

## Taxonomic Status of the Snake Genera *Conopsis* and *Toluca* (Colubridae)

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The taxonomic history of the colubrid genera *Conopsis* and *Toluca* is complex and has been reviewed by Goyenechea and Flores-Villela (2000). The single character purportedly differentiating them has been called into question by several authors (e.g., Bogert and Oliver, 1945). Some workers recognize just one genus for this group (Bogert and Oliver, 1945; Goyenechea, 1995), whereas others have regarded the two genera as valid (Boulenger, 1894; Dugès, 1896; Duellman, 1961). Taylor and Smith (1942) reviewed these genera and concluded that each was valid. According to these authors, species of *Toluca* have a groove on each posterior maxillary tooth, that is lacking in species of *Conopsis*. In spite of the review by Taylor and Smith (1942), the generic status of *Conopsis* and *Toluca* was questioned by Bogert and Oliver (1945) because the latter did not consider the putative diagnostic character sufficient for recognizing the genus *Toluca*.

In addition to the presence or absence of grooves in the posterior maxillary teeth, another morphological character purportedly differentiating these genera is the condition of the loreal scale (Taylor and Smith, 1942). In *Conopsis*, the loreal scale may be present or fused with the nasal, whereas it is completely absent in *Toluca*. As part of revisionary work on these snakes, we reevaluated these putative, diagnostic features in all recognized taxa of both genera to assess their taxonomic utility, since the only way to allocate specimens to particular species has been on the basis of geographic provenance.

We examined 659 museum specimens, including 199 *Conopsis* and 460 *Toluca* that represented all known taxa (10 species and subspecies) from throughout the geographical range of both genera (both are endemic to Mexico, distributed from Chihuahua to Oaxaca), in order to reevaluate their taxonomic status. The following characters were recorded: snout-vent length (SVL), total length (TL), diameter of the body (DIAM), number of ventral and subcaudal scales, supralabials, infralabials, presence-absence of the nasal, loreal, preocular, postocular, frontal, and genial scales, temporal formula, shape of the hemipenis, and dorsal and ventral color pattern. To determine the presence or absence of tooth grooves, maxillae were dissected on 43 specimens (Appendix 1) representing all recognized species and subspecies of each genus. One maxilla

was dissected in each of six specimens of *Conopsis biserialis* from Guerrero and Morelos; one specimen of *Conopsis nasus labialis* from Chihuahua; seven specimens of *Conopsis nasus nasus* from Distrito Federal, Durango, Hidalgo, Michoacán, Oaxaca and Queretaro; five specimens of *Toluca amphisticha* from Oaxaca; five specimens of *Toluca conica* from Guerrero; six specimens of *Toluca lineata acuta* from Puebla and Hidalgo; four specimens of *Toluca lineata lineata* from Puebla; two specimens of *Toluca lineata varians* from Mexico and Puebla; five specimens of *Toluca lineata wetmorei* from Oaxaca; and two specimens of *Toluca megalodon* from Oaxaca.

All species of *Conopsis* and *Toluca* typically have 12 maxillary teeth, of which the posterior five are enlarged and flanged (10 taxa; Fig. 1). There is no diastema between the smaller anterior teeth and the enlarged posterior teeth. The structure of the flange is the same for all taxa, the posterior ridge of the tooth is extended caudally into a flange or blade, and this leaves a shallow fossa on both the labial and the medial surfaces of the tooth. The maxillary teeth are uniformly conical, becoming larger posteriorly along the maxilla. We found variation in the maxillary teeth among species of both genera regarding the relative size of the teeth, curvature of the fangs, and depth of the flange.

Flanges can be observed on maxillary teeth seven to 12 on all taxa. This condition is common in many aglyphous colubrids. A low, but distinct, flange can be found on *Conopsis biserialis* and *C. n. nasus*. *Conopsis nasus labialis*, *T. l. lineata*, and *T. l. wetmorei* have a more prominent flange, and *T. amphisticha*, *T. conica*, *T. l. acuta*, *T. l. varians*, and *T. megalodon* have the most highly developed flanges.

