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A new plethodontid salamander (Bolitoglossa sooyorum) from Costa Rica

by

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During a period of study on the ecology and population biology of salamanders of the genus *Bolitoglossa* (= *Magnadigita*) a previously undescribed species of the genus was discovered. The new form is closely allied to *B. marmorea* (Tanner and Brame) of Panamá and shows affinity to *B. hypacra* (Brame and Wake), *B. cerroensis* (Taylor) and *B. nigrescens* (Taylor). It is a member of the species complex which includes these forms and *B. subpalmata* (Boulenger).

The new salamander is being named, as an expression of sincere appreciation for years of close friendship and encouragement, for Mrs. Jean L. Sooy and Mr. Kirk Van Sooy.

Bolitoglossa sooyorum sp. nov.

HOLOTYPE: USC-CR 2600; an adult male from the Cordillera Talamanca, Cerro de la Muerte (= Cerro Buena Vista) at 9,000 feet (2,745 meters), 12 miles (19.2 km.) southeast of El Empalme, Provincia de Cartago, Costa Rica. Collected by Jay M. Savage and James L. Vial, August 22, 1962.

PARATYPES: A total of fifteen examples of the new form are designated as paratypes. All of the USC-CR specimens were collected at the same locality as the holotype. USC-CR tr. 1392, 1393; collected by Lynda W. and James L. Vial. USC-CR 2598, 2599; collected by Jay M. Savage and James L. Vial. USC-CR 2612; collected by Lynda W. and James L. Vial. KU 066193-066202; collected by William E. Duellman at essentially the same locality given for the holotype.

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DIAGNOSIS: A species closely related to other members of the *Bolitoglossa subpalmata* group, but differing from the recognized forms as follows: *B. cerroensis* has a higher maxillary tooth count in adults; 19-43, ave. 32.6 (vs. 17-79, ave. 41.8 in *B. sooyorum*), a greater maximum snout-vent length (76.6 mm vs. 71.4 mm), is more robust than the new species, has shorter limbs (costal folds between appressed limbs ½-2 vs. 0-1), and is colored a deep olive brown with yellow green reticulum compared to the dark lavender brown with cream mottling in *B. sooyorum. B. hypacra* differs in being of lesser maximum snout-vent length (62.0 mm vs. 71.4 mm), having shorter limbs (2½ costal folds between appressed limbs vs. 0-1), is more robust than the new species and in color is a dark brown with large yellow spots on the lateral surfaces rather than lavender brown with cream flecking. Also, *B. hypacra* has a near absence of interdigital webbing, while this character is well developed in *B. sooyorum. B. nigrescens* possesses fewer maxillary teeth (16 vs. 17-79, ave. 41.8), has shorter limbs (2½ costal folds between appressed limbs vs. 0-1), is smaller in maximum size (46.0 mm vs. 71.4 mm), is more robust and is a nearly uniform slate black in color. *B. subpalmata* is proportionately more robust, the limbs are shorter (costal folds between appressed limbs 1½-3 vs. 0-1) and although highly variable in color phases does not exhibit that described for *B. sooyorum. B. marmorea,* obviously the species most closely related to the new salamander, is similar in meristic characters, but differs from *B. sooyorum* principally in color and stoutness. *B. marmorea* is a dark slate marbled with rusty buff or yellow but is not known to be lavender brown with distinctly cream flecking. The webbing of the hind feet of *B. marmorea* averages 1.3 mm from the the tip of the median toe at its deepest emargination (vs. 2.1 mm in *B. sooyorum*) and the body and appendages are conspicuously stouter.

DESCRIPTION OF THE HOLOTYPE: An adult male, snout blunt and truncate, nostrils and labial protruberances conspicuous (Fig. 1A); canthus rostralis short and smoothly rounded. Snout-vent length 6.9 times the head width, 4.3 times the snout-gular fold length. Vomerine teeth 11-11; maxillary teeth 25-26; premaxillary teeth 4, protruding through the outer margin of the lip. Tail 1.02 times the snout-vent length, cylindrical in cross-section, slender, with a slight taper and but a shallow constriction at the base. Limbs long and slender, slightly overlapping when appressed to body. Snout-vent length 3.8 times that of the left forelimb, 3.6 times that of the left hind limb. Webbing of the hands and feet incomplete but well developed (Fig. 1B). Digits rounded at the extremes, distinctly flattened and extended beyond the webbing. Distal extremes of the digits with slightly developed subdigital pads. Fingers in order of decreasing length 3,2,4,1; the toes decreasing in length in the order of 3,4,2,5,1.

