

ON THE TAXONOMIC STATUS OF *NOTOTRITON SANCTIBARBARUS* MCCRANIE AND WILSON (AMPHIBIA: CAUDATA)

DAVID B. WAKE

Museum of Vertebrate Zoology, 3101 Valley Life Sciences Building, University of California, Berkeley, CA 94720-3160

Honduras has a large and complex salamander fauna that was undervalued until the recent work by McCranie, Wilson, and associates (see McCranie et al., 1993, McCranie and Wilson, 1993, 1995a, 1995b, 1997a, 1997b; McCranie and Cruz, 1996), which has appreciably increased not only the number of species but also the number of clades represented in the country. In a recent number of this journal, McCranie and Wilson (1997a) described a new species of plethodontid salamander, *Nototriton sanctibarbarus*, from specimens collected in forests between 1,829 and 2,744 m in the Montaña de Santa Bárbara, an isolated mountain range lying just west of Lago de Yojoa, Honduras. Salamanders had long been known from the area (Meyer and Wilson, 1971), but they had been assigned to *Nototriton nasalis* (Dunn, 1924), a species otherwise restricted to the Sierra de Omoa in northwestern Honduras. McCranie and Wilson had access to recently collected specimens from Montaña de Santa Bárbara, which they correctly discerned represented a species distinct from *Nototriton nasalis*. Although I reviewed the manuscript for the authors, and later for this journal, and agreed with their assessment that this population deserved description, only recently have I been able to examine specimens of the new species.

The collector of the new specimens reported to me that he found 45 specimens (44 collected) in a total of 80 bromeliads examined, and that he had collected tail tips in ethanol for molecular studies (R. D. Jennings, pers. comm. 1992). Following description of the new species, I contacted A. L. Heindl of the Barrick Museum, University of Nevada, Las Vegas, to obtain the tail tips for current molecular systematic studies. The tail tips could not be

found, so I was sent a few preserved specimens. Upon receiving the specimens I was surprised to note the relatively large heads (noted by McCranie and Wilson, 1997a), the long limbs, broad hands and feet, the slender tails, and the orientation of the external nares. These nares open laterally, and the heads in general are more angular and blunt-tipped than characteristic of *Nototriton*. Those species of *Nototriton* with enlarged external nares have the openings oriented dorsolaterally, so that they are very evident when viewed from above. I suspected that the species did not belong in the genus *Nototriton*.

I received permission to make cleared and stained skeletal preparations of two of the specimens, a male and a female, and my findings disclose that this species is incorrectly assigned to *Nototriton*. Instead, the species is a member of the clade now known as *Dendrotriton*, a genus otherwise known from western Guatemala and southern Chiapas, Mexico (Wake and Elias, 1983).

The two skeletal preparations are the following: 1) MVZ 226082 (originally RDJ 1113), an adult female (38.6 mm snout-vent length, SVL), and 2) MVZ 226085 (originally RDJ 1107), an adult male (33.4 mm SVL). The two specimens share the following morphological synapomorphies with *Dendrotriton*: no prefrontal bones, septomaxillary bones variable in presence (present and symmetrical in male, absent in female) (Fig. 1). The two specimens lack the following synapomorphies of *Nototriton*: ulnare and intermedium fused in the manus (the two elements are separate entities in both specimens), distal tarsals 4 and 5 fused into a single entity that articulates with the centrale in the pes (in both specimens the two elements are separate, distal tarsal 4 is larger

