

A NEW SPECIES OF SALAMANDER OF THE GENUS  
*NOTOTRITON* FROM NICARAGUA  
(AMPHIBIA: CAUDATA: PLETHODONTIDAE)

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**ABSTRACT:** I describe a new species of salamander of the genus *Nototriton* from Cerro Saslaya, eastern Nicaragua. It differs from all other species of the genus *Nototriton* by unique characteristics of coloration, morphometrics, and osteology.

*Key words:* *Nototriton saslaya* new species; Plethodontidae; Nicaragua

THE salamander fauna of Nicaragua appears to be remarkably depauperate, with only two species of the genus *Bolitoglossa* and three species of the genus *Oedipina* recorded from the country (Köhler, 1999). Although the genus *Nototriton* has not been reported from Nicaragua, it might be expected to occur there because it is known to the north and south (Campbell and Smith, 1998; García-París and Wake, 2000; Good and Wake, 1993; McCranie et al., 1998; Papenfuss and Wake, 1987; Wake and Campbell, 2000). In July 1999, seven salamanders belonging to the genus *Nototriton* were collected in the cloud forest of Cerro Saslaya in eastern Nicaragua. Examination of these specimens demonstrated that they represent an undescribed species. This new species of *Nototriton* is described below.

MATERIALS AND METHODS

All measurements were made to the nearest 0.1 mm with dial calipers under a dissecting microscope (Leica MZ 12), except for diameter of external nares, which was measured using the ocular micrometer of a dissecting microscope and rounded to the nearest 0.01 mm. Abbreviations used are SVL (snout to posterior end of vent), AG (axilla–groin length), TW (trunk width), HL (head length, snout to gular fold), HW (head width), TL (tail length), HLL (hind limb length), FLL (forelimb length), CLL (combined forelimb and hind limb lengths), HFW (hind foot width), and NL (diameter of external na-

res). The format for the description of the new species generally follows that of McCranie et al. (1998). The webbing formula proposed by Savage and Heyer (1967), modified by Savage and Heyer (1997), is used. Comparative data for Costa Rican, Guatemalan, and Honduran species of *Nototriton* were taken from Campbell and Smith (1998), Good and Wake (1993), Franzen (1999), McCranie and Wilson (1997), McCranie et al. (1998), and Wake and Campbell (2000). The capitalized colors and color codes (the latter in parentheses) are those of Smithe (1975–1981). Acronyms for museum collections follow those of Leviton et al. (1985).

SYSTEMATICS

*Nototriton saslaya* sp. nov.

*Holotype* (Figs. 1, 2).—SMF 79408, an adult female from S slope of Cerro Saslaya (13° 46.0' N, 85° 02.3' W), 1371 m elevation, Región Autónoma Atlántico Norte, Nicaragua, collected on 12 July 1999, by Gunther Köhler. Original number N-375.

*Paratypes*.—MVZ 230241, SMF 79407, 79409–12, from S slope of Cerro Saslaya (13° 46.0' N, 85° 02.3' W), 1280–1360 m elevation, Región Autónoma Atlántico Norte, Nicaragua, collected on 12 July 1999, by Gunther Köhler. All are adult females except MVZ 230241 (an adult male) and SMF 79412 (a juvenile).

*Diagnosis*.—A moderately large (maximum SVL = 34.6 mm) species of the genus *Nototriton* (García-París and Wake, 2000) that belongs to a series of species



FIG. 1.—Holotype of *Nototriton saslaya* (SMF 79408) in life, SVL 34.6 mm.

with small external nares (NL/SVL < 0.011), which includes *N. brodiei* from Guatemala, *N. barbouri*, *N. lignicola*, and *N. limnospectator* from Honduras, as well as *N. major*, *N. guanacaste*, and *N. abscondens* from Costa Rica (Campbell and Smith, 1998; Good and Wake, 1993;

McCranie et al., 1998). *Nototriton saslaya* differs from the remaining species with small external nares by its longer hind legs (HLL/SVL 0.22–0.24 versus 0.16–0.21). The new species is further differentiated from *N. barbouri*, *N. stuarti*, *N. lignicola*, and *N. guanacaste* by having even smaller