Measurements in millimeters: Head width 9.5, snout-gular fold 15.2, snout-posterior angle of vent 65.7, snout to insertion of the forelimb 19.0. Axilla-groin 33.6, tail length 68.6. Eyelid length 4.1, eyelid width 2.4, anterior rim of orbit to snout 4.2, interorbital distance 3.1. Forelimb length

17.2, hindlimb length 18.3. Distance between the internal nares 2.8, between the external nares 4.2. Head depth at the angle of jaw 4.1. A postorbital sulcus extends more or less horizontally for a distance of 3.0 mm and arches downward to intersect the gular region at a distance of 5.4 mm anterior to the gular fold.

Coloration: In life upper surfaces of the head, body and tail a dark, lavender brown with profuse, minute, yellow cream flecks interrupting the ground color; especially along lateral margins of trunk. Limbs and feet marked in the same manner. A suffusion of lavender brown appears as a light wash in the gular region, interrupted by a sparse mottling of cream. Abdomen heavily washed with lavender brown but broken by sparse flecks of cream; venter uniformly lavender brown. Guanophores minutely interrupt the dark pigment throughout.

VARIATION IN THE HYPODIGM: A total of sixteen specimens of the new species are available for study.

The body and head color variation is negligible among the specimens examined. Dorsally the tail coloring and patterns are a uniform dark ground color through conspicuously interrupted with light blotches. The amount of dark suffusion on the gular region may be almost complete through intermediate phases, to a broken patchwork of light blotches. Juvenile individuals are less obviously marked than adults.

The extremes of size in the hypodigm are from 23.7 to 71.4 mm (ave. 53.6) snout-vent length. Males ranged from 58.2 to 65.7 mm (ave. 63.4) and females from 34.7 to 71.4 mm (ave. 55.0). Apparently there is sexual dimorphism in the maximum size attained. The sex was not determined in the smallest specimen. Table 1 presents the pertinent measurements and tooth counts for *B. sooyorum.*

REMARKS: It appears that sexual maturity is not developed in individuals of less than 30 mm snout-vent length. Stained sections of the gonads of an adult male (USC-CR 1393) collected in September showed that the animal was actively producing sperm, recognizable in the two-lobed testes and the vas efferentia. USC-CR 2612 possessed testes of one and two lobes. An adult female (USC-CR 1392) contained numerous ripe follicles with a large suply of vitelline material. The chromosome number is n=13, as indicated by study of a chromosome squash preparation.

Bolitoglossa sooyorum has been collected only in a restricted habitat. A rock-dwelling species, it is found in talus accumulations that have a considerable amount of moist, clayey-loam matrix and that are usually covered by a matting of decumbent vegetation. The generally flattened appearance of the head and slenderness of the body, tail and limbs suggest morphological adaptations to a saxicolous existence. No experimental data are yet available but is seems probable that *B. sooyorum* is less tolerant of dessication than the other species found in sympatry, *B. cerroensis* and *B. subpalmata.* The latter two forms are known from a wide distribution range and variable microhabitat conditions. Most of the talus accumulations are part of the road building activities during the cons-