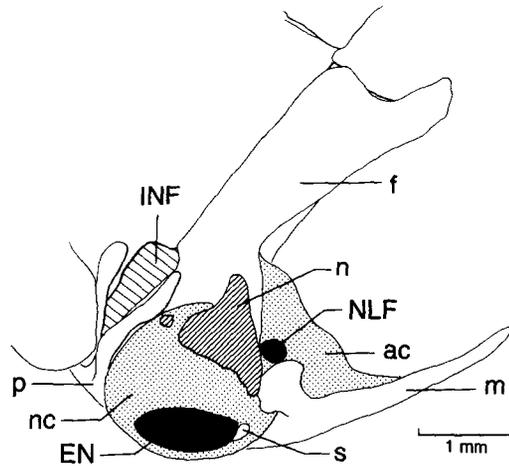


FIG. 1.—Snout of an adult male *Dendrotriton sanctibarbarus* (MVZ 226082), in three-quarter, dorsoanterolateral view. The nasal capsule (nc) and the antorbital cartilage (ac) on the left side of the skull are stippled. The nasal bone (n) is marked with fine diagonal lines, and is in two parts. The internasal fontanelle (INF) is marked by coarse horizontal lines. The large opening in the nasal capsule for the external naris (EN) is blackened, as is the smaller foramen for the nasolacrimal duct (NLF) posterior to the nasal. Note that there is no prefrontal bone posterior to the nasal bone but there is a small septomaxillary bone (s) at the posterior margin of the naris. Other abbreviations: f = frontal, m = maxillary, p = premaxillary.

than distal tarsal 5, and distal tarsal 5 does not articulate with the centrale whereas distal tarsal 4 does) (Fig. 2). The nasal bone is large and well developed in the female (but fragmented into a small and a much larger piece on the left side, Fig. 1), but smaller in the male. The dorsal fontanelle between the frontals and parietals is insignificant, and the vomer lacks preorbital processes in both specimens. The frontal processes of the premaxilla of the male fuse, then separate, whereas in the female they remain separated. In all of these osteological features the species most closely resembles *Dendrotriton megarhinus* (as illustrated in Lynch and Wake, 1975), the most geographically remote member of the genus (from Cerro Tres Picos, western and southern Chiapas, Mexico; Rabb, 1961).

In *Nototriton nasalis* the nasal bone is small, the prefrontal bone is large, and there is no septomaxillary bone (illustrated for species

then assigned to *Chiropterotriton* by Lynch and Wake, 1978). This species lacks preorbital processes of the vomers, and has fused frontal processes of the premaxillary. It has the typical manus and pes of *Nototriton*.

Based on these observations, the newly described species should be known as *Dendrotriton sanctibarbarus* (McCranie and Wilson, 1997). This species closely resembles other members of *Dendrotriton* in many respects, notably the large head and protuberant, forward-oriented eyes, the broadly rounded snout, the anterolaterally oriented external nares, the relatively prominent snout, the relatively long limbs and broad hands and feet, and the well-developed digits, with expanded and even bifurcated terminal phalanges. The color pattern is also like that of other species of *Dendrotriton*, especially the distinct bright band that extends between the eyes (see McCranie and Wilson, 1997a, Fig. 1).

This species is the sixth member of *Dendrotriton*. It is distinguished from *D. xolocalcae*, *D. cuchumatanus* and *D. rabbi* by its large nostrils, which are similar (a little larger) in size to those of *D. bromeliacia* but smaller and less elliptical than those of *D. megarhinus*. It differs further from *D. xolocalcae* and *D. rabbi* in lacking preorbital processes of the vomers. This species has many more maxillary and several more vomerine teeth than *C. bromeliacia*. It apparently is most similar to *D. cuchumatanus* in overall proportions and numbers of teeth. A detailed comparison of these species is beyond the scope of the present study, but I conclude that *D. sanctibarbarus* is a valid species that is morphologically distinct from all related species. Relationships within the genus have been subjected to several (mainly inconclusive) re-analyses in recent years (Collins-Rainboth and Buth, 1990; Wilkinson, 1997), because of the accessibility of data presented by Lynch and Wake (1975). It will be difficult to incorporate *D. sanctibarbarus* in future studies because describers of the taxon were unaware of its relationships and accordingly did not record observations in a manner compatible with the earlier data set.

