

AN ALTERNATIVE CLASSIFICATION OF THE NEW WORLD RAT SNAKES
(GENUS *PANTHEROPHIS* [REPTILIA: SQUAMATA: COLUBRIDAE])

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Abstract: *Mintonius*, gen. nov, is erected for two species of large snakes (100-140 cm) from the north-central United States and adjacent Canada, principally around the Great Lakes region. The genus contains *M. vulpinus* and *M. gloydi*, and is distinguishable from its closest relatives, *Pantherophis*, *Pituophis*, and *Scotophis*, by aspects of its scutellation, color pattern, and gross morphology, as well biochemically, genetically, and phylogenetically. Key Words: evolutionary history, phylogeny, taxonomy, Fox Snake.

Introduction

Burbrink and Lawson (2007) hypothesized a relationship for the New World Rat Snakes (*Pantherophis* sensu Utiger 2002) in which their hierarchical arrangement differed from the taxonomic conventions in current use (Crother et al. 2000; Collins and Taggart 2002). Of particular note, they discovered a sister group relationship between *Pantherophis vulpinus* (Baird and Girard) and *Pituophis melanoleucus* (Daudin) rendering *Pantherophis* paraphyletic. Accordingly, Burbrink and Lawson (2007: 186) suggested that *Pantherophis* (Fitzinger 1843) be synonymized into *Pituophis* (Holbrook 1842), thereby reconciling the taxonomy of the group with their phylogeny.

The taxonomic suggestions of Burbrink and Lawson (2007) are consistent with the recovered phylogenetic history of the group and are therefore valid. However, we feel that combining these taxa into a single genus containing fourteen well-differentiated species minimizes the information content of the group, especially when one takes into consideration the morphology, behavior, ecology, and evolutionary history of these taxa.

An alternative classification is proposed below (and see Figure 1) which, like the Burbrink and

Lawson (2007) classification, is consistent with the recovered phylogenetic relationships of the group, and is thus equally logical and comprehensive. We feel this arrangement is superior in its restriction and retention of *Pituophis* to its previous and widespread usage (containing only the species *catenifer*, *deppei*, *lineaticollis*, *melanoleucus*, and *ruthveni*), and the resurrection of one genus and description of another, increasing the information content inherent in the classification.

Systematic Account

***Mintonius* gen. nov.**

Type species: *Scotophis vulpinus* Baird & Girard, 1853: 75. Neotype: Designation by Conant (1940: 10): USNM 9969, (a 1242 mm female collected by P. R. Hoy from Racine, Racine County, Wisconsin). The holotype (USNM 7269 [Racine, Wisconsin. P. R. Hoy, collector]) and paratype (USNM 1570 [Gross Island, Michigan]) are not known to currently exist.

Description: As given for the type species in Baird and Girard (1853: 75-76), but also defined phylogenetically by Burbrink and Lawson (2007). Additionally, *Mintonius* differs from its most closely related