TABLE 1

Data on Bolitoglossa sooyorum

NUMBER		Snout-Vent Length	Axilla-Groin	Tail Length	Head Width	Snout-Gular Fold	Forelimb	Hindlimb	Vomerine Teeth	Maxillary Teeth	Premaxillary Teeth	Costal Folds between Apressed Limbs
USC-CR									L R			
1392	♀	71.4	37.8	69.4	9.8	15.5	17.5	19.4	17-15	59	2	0
1393	♂	65.0	33.6	71.1	8.7	14.6	17.8	18.9	14-15	56	5	0
2598	♂	65.3	32.3	46.4R	10.0	16.0	17.3	18.5	14-12	52	4	0
2599	♀	59.9	31.0	68.1	8.7	13.7	15.7	17.4	15-15	47	4	0
2600	♂	65.7	33.6	68.6	9.5	15.2	17.2	18.3	11-11	51	4	0
2612	♂	63.2	31.8	30.2R	8.4	15.0	15.6	18.0	12-14	50	5	0
KU												
066193	♂	64.0	31.8	64.8	9.2	14.9	17.1	18.8	12-12	46	5	0
066194	♀	70.0	36.8	72.3	9.7	15.2	17.6	17.3	17-16	79	5	1
066195	♀	65.9	33.7	73.9	9.4	15.2	18.1	18.8	17-15	63	5	0
066196	♀	58.5	36.6	74.1	9.1	14.5	17.0	18.1	16-11	60	5	1
066197	♂	62.4	32.9	67.9	9.0	14.1	15.9	17.8	14-11	48	5	½
066198	♂	58.2	29.1	—	8.9	13.7	17.8	15.8	9-10	43	3	0
066199	♀	42.3	22.7	39.2	6.6	10.3	10.6	11.0	9-9	17	—	1
066200	♀	34.7	17.7	27.9	5.7	8.6	8.7	8.9	6-7	7	—	1
066201	♀	*37.4*	*18.7*	*25.0*	*6.2*	*9.5*	*9.7*	*10.2*	*4-6*	*9*	—	½
066202	?	23.7	10.8	14.4	4.4	6.4	5.4	6.0	4-3	6	—	1

R = Regenerated.

truction of the Inter-American Highway. The region is predominanttly an oak forest community (*Quercus costaricensis* Liebm.) which, in disturbed areas, has been invaded by second growth vegetation exemplified by *Gunnera insignis* (Oerst.) A. DC., *Senecio firmipes* Greenman, *Wigandia caracasana* H.B.K. and *Cirsium subcoriaceum* (Less.) Petrak. According to HOLDRIDGE (1, 2) the type locality is included within the Tropical Montane Wet Forest vegetation formation.

TANNER and BRAME (3) described *B. marmorea* from material collected at Volcán Chiriquí of Panamá, a distance of 100 airlines miles (160 km) to the southeast of the type locality of *B. sooyorum* (Fig. 2). The close relationship of the two species is indicated by such typical meristic characters as size, limb length, number of maxillary teeth and webbing of the forefeet. In spite of these obvious similarities the diagnostic features previously stated compel

the author to recognize *B. sooyorum* as a morphologically distinct and genetically isolated population. Further evaluation of their relationship must await collection of salamanders from between the type localities of *B. marmorea* and *B. sooyorum.*

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My wife, Lynda W. Vial, participated in all of the field work and collected the original specimens we came to recognize as being new. Jay M. Savage of the Department of Biology, University of Southern California (USC-CR), offered encouragement and editorial advice as well as collaborating in the field work. David B. Wake and Arden H. Brame, Jr., who are two of the leading authorities on Central and South American salamanders, were generous in their suggestions as well as providing data they had gathered during the course of their investigations. Benjamin H. Banta permitted me the opportunity of studying the collections of the California Academy of Sciences. Specimens from the University of Kansas Museum of Natural History (KU) were loaned by William E. Duellman. Wilmer W. Tanner of Brigham Young University was helpful with his pertinent comments. Preparation of the orcein stain squash and determination of the chromosome number was accomplished by Donald H. Humphrey of Oregon State University.

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SUMMARY

A new species of plethodontid salamander, *Bolitoglossa sooyorum,* is described from the Tropical Montane Wet Forest of the Cerro de la Muerte of Costa Rica. It is distinguished from other species on the basis of its slender body form, markings and elongate limbs. It is closely related to *B. marmorea* of Panamá.

RESUMEN

Se describe una nueva especie de salamandra pletodóntida, *Bolitoglossa sooyorum,* del bosque tropical montano muy húmedo del Cerro de Buena Vista, Cordillera de Talamanca, Costa Rica. Se distingue de otras especies por su cuerpo delgado, miembros largos, y por el color pardo violáceo con manchas pequeñas de amarillo crema. Es pariente cercano de *B. marmorea* de Panamá.