At one time the genus *Chiropterotriton* was thought to include a number of small salamanders distributed from northeastern Mexico to Costa Rica (e.g., Rabb, 1961). As evidence accumulated it became clear that separate lin-

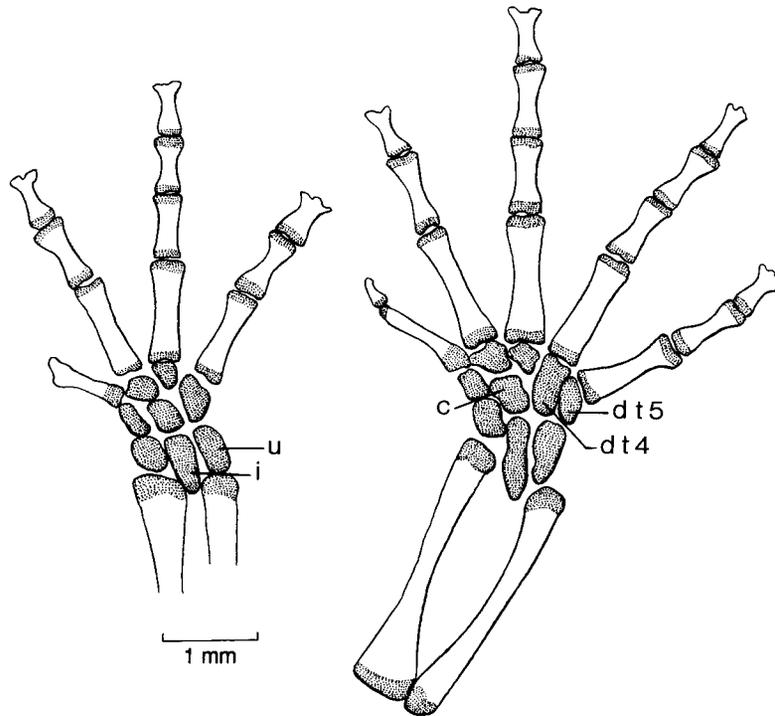


FIG. 2.—Skeletons of the hand (left) and foot (right) of an adult female *Dendrotriton sanctibarbarus* (MVZ 226085). Preaxial to the left. Cartilage is stippled. Note that the intermedium (i) and the ulnare (u) are separated in the hand, and that distal tarsal 4 (dt4) is separated from distal tarsal 5 (dt5), and that it bars the latter from articulating with the centrale (c). The first digit of the left hand consists of only a metacarpal, finished in bone at its end, whereas the right hand (not shown) has a small phalanx. The tibia lacks a tibial spur.

eages were represented, and the new genera *Bradytriton*, *Dendrotriton* and *Nototriton* were created for different species (Wake and Elias, 1983). These four genera display substantial parallel evolution, possibly associated with adaptation for life in arboreal microhabitats (Wake, 1987), and this leads to taxonomic confusion from time to time. There is suspicion that *Nototriton* may be paraphyletic, and further subdivision may be in order (Wake, 1987), but all taxa of *Nototriton* share the synapomorphies identified above, relative to *Dendrotriton*.

It is a great surprise to discover that *Dendrotriton* occurs in Honduras, for the site of discovery is about 390 km east of the nearest known locality for *Dendrotriton bromeliacia* near San Marcos, Guatemala, or 300 km east of the location of a population assigned to *Dendrotriton rabbi* near Uspantán, Guatemala (Elias, 1984). Surveys should be made for other representatives of this clade in intervening areas.

Resumen—La salamandra denominada *Nototriton sanctibarbarus* en esta revista por McCranie y Wilson en 1996, carece de las sinapomorfías características de *Nototriton*, pero, sin embargo, presenta los caracteres diagnósticos del género *Dendrotriton*. *Nototriton sanctibarbarus* es transferida por consiguiente al género *Dendrotriton* y se describen aspectos de su morfología y osteología. La especie se compara con otros representantes de *Dendrotriton*, que, en conjunto se localizan a más de 300 km hacia el Oeste y de los que es claramente diferenciable a nivel específico.