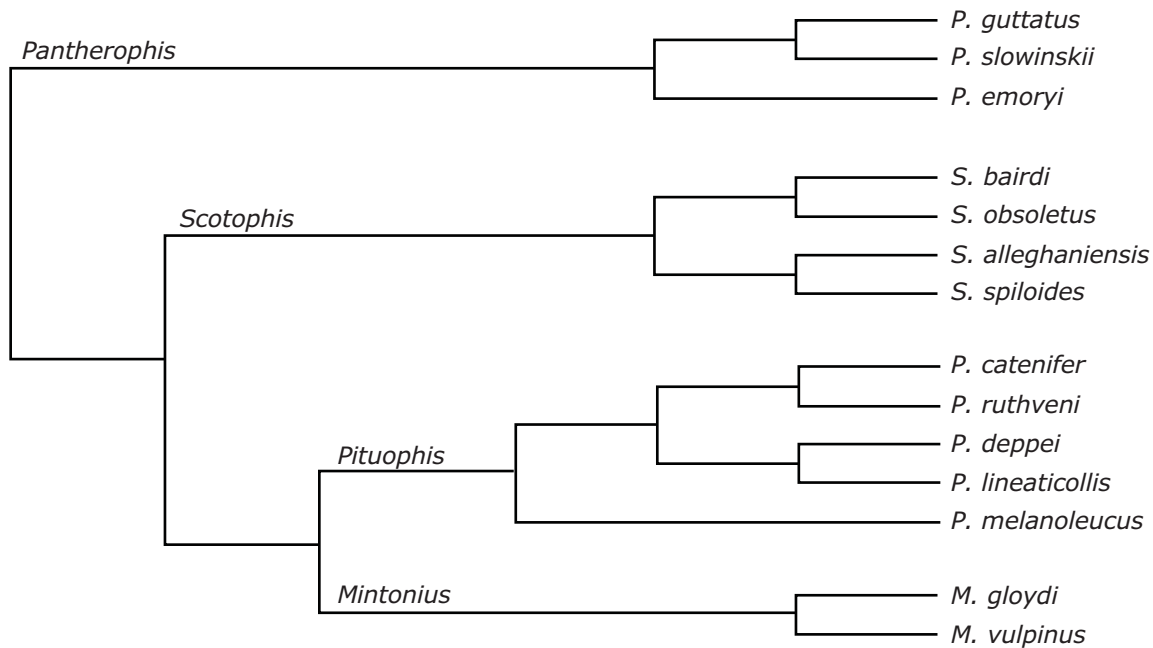


Figure 1. An expanded consensus phylogenetic hypothesis of Burbrink and Lawson (2007). The relationships of missing taxa have been added to the terminal branches following Burbrink (2002) [*Pantherophis* group], Rodríguez-Robles et al. (2000) [*Pituophis* group], and Burbrink (2001) [*Scotophis* group]. The relationships shown are those of the listed authors, and do not reflect an analysis of those data given in Table 1.

genera (*Pantherophis*, *Pituophis*, and *Scotophis*) by aspects of its scutellation (smooth laterally and keeled on the back [juveniles smooth throughout], 2 postoculars, 1 preocular, 8 supralabials [rarely 7 or 9, and with the 4th and 5th touching the eye], 10-12 infralabials, 23-25 dorsal scale rows at mid body [rarely 27]), and color pattern (reddish-brown to dark brown blotches over a yellowish-grey to yellowish-brown ground color along the body. The head is conspicuously off-colored from the body, ranging from copper-red to light brown. The belly is yellowish overall with well-defined dark (black to brown) rectangular blotches. *Mintonius* differs further by morphology in having a large stout body, a short tail (15% of total length), a head slightly set off from the body, and a snout that is rounded. These characters and others pertaining to behavioral, structural, and biochemical differences between *Mintonius* and those species allied to it are summarized in Table 1.

Content: *Mintonius gloydi* (Conant 1940) and *Mintonius vulpinus* (Baird and Girard 1853).

Range: Found over much of the glaciated upper midwest of North America in two currently recognized species. The first, *Mintonius vulpinus*, is bounded on the north and east by Lake Superior and Lake Michigan respectively and terminates to the west in Nebraska and central Illinois in the south. The second, *Mintonius gloydi*, is found along the shores of Lake Huron and Lake Erie in Michigan and Ohio, and in Canada in the region bounded by Lakes Huron, Erie, and Ontario.

Etymology: We take this opportunity to recognize

the contributions of the late Sherman A. Minton and Madge Rutherford Minton of Indiana, both of whom made their mark in herpetology worldwide and also in Indiana, where the type species of this new genus occurs.

The paraphyly of the former genus *Pantherophis* and the retention of *Pituophis*, necessitates three additional changes plus the recognition of the new genus, *Mintonius*, so that the classification reflects the phylogeny, as shown in the following arrangement:

1) The genus *Mintonius* Collins & Taggart 2008 (Fox Snakes) proposed as follows: *Mintonius gloydi* (Conant 1940) - Eastern Fox Snake; *Mintonius vulpinus* (Baird and Girard 1853) - Western Fox Snake.