Loreal scales were present in 31% of the specimens of *Toluca* and 81% of specimens of *Conopsis*. After checking several hundred specimens (the complete list of specimens examined is available upon request to the first author), we attribute this variation to inter-populational differences rather than a feature worthy of generic recognition. In some cases, the loreal scale was present on one side but absent on the other side in the same specimen; similar variation was noted in all the species of both genera (13% in *Conopsis* and 18% in *Toluca*).

Other relatively invariable characters observed in all specimens of both genera include presence of a pair of internasal scales, one preocular and a pair of postocular scales, one rostral, one nasal, one hexagonal frontal scale, and a temporal formula of 1+2. The shape and ornamentation of the hemipenis corresponds to Types A and B of Dowling and Savage (1960), with a subcylindrical shape and reticulated ornamentation with several large spines at the base, respectively. Characters that have been used to define species of *Conopsis* and *Toluca* were found to be variable in all species of both genera. These characters include the number of genial scales, upper and lower labials, the coloration and pattern of spots on both the dorsum and ventrum, and all the morphometric measures we recorded.

Günther (1893) described *C. nasus* for a second time,

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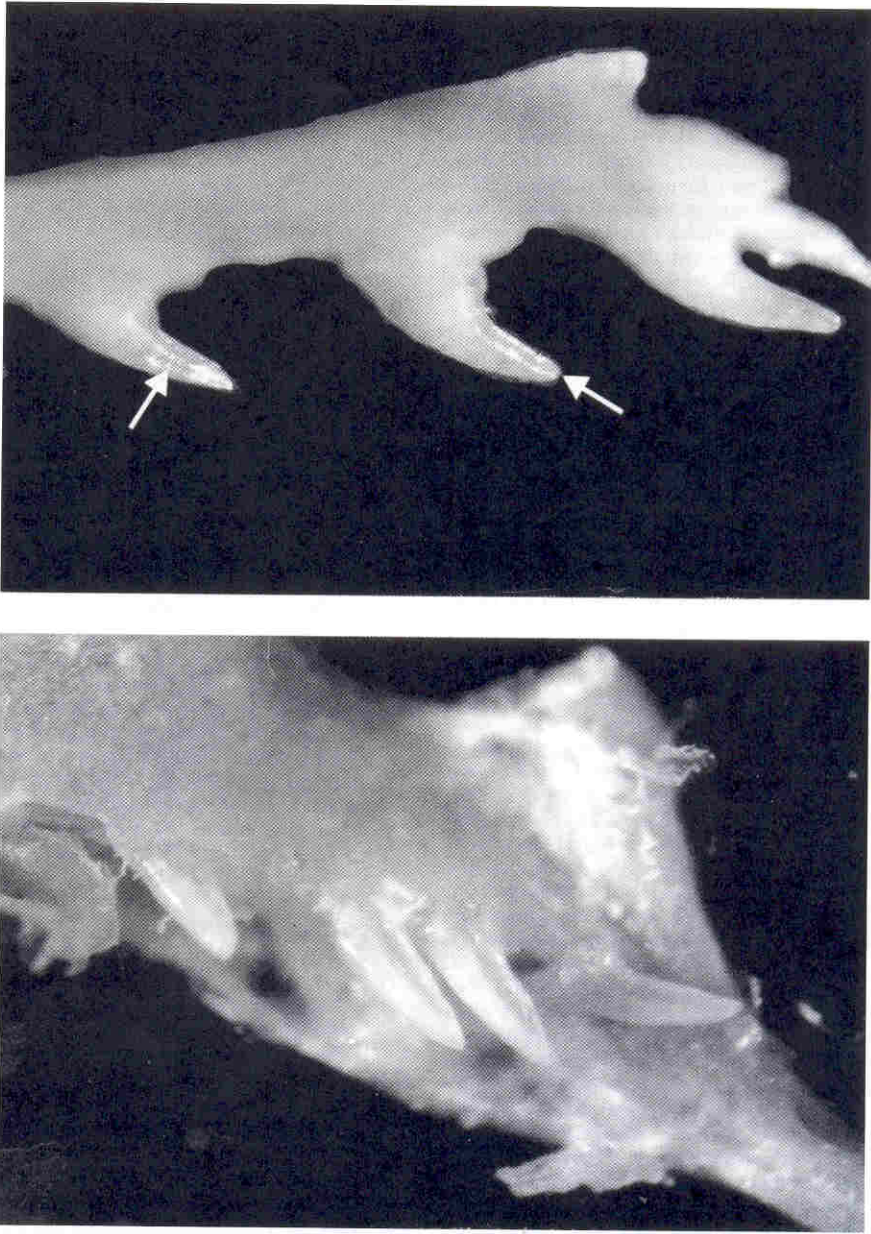


