



Molecular phylogeny, classification, and biogeography of West Indian racer snakes of the Tribe Alsophiini (Squamata, Dipsadidae, Xenodontinae)

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Abstract

Most West Indian snakes of the family Dipsadidae belong to the Subfamily Xenodontinae and Tribe Alsophiini. As recognized here, alsophiine snakes are exclusively West Indian and comprise 43 species distributed throughout the region. These snakes are slender and typically fast-moving (active foraging), diurnal species often called racers. For the last four decades, their classification into six genera was based on a study utilizing hemipenial and external morphology and which concluded that their biogeographic history involved multiple colonizations from the mainland. Although subsequent studies have mostly disagreed with that phylogeny and taxonomy, no major changes in the classification have been proposed until now. Here we present a DNA sequence analysis of five mitochondrial genes and one nuclear gene in 35 species and subspecies of alsophiines. Our results are more consistent with geography than previous classifications based on morphology, and support a reclassification of the species of alsophiines into seven named and three new genera: *Alsophis* Fitzinger (Lesser Antilles), *Arrhyton* Günther (Cuba), *Borikenophis* Hedges & Vidal gen. nov. (Puerto Rican Bank and nearby islands), *Caraiba* Zaher et al. (Cuba), *Cubophis* Hedges & Vidal gen. nov. (primarily Cuba but extending throughout the western Caribbean and Bahamas Bank), *Haitiophis* Hedges & Vidal gen. nov. (Hispaniola), *Hypsirhynchus* Günther (Hispaniola and Jamaica), *Ialtris* Cope (Hispaniola), *Magliophis* Zaher et al. (Puerto Rican Bank), and *Uromacer* Duméril & Bibron (Hispaniola). Several subspecies are recognized as full species. Three subtribes are recognized within the tribe Alsophiini Fitzinger: Alsophiina Fitzinger (for *Alsophis*, *Borikenophis*, *Caraiba*, *Cubophis*, *Haitiophis*, *Hypsirhynchus*, *Ialtris*, and *Magliophis*), Arrhytonina Hedges & Vidal subtribus nov. (for *Arrhyton*), and Uromacerina Hedges & Vidal subtribus nov. (for *Uromacer*). Divergence time estimates based on the molecular data indicate a relatively recent (~17–13 million years ago, Ma) origin for alsophiines. A single species apparently dispersed from South America, probably colonizing Hispaniola or Cuba and then later (13–0 Ma) there was dispersal to other islands and subsequent adaptive radiation, mostly in the Pliocene (5.3–1.8 Ma) and Pleistocene (1.8–0.01 Ma). More evidence will be needed to resolve all relationships among the genera and species groups and further details of their biogeographic history.

Key words: Alethinophidia, *Borikenophis*, Caenophidia, Colubroidea, *Cubophis*, cytochrome b, ND4, ND2, RAG2, Serpentes, 16S rRNA, 12S rRNA, West Indies

Introduction

Among snakes (~3150 species), Caenophidia or advanced snakes form a monophyletic group including the great majority (~2620 species) of extant snakes (Vidal 2002; Vidal & Hedges 2002a,b; Vidal *et al.* 2007; Uetz *et al.* 2008). The American caenophidian snake fauna comprises five families: the Viperidae and Elapidae—both displaying a front-fanged venom system—and the Natricidae, Colubridae and Dipsadidae (Vidal & Hedges 2002b; Vidal *et al.* 2007). The latter is one of the largest families of snakes (~700 species),