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COMUNICACIONES

Distribution and reproduction of the gray earth snake *Geophis brachycephalus* (Serpentes: Colubridae) in Costa Rica

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Resumen: En Costa Rica, el colúbrido excavador *Geophis brachycephalus* se distribuye principalmente en tierras altas del Sistema Montañoso Central. Se presentan las primeras observaciones en tamaño de nidada, incubación y medidas de neonatos de la especie. La actividad reproductiva no es estacional, lo que podría deberse a un fenómeno de asincronía reproductiva o a múltiples nidadas por año. El tamaño promedio de cada nidada es de 4.2 huevos que miden 24.88 ±2.25 X 9.94 ± 0.2 mm. Los neonatos poseen un collar nucal característico que se pierde ontogénicamente.

Key words: Colubridae, *Geophis brachycephalus*, reproduction, distribution.

The genus *Geophis* belongs to a group of 41 burrowing and semiburrowing snakes of great diversity that are distributed in the isthmic region of Central America (Restrepo & Wright 1987). Due to its digging habits and the high intra and interspecific variation in scalation the genus is considered taxonomically problematic.

Geophis brachycephalus is distributed from the Cordillera Volcánica Central in Costa Rica to the Chocó region in Colombia, occupying habitats between 250 and 2000 m(Downs 1967). In the Costa Rican highlands, it has been collected in the Central Plateau (Savage & Villa 1986), in Cordillera de Tilarán (Hayes *et al.* 1989) and in Cordillera de Talamanca (Fig. 1). Between 500 and 1000 m, it has been found also in some areas of the Caribbean slope (Taylor 1951). Locality records of Museo de Zoología, Universidad de Costa Rica (UCR), are listed in Appendix 1.

Specimens were collected in an altered area at Las Nubes de Coronado, in the Cordillera Volcánica Central, San José Province, at 1800 m. This region corresponds to a low tropical montane forest zone (Tosi 1969), although actually very little forest remains due to agricultural activity. There, *Geophis brachycephalus* is sympatric with the burrowing snakes *G. godmani*, *G. hoffmanii*, *Rhadinaea serperaster*, *Trimetopon pliolepis* and the coffee snake *Ninia maculata*.

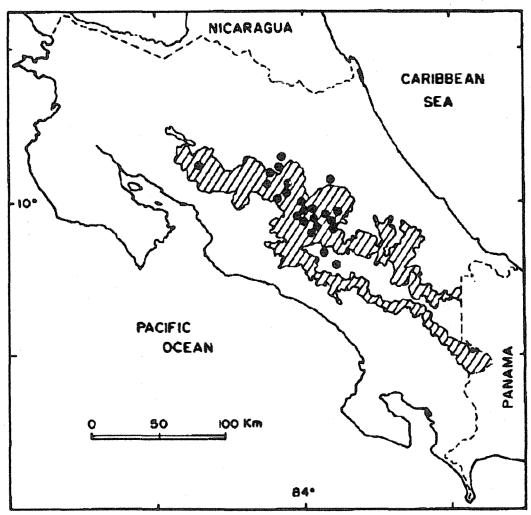

Fig. 1. Locality records for *Geophis brachycephalus* in Costa Rica (black dots). Highlands over 1000 m are shown.

Gravid females were found under tree trunks or buried in smooth soil, in six months (Table 1). Several tropical and sub-tropical snakes have seasonal reproductive cycles associated with foraging ecology and seasonal variation in resource availability (Seigel & Ford 1987, Vitt 1983, Solórzano & Cerdas 1989). However, other tropical species have aseasonal reproduction (Berry & Lim 1967) or extended cycles (Zug *et al.* 1979). The prolonged breeding season of *G. brachycephalus* suggest that reproductive activity is not seasonally restricted: it probably occurs year-around. This could be interpreted as asynchronous reproduction or as multiple clutches per year. Additional data are needed to further clarify this.