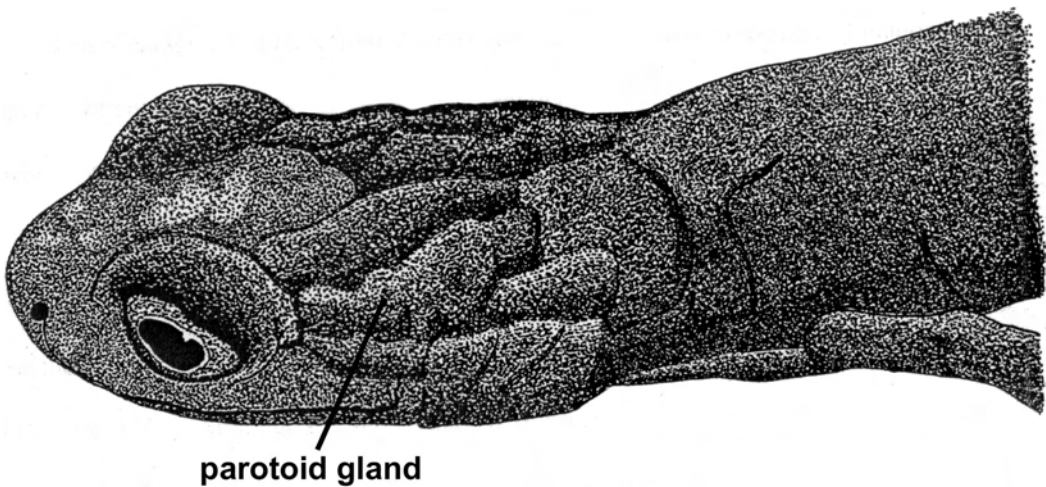


FIG. 2.—Lateral aspect of head of *Nototriton saslaya* (SMF 79408), HL = 7.1 mm.

TABLE 1.—Measurements (in mm) of the type series of *Nototriton saslaya*. See Materials and Methods for identification of abbreviations.

Specimen	SVL	AG	TW	HL	HW	TL	HLL	FLL	CLL	HFV	NL
MVZ 230241	28.1	14.8	3.7	5.8	4.2	—	6.1	5.6	11.7	2.1	0.06
SMF 79407	32.5	17.5	5.1	6.7	4.6	28.7	7.2	6.3	13.5	2.5	0.10
SMF 79408	34.6	18.5	4.0	7.1	4.6	42.9	7.9	6.8	14.7	2.6	0.07
SMF 79409	32.8	18.2	4.2	7.7	5.1	37.2	8.0	6.8	14.8	2.9	0.09
SMF 79410	28.7	16.0	4.7	6.3	4.1	32.1	6.7	5.7	12.4	2.6	0.07
SMF 79411	28.6	15.2	3.9	6.1	4.3	35.9	6.6	6.0	12.6	2.2	0.09

external nares (NL/SVL 0.002–0.003 versus 0.004–0.011) and by having the frontal processes of the premaxilla bone arising fused before splitting (versus frontal processes unfused). It differs from *N. brodiei* by having a larger head (HL/SVL 0.21–0.24 versus 0.18–0.19 in *N. brodiei*), by having a shorter tail (TL/SVL 0.88–1.26 versus 1.42–1.44), and from *N. brodiei* and *N. stuarti* by having broader hind feet (HFV/SVL 0.08–0.09 versus 0.04–0.06). It is distinguished from *N. limnospectator* by lacking a narrow cream-colored or silver stripe separating the dorsal and ventrolateral patterns (present in most individuals of *N. limnospectator*), by having a longer head (HL/SVL 0.21–0.24 versus 0.16–0.19), a broader head (HW/SVL 0.13–0.16 versus 0.10–0.12), prominent parotoid glands (versus parotoid glands indistinct or absent), and broader hind feet (HFV/SVL 0.08–0.09 versus 0.05–0.06). *Nototriton saslaya* is further differentiated from *N. major* by having a shorter axilla-groin length (AG/SVL 0.53–0.56 versus 0.58 in single known specimen of *N. major*), a more robust body (TW/SVL 0.12–0.16 versus 0.10), a shorter tail (TL/SVL 0.88–1.26 versus 1.44), and a broader head (HW/SVL 0.13–0.16 versus 0.11). It also differs from *N. abscondens* by having a more robust body (TW/SVL 0.12–0.16 versus 0.08–0.10) and by having broader feet (HFV 0.08–0.09 versus 0.06–0.07). *Nototriton saslaya* differs from *N. gamezi*, *N. picadoi*, *N. stuarti*, and *N. tapanti* by its smaller external nares (NL/SVL 0.002–0.003 versus 0.0010–0.016 in the latter three species). It can further be distinguished from *N. gamezi* by its more robust body (TW/SVL 0.12–0.16 versus 0.08–0.10 in *N. gamezi*) and by having broader feet

(HFV 0.08–0.09 versus 0.06–0.07). It differs from *N. picadoi* by the presence of the prefrontal bone (versus absent in *N. picadoi*) and by having longer hind legs (HLL/SVL 0.22–0.24 versus 0.18–0.19).

