. dubius* (Campbell et al., 1983), and from 118 ventrals in females of *G. juarezi* to 151 in females of *G. dubius* (Campbell et al., 1983); there are 55 subcaudals in the only male known of *G. juarezi* and as many as 44 subcaudals in females of *G. carinosus* (Pérez-Higareda and Smith, 1988) and 49 in the only female with a complete tail of *G. juarezi*; and the tail represents 25% and 22% of the total length in the only male known and the only female with a complete tail, respectively, of *G. juarezi*.

Similarly, according to the definitions of Downs (1967) for the *G. dubius* group, the anterior extension of the maxilla is greater than that of the palatine, the first tooth is at the anterior tip of the maxilla, and the anterior end of the ectopterygoid is bifurcate (one branch short; the second long). However, the anterior extension of the maxilla is even with the tip of the palatine, and the maxilla extends slightly forward of the anteriormost tooth in *G. duellmani* (Smith and Holland, 1969); and the anterior end of the ectopterygoid is single or weakly bifurcate in *G. anocularis* and weakly bifurcate in *G. duellmani* (Campbell et al., 1983, but see Smith and Holland, 1969).

Recognition of *G. rostralis* has been disputed (see above). Nonetheless, Downs (1967) encompassed in his definition of the *G. dubius* group, though assigned to *G. dubius*, the same two specimens from the Sierra Madre del Sur in Oaxaca that served as the basis for the recognition of *G. rostralis* by Bogert and Porter (1966). Although Campbell et al. (1983) assigned a third specimen from the same region to *G. rostralis*, this specimen was not reported to differ from the former two specimens. Thus, recognition of *G. rostralis* in the *Geophis dubius* group, if warranted, would not affect the definition of Downs (1967) for the group.

The characters in Downs' (1967) definition of the *G. dubius* group do not represent shared derived characters identified in the context of an explicit phylogenetic analysis. In similar, polythetic groups, each character in the definition of the group is usually present in most, but not all, of the members of the group, and each member usually possesses most, but not all, of the characters in that definition (Wiley, 1981). Assignment of *G. juarezi* to the *G. dubius* group requires only minor adjustments to its definition by Downs (1967), and thus it seems to be justified. However, because the monophyly of the group remains to be tested, assignment of members to the group should be regarded as provisional.

Relationships of Geophis juarezi

Campbell et al. (1983) recognized *G. anocularis* and *G. rostralis* as valid species in the *G. dubius* group (see above) and hypothesized that the Oaxacan species of the group (*G. anocularis*, *G. dubius*, *G. duellmani*, and *G. rostralis*) were each other's closest relatives on the basis of their morphological similarity and geographical proximity. *Geophis anocularis* and *G. duellmani* were viewed as sister taxa because of their "uniquely derived loss" of supraoculars and postoculars. *Geophis rostralis* was considered the sister taxon of *G. anocularis* and *G. duellmani* since these three species have the mental in broad contact with the chinshields (the mental is frequently separated from the chinshields by the first pair of infralabials in *G. dubius*). The four species were regarded as a monophyletic group defined by their reduced maxilla (shortened to the level of the suture between the second and third supralabials in these species, extending anteriorly to the level of the suture between the first and second supralabials in the other species of the group) and "low number of maxillary teeth" (9–12 in these species; 10, 12, and 14–17 in the remaining species of the group fide Downs, 1967). Thus, *G. dubius* appeared to be the sister taxon of the other three species, which was considered consistent with its higher number of ventrals.

Geophis juarezi has the mental in wide contact with the chinshields, is geographically closer to *G. anocularis* and *G. duellmani* than is *G. rostralis* (if distinctness of this taxon is assumed), and has a lower number of ventrals

than *G. dubius* and *G. rostralis* (data for the latter two taxa in Campbell et al., 1983; Pérez-Higareda and Smith, 1988). Thus, it could be hypothesized that *G. anocularis* and *G. duellmani* are more closely related to *G. juarezi* than they are to *G. dubius* or *G. rostralis*. However, in *G. juarezi*, the maxilla extends anteriorly to about the level of the middle of the second supralabial, and there are 11 or 12 maxillary teeth (plus two presumably empty maxillary sockets) in each of two specimens examined and 13 maxillary teeth in another one. Thus, the maxilla in this species appears to be intermediate in length between the reduced maxilla in the other Oaxacan members of the *G. dubius* group and the longer one found in the remaining species of the group. Similarly, the number of maxillary teeth in *G. juarezi* appears to exceed the "low number" purported as an advanced state for the Oaxacan members of the *G. dubius* group by Campbell et al. (1983), although such "low number" of maxillary teeth actually is not restricted to these members (see Downs, 1967). Therefore, it appears that, despite its geographic destribution in north-central Oaxaca, *G. juarezi* is not a member of the Oaxacan monophyletic group hypothesized by Campbell et al. (1983).