TABLE 1

Gravid females of Geophis brachycephalus collected at Las Nubes de Coronado, Costa Rica

Date of collection	Mass (g)	SVL * (mm)	TL ** (mm)
10/01/87	-	351	415
07/31/89	26.20	365	420
07/31/89	26.30	345	400
11/07/89	22.54	300	345
11/13/89	17.90	295	340
11/22/89	24.85	365	420
01/22/90	-	352	415
02/14/90	20.60	312	381
02/14/90	22.10	344	410
02/15/90	21.21	354	424
08/10/90	20.30	300	351
08/15/90	21.60	320	375

* Snout-vent length.
** Total length.

Six females were brought to the Instituto Clodomiro Picado (Universidad de Costa Rica). Each snake was maintained individually in a 38 x 27 x 15 cm fiberglass cage provided with live plants and logs. These females laid an average of 4.2 eggs (Table 2), which were deposited in cavities buried under smooth soil in the cage. All eggs were incubated in the laboratory, but none developed.

On 20 Jan. 1990, another female (415 mm total length) was captured and brought to the laboratory. Two days later, this snake laid four eggs that were placed in a 500 ml glass container with a thick cotton layer in the bottom (Solórzano& Cerdas 1988). Incubation temperature ranged between 25 ° and 28 °C and the relative humidity was maintained at 80%.

A male and two females hatched after 109 days of incubation. Snout-vent length ranged from 118 to 129 mm, total length ranged from 136 to 143 mm and mass ranged from 1.42 to 1.45 g. The remaining egg did not develop. There was no sexual dichromatism among the neonates. They were black, with characteristic reddish stripes along the body and a white nuchal collar behind the parietal scales. This collar is lost ontogenetically, being replaced by black pigment.

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TABLE 2

Reproductive data for Geophis brachycephalus from Las Nubes de Coronado Costa Rica

	Clutch size	Egg Mass (g) $\bar{X}$	(SD)	Egg Length (mm) $\bar{X}$	(SD)	Egg Diameter (mm) $\bar{X}$	(SD)
	3	1.57	(0.05)	23.12	(1.27)	10.13	(0.32)
	3	1.92	(0.03)	29.02	(0.77)	9.45	(0.10)
	4	1.62	(0.00)	25.19	(1.88)	10.02	(0.31)
	4	2.08	(0.05)	26.53	(1.38)	10.70	(0.33)
	5	1.45	(0.04)	22.75	(4.22)	9.82	(0.004)
	6	1.81	(0.04)	24.36	(3.16)	10.29	(0.26)
$\bar{X}$	4.2	1.67	(0.04)	24.88	(2.25)	9.94	(0.20)

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Appendix 1. Location and museum numbers for specimens examined

Geophis brachycephalus:

Vara Blanca (84°14', 10°16') UCR 638, 674-76, 900.

Volcán Poás (84°17', 10°10') UCR 3900.

Volcán Barba (84°08', 10°08') UCR 11138.

Monte de la Cruz (84°03', 10°05) UCR 1434.

Catarata de la Paz (84°00', 10°22') UCR 3330.

Tapantí (83°53', 9°44') UCR 779.

Cerro de la Muerte (83°45, 9°33') UCR 5731, 7111.

San Isidro del Tejar (83°55', 9°46') UCR 5482, 7148, 7191.

Ipis (84°04', 9°50') UCR 919.

San Isidro de Coronado (84°00', 9°58') UCR 3415-17, 7590.

Rancho Redondo (83°57', 9°58') UCR 6229-30.

Cascajal (83°58', 10°01') UCR 5357-58.

Las Nubes de Coronado (83°57', 10°00') UCR 11143.

Dulce Nombre de Tres Ríos (83°57', 9°56') UCR 9235.

Volcán Irazú (83°51', 9°57') UCR 11142.

Jicotea de Turrialba (83°30', 9°51') UCR 11141.

Cervantes (83°49', 9°54') UCR 11140.

Guápiles (83°47, 10°11') UCR 11139.

Monte Verde (84°48', 10°16') UCR 1054.