Fig. 1. Maxillae of *Conopsis* and *Toluca* showing the flange in at least one of the rear teeth. Top: *Conopsis nasus* MZFC 617; Bottom: *Toluca lineata wetmorei* MZFC 7568.

as having smooth, equal teeth. However, he also noted, that teeth in "*Conopsis nasus* are not strictly isodont" and observed a "commencement of a groove on large specimens." In their review of the genera *Conopsis* and *Toluca*, Taylor and Smith (1942) argued that Günther (1893) probably confused species of the two genera which at that time were lumped under *Conopsis*, and because of that he saw a faint groove in some individuals. Also, they commented that *Conopsis biserialis* may possess two or three teeth that "may be

very slightly thicker, and a slight depression may be discernible on the outer posterior face."

In contrast to Taylor and Smith (1942), who noted the presence of grooves on the rear teeth of *Toluca*, but described the teeth of *Conopsis* as being smooth, we found that a distinct flange is present in at least the three most posterior maxillary teeth in all of the specimens in both genera, and that the posterior maxillary teeth tend to be enlarged.

Likewise, the condition of the loreal scale is highly

variable within taxa assigned to both genera, and indeed in individual specimens, and cannot be considered a diagnostic character differentiating *Conopsis* from *Toluca*. The diagnostic characters that purportedly separate these genera (sensu Taylor and Smith, 1942) simply do not exist. Therefore, because of the principle of priority, *Conopsis* Günther (1858) must be given priority over *Toluca* Kennicott (in Baird, 1859). All species and subspecies of the former genus *Toluca* should be synonymized under *Conopsis*, and considering that both names have female endings, no changes in spelling of specific or subspecific names are needed.

**Acknowledgments.**—This report was part of a graduate thesis submitted by the senior author to Facultad de Ciencias, UNAM. We would like to acknowledge W. Duellman, L. Trueb and J. Simmons for the facilities provided to check specimens from different institutions at Kansas University and D. Kizirian for his hospitality during our visit to Kansas. Also, we thank all the curators who lent information and/or organisms to check: D. Frost, AMNH; J. E. Cadle, ANSP; J. J. Vindum, CAS; C. J. McCoy, CMNH; S. K. Wu, CUM; T. Alvarez, ENCB; A. Resetar, FMNH; W. E. Duellman, KU; A. Ramírez, IBH; R. L. Bezy, LACM; D. A. Rossman, LSUMZ; J. Rosado, MCZ; W. Tanner, MLBM; G. S. Casper, MPM; D. Wake, MVZ; G. Pregill, SDSNH; D. Lintz, SM; J. Dixon, TCWC; J. Vázquez, UAA; D. Auth, UF; D. Bakken, UIUC; A. G. Kluge, UMMZ; G. Zug, USNM; J. Campbell, UTA; R. Webb, UTEP. Assistance with various aspects of the study was provided by J. Castillo. J. Campbell loaned some specimens from which the maxillae were dissected, we are indebted to him. D. Frost gave support while visiting the American Museum of Natural History. A. Savitsky shared valuable information concerning the ecology and osteology of *Conopsis*. J. J. Morrone and W. L. Hodges reviewed a draft copy of the manuscript and made helpful suggestions. Also we thank an anonymous reviewer for his helpful suggestions. H. M. Smith is greatly acknowledged for his kind help in the lab and making valuable suggestions to this manuscript; also J. J. Wiens and J. A. Campbell are greatly acknowledged for their comments on the manuscript. Financial support was provided by a scholarship to IG from Dirección General de Asuntos del Personal Académico DGAPA, UNAM, and grants from the Comisión Nacional para el Estudio y Conocimiento de la Biodiversidad CONABIO (H-127), Theodore Roosevelt Memorial Fund, and Collections Grants (AMNH) to IG, and Dirección General de Asuntos del Personal Académico DGAPA, UNAM DGAPA (IN 203493) to Museo de Zoología, UNAM.