*Description.*—The six adult specimens (one male, five females) have the following measurements and proportions (means in parentheses): SVL 28.1–34.6 (30.9); AG/SVL 0.527–0.557 (0.541); TW/SVL 0.113–0.164 (0.139); HL/SVL 0.205–0.235 (0.214); HW/SVL 0.133–0.155 (0.145); TL/SVL 0.883–1.255 (1.126); HLL/SVL 0.217–0.244 (0.229); FLL/SVL 0.194–0.210 (0.201); CLL/SVL 0.415–0.451 (0.430); HFV/SVL 0.075–0.091 (0.080); NL/SVL 0.002–0.003 (0.003). See Table 1 for the actual measurements.

Head relatively large, well demarcated from trunk; snout broadly rounded in dorsal aspect and in profile; eyes moderately sized, moderately protuberant, narrowly visible beyond margin of jaw when viewed from below; parotoid glands well developed, prominent (Fig. 2); single adult male with pigmented, rather flat and inconspicuous mental gland; sublingual fold present; maxillary teeth 17–22 (19.6), extending to level beyond center of orbit; vomerine teeth 3–11 (9.4), arranged in arched series extending to outer edge of choanae; premaxillary teeth 6–8 (7.0); costal grooves 13; tail slightly constricted at base, tapering to a pointed tip; limbs slender, relatively long, limb interval 3–4.5 costal folds; hands and feet with well differentiated digits; webbing formula of fingers I 0–2 II 1½–1+ III 1½–1+ IV; webbing formula of toes I 0–2 II 1+–2+ III 2½–1 IV 1+–1 V; tips of digits bluntly rounded, with subdigital pads; relative length of dig-

its on forelimbs I < IV < II < III, those on hind limbs I < V < II < IV < III.

*Coloration in life.*—(SMF 79408; holotype; adult female.) Dorsal surface of head Prout's Brown (121A) with Buff (124) fine mottling; dorsal surface of body Brussels Brown (121B) with irregular Sepia (119) chevrons and Olive-Yellow (52) fine mottling; upper surface of hind and forelimbs Rubin Rufous (340) with both Olive-Yellow (52) and Sepia (119) fine mottling; dorsal surface of tail Antique Brown (37) with Sepia (119) fine mottling; ventral surfaces of head, body and tail Walnut Brown (221B) with Raw Umber (223) fine mottling; iris Clay Color (123C); (SMF 79407; adult female) dorsal surfaces of head and body Raw Umber (223) with Clay Color (123B) spots and a pair of Clay Color (123B) blotches in neck region; dorsal surface of tail Sepia (119) with Buff (124) fine mottling; upper surface of hind and forefeet Sepia (219) with Buff (124) fine mottling; ventral surfaces of head and body Warm Sepia (221A); ventral surface of tail Sepia (219) with fine Clay Color (123B) streaks; iris Orange-Rufous (132C); (SMF 79410; adult female) dorsal surface of head Walnut Brown (221B) with Clay Color (123B) fine mottling; dorsal surface of body Clay Color (123B) with a fine vertebral Yellow-Ocher (123C) stripe and diffuse Yellow-Ocher (123C) and Verona Brown (223B) speckles and blotches; dorsal surface of tail Clay Color (123B); upper surface of hind and forefeet Clay Color (123B), except for tips of digits which are Spinel Red (108B); ventral surfaces of head and body Yellow-Ocher (123C) with irregular Cinnamon (123A) markings; ventral surface of tail Hair Brown (119A); iris Orange-Rufous (132C); (SMF 79411; adult female) dorsal surface of tail Brick Red (132A); (SMF 79409; adult female) dorsal surface of body Warm Sepia (211A) with Walnut Brown (221B) chevrons.

*Color in preservative.*—(SMF 79408) Dorsal surface of head dark brown with pale brown fine mottling; dorsal surface of body brown with irregular dark gray brown chevrons; dorsal surface of tail brown with dark gray brown fine mottling; ventral surfaces of head, body and tail

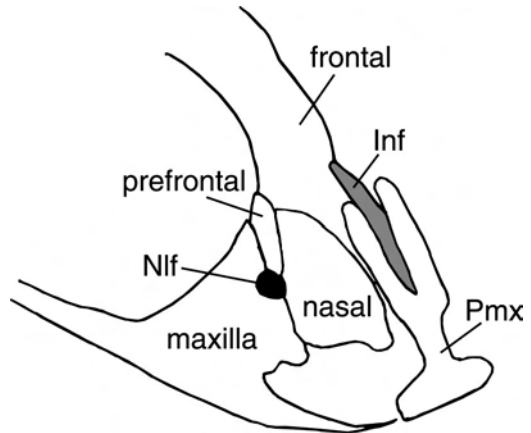


FIG. 3.—View of the anterior cranial elements (right side) of *Nototriton saslaya* (SMF 79407); cartilage not shown. Abbreviations: Inf = internasal fontanelle (space between skeletal elements); Nlf = nasolacrimal foramen; Pmx = premaxilla. Scale bar = 1 mm.

brown with dirty white to pale brown fine mottling; lateral band dark brown with dirty white fine mottling.