On the other hand, *G. juarezi* and *G. carinosus* are the only members of the *G. dubius* group with widely distributed, distinct keeling of the dorsal scales, and, overall, they are most similar to each other than any of them is to any other species in the group. If their overall similarity indicates a sister taxa relationship, their slight differentiation and geographic distribution (on the Atlantic slopes of southeastern Mexico separated by the lowlands of the Isthmus of Tehuantepec) suggest that they may be the descendants of an ancestral lineage distributed continuously across the Isthmus in relatively recent geological times. It has been documented that, during the last 40,000 yr, the current Tropical Rain Forest in the lowlands of the Gulf of Mexico must have been disrupted and eventually reduced and displaced to lower latitudes because of Pleistocene climatic changes and the consequent predominance of other plant communities (Toledo, 1982). Between 40,000 and 20,000 yr BP, most of these lowlands were characteristically occupied by temperate plant communities (Cloud and Oak Forests). The lowlands were subsequently dominated by Pine and Oak Forests when climate became cold and dry (between 20,000 and 12,000 yr BP), at least temporarily by Tropical Rain Forest when climate became less cold and wet (between 12,000 and 9000 yr BP) with about 1000 yr of warm and dry conditions, and by Tropical Deciduous and Tropical Semideciduous Forests when climate became warm and dry, between 9000 and 2000 yr BP (Toledo, 1982). This hypothesis appears to have some support from the discovery of the population from Chalchijapa (see below) in the lowlands of the Isthmus of Tehuantepec.

Taxonomic Status of the Population from Northern Puebla

Downs (1967:83) assigned the juvenile male from about 10 miles southwest of Villa Juárez in northern Puebla to *G. carinosus* on the basis that "the heavy keeling, prominent scale pits, straight dorsal margin of the loreal, and general head scutellation of KU 39642 all indicate a conspecific relationship." However, he noted that the specimen had fewer ventrals and more subcaudals than all other populations assigned to this taxon.

The statements by Downs (1967) that the specimen from Puebla had "heavily keeled dorsal scales" and "prominent apical pits" were mistaken. These and numerous other characters examined herein corroborate the previous evaluation by Pérez-Higareda and Smith (1988) that the specimen from northern Puebla is not conspecific with *G. carinosus*. Although Webb and Fugler (1957) assigned this specimen to *G. rostralis*, Pérez-Higareda and Smith (1988) argued that this taxon is actually a synonym of *G. dubius* and assigned the specimen to the latter taxon. Furthermore, the workers who maintained the distinctness of *G. rostralis* did not assign the specimen from northern Puebla to this taxon. Bogert and Porter (1966) recognized *G. rostralis* as distinct from *G. dubius* on the basis of only two males from the Sierra Madre del Sur in Oaxaca and regarded the status of the population in the Sierra Madre Oriental in northern Puebla (Bogert and Porter, 1966:4) as "uncertain until more specimens become available from areas between southern Oaxaca and Puebla." Campbell et al. (1983) followed Bogert and Porter (1966) and

assigned a third specimen from the Sierra Madre del Sur to *G. rostralis*, but they did not discuss the population in northern Puebla. Additional specimens from northern Puebla and the Sierra Madre del Sur are needed to clarify the status of these populations. For the time being, the specimen from northern Puebla is tentatively assigned to *G. dubius*.

Taxonomic Status of the Population from the Isthmus of Tehuantepec

The identity of the specimen from Chalchijapa is problematical. This specimen has all the characters that define the *G. dubius* group (see above), and it is most similar to *G. carinosus* and *G. juarezi*, the only taxa in the group with widely distributed, distinct keeling of the dorsal scales. Furthermore, its collecting locality, in the middle of the Isthmus of Tehuantepec in Oaxaca (Fig. 2), is approximately equidistant geographically from localities for *G. carinosus* in southern Veracruz (Los Tuxtlas) and *G. juarezi* in north-central Oaxaca. The specimen from Chalchijapa was more similar to those of *G. carinosus* in two out of the four characters that distinguish it from *G. juarezi* (namely, the presence of frontal and supraocular scales in comparatively broad contact and posterior chinshields in medial contact anteriorly). However, the specimen was more similar to specimens of *G. juarezi* than to those of *G. carinosus* in the remaining two characters (119 ventrals versus 118–124 in females in *G. juarezi*, 125–136 in *G. carinosus* [Pérez-Higareda and Smith, 1988; this work], and 47 subcaudals versus 49 in the only female with an unbroken tail in *G. juarezi*, 37–43 in *G. carinosus* [Pérez-Higareda and Smith, 1988; this work]).