2) The genus *Pantherophis* Fitzinger 1843 (Corn Snakes) restricted as follows: *Pantherophis emoryi* (Baird and Girard 1853) - Great Plains Rat Snake; *Pantherophis guttatus* (Linnaeus 1766) - Eastern Corn Snake; *Pantherophis slowinskii* (Burbrink 2002) - Slowinski's Corn Snake.

3) The generic name *Scotophis* Baird & Girard 1853 (Woodland Rat Snakes) resurrected for the following taxa: *Scotophis alleghaniensis* (Holbrook 1836) - Eastern Rat Snake; *Scotophis bairdi* [Yarrow (in Cope) 1880] - Baird's Rat Snake; *Scotophis obsoletus* (Say 1823) - Western Rat Snake; *Scotophis spiloides* (Duméril, Bibron and Duméril 1854) - Midland Rat Snake.

4) The genus *Pituophis* Holbrook, 1842 (Gopher Snakes, Bullsnares, and Pine Snakes) retained as follows: *Pituophis catenifer* (Blainville 1835) - Gopher Snake; *Pituophis deppei* (Duméril 1853) - Mexican Bullsnares; *Pituophis lineaticollis* (Cope 1861) - Mid-

Table 1. Data matrix of characters for those taxa allied to *Pituophis* (sensu Burbrink, 2007). See footnote for character and character state designations. Data compiled from Keogh (1996), Conant and Collins (1998), and Stebbins (2003).

	Characters																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Bogertophis</i>	a	a	a	a	a	a	a	10+	b	b	3+	b	a	29+	a	>36	a	12.5–12.6%
<i>Mintonius</i>	a	b	b	b	a	a	a	7–9	a	a	1–2	b	a	21–28	b	36	a	–
<i>Pantherophis</i>	ab	a	c	b	a	a	a	7–9	a	a	1–2	b	a	21–28	b	36	b	9.5%
<i>Pituophis</i>	c	b	cd	c	b	b	b	7–9	ab	a	1–2	a	b	29+	b	36	b	10.5%
<i>Scotophis</i>	b	b	e	b	a	a	a	7–9	a	a	1–2	b	a	21–28	b	36	a	9.6–9.7%
<i>Senticolis</i>	ab	a	a	b	c	a	a	7–9	a	a	3+	b	a	29+	b	?	a	15.7%

Character and character state descriptions used in Table 1.

1. Landscape: a. Terrestrial, b. Arboreal, c. Semi-fossorial
2. Body Form: a. Gracile, b. Robust
3. North American Distribution: a. Southwestern, b. Boreal, c. Southern, d. Western, e. Eastern
4. Left Lung: a. Absent, b. Present, c. Polymorphic
5. Intrapulmonary bronchus length: a. Short, b. Intermediate, c. Absent
6. Hisses: a. No, b. Yes
7. Rostral Scale: a. Round (unmodified), b. Large and pointed upward
8. Number of Supralabials
9. Lorilabial: a. Absent, b. Present
10. Eye/Supralabial Contact: a. Yes, b. Separated by Lorilabials
11. Number of Temporal Scales
12. Anal Scale: a. Single, b. Divided
13. Dorsal Scales: a. Weakly keeled, b. Strongly keeled
14. Dorsal Scale Rows at Mid-body
15. Origin of Hemipenis Retractor Muscles: a. Caudal vertebrae 32 or fewer, b. Caudal vertebrae 38 or higher
16. Diploid Chromosome Number
17. Distinct markings on top of the head (as adult): a. Absent, b. Present
18. Percentage of nucleotide base differences per sequence (in comparison to *Mintonius*) from analysis between aligned sequences (4,495 base pair of four genes used in Burbrink and Lawson, 2007).

dle American Gopher Snake; *Pituophis melanoleucus* (Daudin 1803) - Eastern Pine Snake; *Pituophis ruthveni* Stull 1929 - Louisiana Pine Snake.

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