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Fig. 1: *Bolitoglossa sooyorum* (From the holotype, USC-CR 2600, an adult male).
Line indicates scale of 1 mm.
A. Lateral view of head.
B. Dorsal view of left front foot.

A
B
1

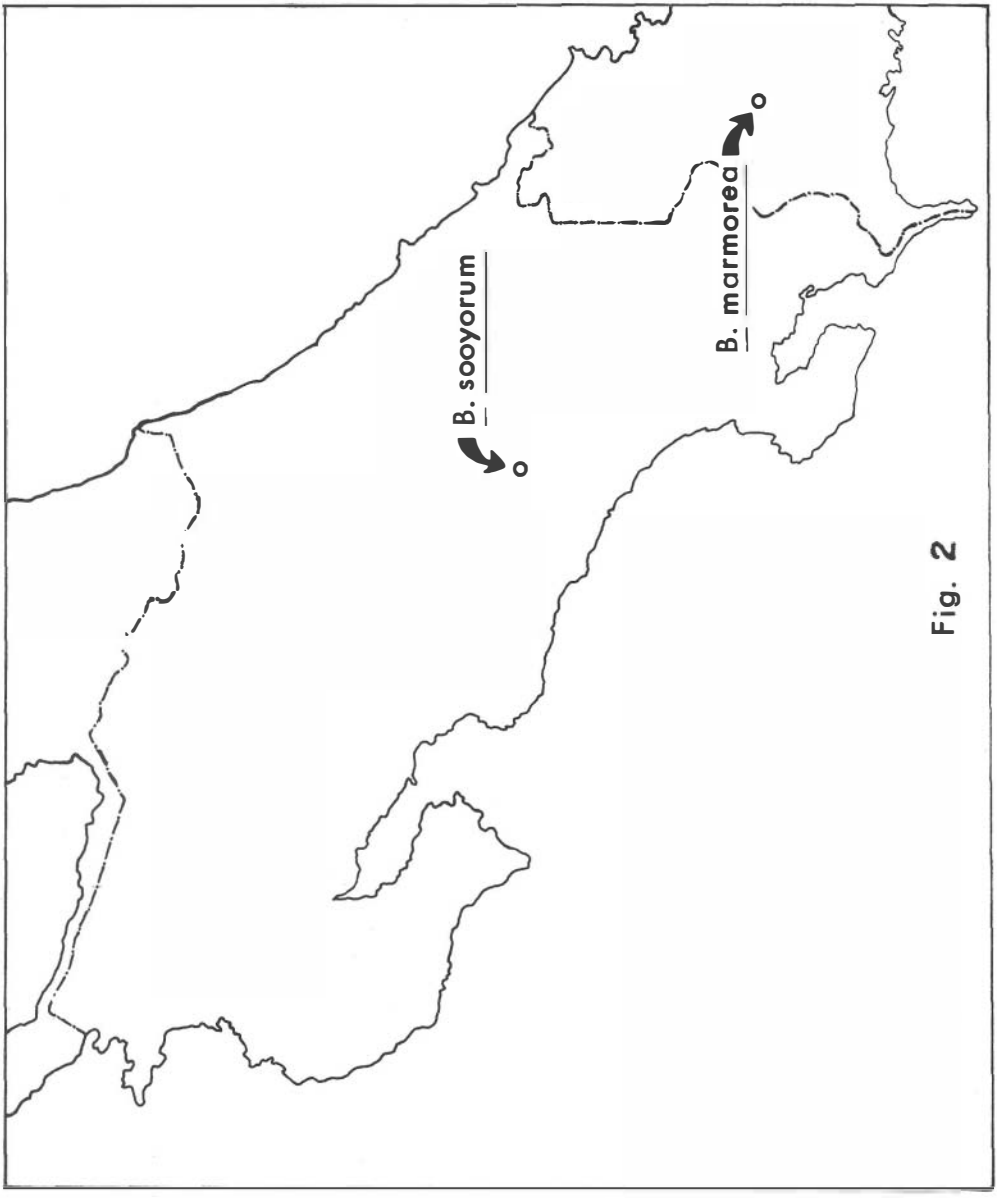

Fig. 2