Thus, assignment of the female from Chalchijapa to either *G. carinosus* or *G. juarezi* is not straightforward. Numbers of ventrals and subcaudals showed little individual and geographic variation among females of *G. carinosus* from southern Veracruz to Guatemala (see above); nonetheless, the female from Chalchijapa had at least six ventrals less and four subcaudals more than females of those populations. These differences seem to be significant enough not to assign the female from Chalchijapa to *G. carinosus*. On the other hand, assignment of this female to *G. juarezi* might seem less problematical. The morphological differences between the Chalchijapa and *G. juarezi* samples (absence or presence and extent of the frontal-supraocular contact and posterior chinshields medial contact) are relatively small; further, these characters showed a wide range of individual variation in *G. juarezi*. In addition, Tropical Evergreen Forest occurs, or occurred, throughout most of the Atlantic lowlands of Oaxaca and in pure form up to about 800 m in the adjacent mountains (Binford, 1989); thus, it seems unlikely that ecological conditions at the type locality of *G. juarezi* were markedly different from those at Chalchijapa. However, this assignment would result in disjunct, widely separated populations of *G. juarezi* in different biogeographic regions, which does not seem to be particularly plausible.

In either case, assignment of the specimen from Chalchijapa to either *G. carinosus* or *G. juarezi* assumes that two species are involved. Alternatively, the mixed characters in the Chalchijapa specimen may suggest that all of the variation found among all of the examined specimens from Oaxaca to Guatemala represents individual and geographic variation within a single lineage. However, because of the slight, yet apparent morphological differentiation (diagnosibility) and geographic isolation of the Sierra de Juárez population, I prefer to recognize it as an evolutionary lineage (Wiley, 1981) independent from *G. carinosus*. The female from Chachijapa differed from both those of *G. juarezi* and *G. carinosus* in having conspicuous, dark apical pits (see above) and was collected in Rain Forest at only 260 m, whereas specimens of both *G. juarezi* and *G. carinosus* were obtained in a presumably Tropical Evergreen–Cloud forest ecotone or pure Cloud Forest at elevations of 750 m or more (Downs, 1967; Pérez-Higareda and Smith, 1988; this work). Thus, although it seems possible that the population at Chalchijapa represents an allopatric population of *G. juarezi*, another possibility is that it represents another, yet undescribed species in the group. Additional specimens from this locality are needed to clarify its taxonomic status.

Resumen

Se describe una especie nueva del grupo *Geophis dubius* de la ladera norte de la Sierra

de Juárez en Oaxaca, México. La nueva especie es más similar a *G. carinosus*. Se reporta una población previamente desconocida del grupo *G. dubius* del Istmo de Tehuantepec en Oaxaca.

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Appendix I

Specimens Examined

Geophis carinosus.—MEXICO: *Veracruz*: Sierra de Los Tuxtlas, Volcán San Martín (KU 57995; MZFC 10552); Sierra de Los Tuxtlas, Estación de Biología Tropical "Los Tuxtlas" (RCV 9565 [IBH-LT uncatalogued]); *Chiapas*: San José La Ceiba, Yajalón (IHN [formerly MZTG] 530). GUATEMALA: *Alta Verapaz*: Baleu (UCM 44661, 44611); *El Quiché*: Finca San Francisco (UMMZ 89082); *Huehuetenango*: 1 km S Barillas (UMMZ 120003); 2 km E Barillas (UMMZ 120004).

Geophis juarezi.—MEXICO: *Oaxaca*: Sierra de Juárez, Metates, 17.7 km S Valle Nacional, 900 m elevation (MZFC 2236 [holotype], MZFC 4523, UTA-R 12320, 25817 [paratypes]).

Geophis sp.—MEXICO: *Puebla*: 10 mi SW Villa Juárez (KU 39642).

Geophis sp.—MEXICO: *Oaxaca*: Municipio de Santa María Chimalapa, 3 km W Chalchijapa, 260 m (MZFC 10631).

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