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Accepted: 10 April 2001.

#### APPENDIX 1

The maxilla was dissected in the following specimens, museum abbreviations follow Leviton et al. (1985), and Flores-Villela and Hernández-Gómez (1992).

*Conopsis biserialis*: 3603 MZFC GRO, Tetipac, Los Llanos, km 10 carr. Taxco-Tetipac; 3606 MZFC GRO, Ixcateopan de Cuauhtémoc, km 26.5 carr. Taxco-Ixcateopan; 3608 MZFC GRO, Tetipac, Los Llanos, km 10 carr. Taxco-Tetipac; 3612 MZFC GRO, Taxco, Cerro del Huizteco; 3613 MZFC GRO, Pedro Ascencio Alquisi-ras, 500 m before 3 Cruces de Mamatla; 10167 MZFC MOR, surroundings of Huitzilac, carr. Tres Marias-Huitzilac.

*Conopsis nasus labialis*: 8565 MZFC CHIH, Guachochi; km 28 carr. Creel-La Bufa.

*Conopsis nasus nasus*: 0089 MZFC DF, Iztapalapa, Villa de Guadalupe, Cerro del Guerrero; 0092 MZFC DF, Iztapalapa, Villa de Guadalupe, Cerro del Guerrero; 7026 UTA DGO, Llano Grande; 0617 MZFC HGO, 5 km from Jasso; 2162 MZFC MICH, Patzcuaro Lake; 3344 UTA OAX, Monte Albán; 6235 MZFC QRO, Los Espinos, km 55 carr. Cadereyta-Xilitla.

*Toluca amphisticha*: 12487 UTA OAX, Sierra Mixe, 0.8 km W Totontepec; 12491 UTA OAX, Sierra Mixe, 0.8 km W Totontepec; 14168 UTA OAX, Sierra Mixe, 0.8

km S Totontepec; 14169 UTA OAX, Sierra Mixe, 0.8 km S Totontepec; 14170 UTA OAX, Sierra Mixe, 0.8 km S Totontepec.

*Toluca conica*: 2898 MZFC GRO, Chilpancingo, Omiltemi Salida E del pueblo; 2899 MZFC GRO, Chilpancingo, Omiltemi 2km E-SE; 2900 MZFC GRO, Chilpancingo, Omiltemi on trail to Las Joyas 500 m NW; 2901 MZFC GRO, Chilpancingo, Omiltemi Barranca de Potrerillos; 2902 MZFC GRO, Chilpancingo, Omiltemi 2 km E.

*Toluca lileata acuta*: 3258, 3258-3, 3258-4, 3258-6, 3258-7 MZFC PUE, Chapulco, 4 km E.

*Toluca lileata acuta* × *Toluca lineata lineata*: 0840 MZFC HGO, Tejocotal approx 500 m NE of town.

*Toluca lineata lineata*: 3216 MZFC PUE, town of Amozoc; 3217-18 MZFC PUE, Chignahuapan, Puente rojo 0.5-1 km W; 3534 MZFC PUE, Chignahuapan, Chignahuapan 10 km S.

*Toluca lineata varians*: 7108 MZFC MEX, Atlacomulco km 21 carr. Toluca-Atlacomulco; 5739 MZFC PUE, Tehuacan, 8 km E Chapulco.

*Toluca lineata wetmorei*: 11453-54 MZFC OAX, Cerro de Yucunino; 11455-57 MZFC OAX, Llano de Guadalupe.

*Toluca megalodon*: 6557 MZFC OAX, Sierra de Juárez, km 148 carr. 185 Oaxaca-Tuxtepec; 8301 MZFC OAX, Sierra de Juárez, La Cumbre carr. Oaxaca-Tuxtepec.