*Osteology.*—The following description is based on a cleared-and-stained adult female (SMF 79407; Fig. 3): basal third of frontal processes of premaxilla fused at base, but separate distally; prefrontal and nasal present, both contacting frontal; nasal subtriangular, not reduced, much larger than prefrontal; foramen of nasolacrimal duct incised into maxillary and associated with maxillary, prefrontal and nasal; intervomerine fontanelle narrow; septomaxilla and columella absent; frontoparietal fontanelle absent; 14 trunk vertebrae; two caudosacral vertebrae; phalangeal formula of forelimbs 2-3-3-3, hind limbs 2-3-4-3-3; penultimate phalanges not reduced, all as long or longer than terminal phalanges; terminal phalanges slightly expanded distally.

*Etymology.*—The name *saslaya* is used in reference to the type locality and mountain where the type series of the species was collected and where it is probably restricted (Fig. 4).

*Natural history notes.*—*Nototriton saslaya* is known from 1280–1371 m elevation in the Lower Montane Wet Forest formation (Holdridge, 1967). The type series

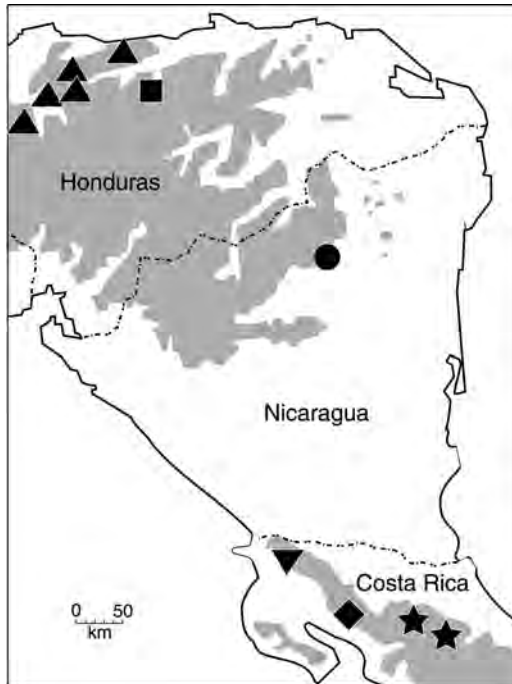


FIG. 4.—The distribution of *Nototriton saslaya* (circle) and its geographically closest congeners in Honduras and Costa Rica, respectively: *Nototriton barbouri* (triangle); *N. lignicola* (square); *N. guanacaste* (inverted triangle); *N. gamezi* (diamond); and *N. abscondens* and *N. richardi* (star).

was collected at night on vegetation about 1–2 m above the ground, mostly on ferns.

#### DISCUSSION

García-París and Wake (2000) provided a phylogenetic analysis of species in the genus *Nototriton* based on molecular data and provided support for a monophyletic Costa Rican *picadoi* group and for a northern *barbouri* group. An unpublished phylogenetic analysis based on sequencing data of the 16S mitochondrial gene of all species currently recognized in the genus *Nototriton* (except the recently described *N. stuarti*) demonstrated *N. saslaya* to be related to the Costa Rican rather than the Honduran species (D. B. Wake in litt., 9 December 1999). Thus, *N. saslaya* is tentatively placed in the *picadoi* group (García-París and Wake, 2000; Good and Wake, 1993). Within this group it shares with *N. abscondens* and *N. guanacaste* the

presence of the prefrontal bone, which is absent in *N. picadoi* (Good and Wake, 1993). As in *N. abscondens* and *N. picadoi*, *N. saslaya* has the frontal processes of the premaxilla bone arising fused before splitting, whereas the frontal processes arise separately in *N. guanacaste* (Good and Wake, 1993). Compared to the Honduran species, *N. saslaya* is most similar in osteology to *N. limnospectator*, especially in regard of the shape of the frontal processes of the premaxilla bone which in these two species arise fused before splitting (versus frontal processes unfused in *N. barbouri* and *N. lignicola*) (McCranie et al., 1998).

#### RESUMEN

Una nueva especie de salamandra del género *Nototriton* es descrita como proveniente de Cerro Saslaya, al este de Nicaragua. Se diferencia de todas las otras especies del género *Nototriton* por características únicas de coloración, morfometría y osteología.

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