R. Jennings first drew my attention to these salamanders and A. Heindl, Barrick Museum, University of Nevada at Las Vegas, kindly loaned specimens to me, gave me permission to make the skeletal preparations, and agreed to exchange eight specimens to be catalogued in the MVZ collection (now MVZ 226082-226089). I thank S. Deban for clearing the

specimens and I also thank J. R. McCranie for keeping me informed concerning his research on Honduran salamanders and for his continued cooperation. I appreciate comments on the manuscript by M. García-Paris, G. Parra and J. R. McCranie, and I thank M. García-Paris for preparing the Spanish summary. Research in this laboratory is supported by NSF grant DEB-9408347

LITERATURE CITED

- COLLINS-RAINBOTH, A., AND D. G. BUTH. 1990. A re-evaluation of the systematic relationships among species of the genus *Dendrotriton* (Caudata: Plethodontidae). *Copeia* 1990:955–960.
- DUNN, E. R. 1924. New salamanders of the genus *Oedipus* with a synoptical key. *Field Museum of Natural History Zoological Series* 12:95–100.
- ELIAS, P. 1984. Salamanders of the northwestern highlands of Guatemala. *Los Angeles County Museum Contributions in Science* 348:1–20.
- LYNCH, J. F., AND D. B. WAKE. 1975. Systematics of the *Chiropterotriton bromeliacia* group (Amphibia: Caudata), with description of two new species from Guatemala. *Los Angeles County Museum Contributions in Science* 265:1–45.
- LYNCH, J. F., AND D. B. WAKE. 1978. A new species of *Chiropterotriton* (Amphibia: Caudata) from Baja Verapaz, Guatemala, with comments on relationships among Central American members of the genus. *Los Angeles County Museum Contributions in Science* 294:1–22.
- MCCRANIE, J. R., AND G. A. CRUZ. 1996. A new species of salamander of the *Bolitoglossa dunnii* group (Caudata: Plethodontidae) from the Sierra de Agalta, Honduras. *Caribbean Journal of Science* 32:195–200.
- MCCRANIE, J. R., AND L. D. WILSON. 1993. A review of the *Bolitoglossa dunnii* group (Amphibia: Caudata) from Honduras with the description of three new species. *Herpetologica* 49:1–15.
- MCCRANIE, J. R., AND L. D. WILSON. 1995a. A new species of salamander of the *Bolitoglossa dunnii* group (Caudata: Plethodontidae) from northern Honduras. *Herpetologica* 51:131–140.
- MCCRANIE, J. R., AND L. D. WILSON. 1995b. A new species of salamander of the genus *Bolitoglossa* (Caudata: Plethodontidae) from Parque Nacional El Cusuco, Honduras. *Journal of Herpetology* 29:447–452.
- MCCRANIE, J. R., AND L. D. WILSON. 1997a (1996). A new species of salamander of the genus *Nototriton* (Caudata: Plethodontidae) from Montaña de Santa Bárbara, Honduras. *Southwestern Naturalist* 41:111–115.
- MCCRANIE, J. R., AND L. D. WILSON. 1997b. Two new species of salamanders (Caudata: Plethodontidae) of the genera *Bolitoglossa* and *Nototriton* from Parque Nacional La Muralla, Honduras. *Proceedings of the Biological Society of Washington* 110:366–372.
- MCCRANIE, J. R., L. D. WILSON, AND K. L. WILLIAMS. 1993. A new species of *Oedipina* (Amphibia: Caudata: Plethodontidae) from northern Honduras. *Proceedings of the Biological Society of Washington* 106:385–389.
- MEYER, J. R., AND L. D. WILSON. 1971. A distributional checklist of the amphibians of Honduras. *Los Angeles County Museum Contributions in Science* 218:1–47.
- RABB, G. B. 1961 (1960). A new salamander of the genus *Chiropterotriton* from Chiapas, Mexico, with notes on related species. *Copeia* 1960:303–311.
- WAKE, D. B. 1987. Adaptive radiation of salamanders in Middle American cloud forests. *Annals of the Missouri Botanical Garden* 74:242–264.
- WAKE, D. B., AND P. ELIAS. 1983. New genera and a new species of Central American salamanders, with a review of the tropical genera (Amphibia, Caudata, Plethodontidae). *Los Angeles County Museum Contributions in Science* 345:1–19.
- WILKINSON, M. 1997. On phylogenetic relationships within *Dendrotriton* (Amphibia: Caudata: Plethodontidae): is there sufficient evidence? *Herpetological Journal* 7:55–65.