

A QUATERNARY FOSSIL OF AMPHISBAENIA (SQUAMATA, LEPIDOSAURIA) FROM GEDA CAVERN, VIÑALES, CUBA FÓSIL CUATERNARIO DE AMPHISBAENIA (SQUAMATA, LEPIDOSAURIA) DE LA CAVERNA GEDA, VIÑALES, CUBA

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ABSTRACT: We report the second amphisbaenian remain (Squamata, Lepidosauria) from Cuba, recovered from Pleistocene-Holocene sediments in Geda Cavern, Guasasa mountain range, Viñales, Pinar del Río province. The remain consists in an almost complete vertebra, being identified into Amphisbaenia clade. Due to the lack of diagnostic characters we could not place it in a more precise taxonomic category. This fossil increase the Geda Cavern paleontological record, and also constitutes a rare record for the region.

KEY WORDS: osteology, Pinar del Río, Pleistocene, Reptilia, vertebra.

RESUMEN: Registramos el segundo resto de Amphisbaenia (Squamata, Lepidosauria) para Cuba, obtenido en sedimentos Pleisto-Holocénicos en la Caverna Geda, Sierra Guasasa, Viñales, provincia Pinar del Río. La muestra consiste en una vértebra casi completa, identificada dentro del clado Amphisbaenia. Debido a la falta de caracteres diagnósticos no fue posible ubicarla en una categoría taxonómica más precisa. Este fósil incrementa el registro paleontológico de la Caverna Geda, y además contribuye un registro raro para el área.

PALABRAS CLAVES: osteología, Pinar del Río, Pleistoceno, Reptilia, vértebra.

INTRODUCTION

Amphisbaenia is a group of Squamate reptiles, uniquely adapted to burrowing lifestyle. They have a global distribution, around all continents, except Antarctica. In Greater Antilles they are present in Cuba, Hispaniola, and Puerto Rico, the second one count seven species described, the bigger richness of all (Uetz *et al.*, 1995-2020). Cuba present three species of the *Amphisbaena* genus (Amphisbaenidae), and other two of the endemic *Cadea* genus (Cadeidae) (Rodríguez-Schettino *et al.*, 2013; Uetz *et al.*, 1995-2020). *Amphisbaena cubana* inhabits all Cuban archipelago, *A. barbouri* inhabits the Western region, whereas *A. carlgansi* inhabits the Eastern region. On the other hand, *Cadea blanooides* inhabits the Eastern and Western regions, leaving the Center mostly

uninhabited, and *C. palirostrata* is present only in Isla de la Juventud Island (Rodríguez-Schettino *et al.*, 2013).

Two fossil record of Amphisbaenia for the Antilles are known until now. The first one is an *Amphisbaena* Quaternary mandible and two vertebrae from Blackbone cave, Puerto Rico (Pregill, 1981). Biogeographical criteria was used for the identification, because no diagnostic characters were present that could lead to a more specific identification. The second one is a recently discovery of a *Cadea* aff. *blanooides* mandible and other amphisbaenias vertebrae from Abron Cave, in Sierra La Güira, Western Cuba (Syromyatnikova *et al.*, 2020). Also, in this work, vertebra remains led to no specific identification of the specimens.

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Here we present a new *Amphisbaenia* fossil record for Cuba and the Antilles from a known fossiliferous deposit. This time from Geda Cavern, located in Guasasa Mountain range, Viñales, Western Cuba.

MATERIAL AND METHODS

LOCALITY

The fossil studied was collected in Geda Cavern, located in Sierra de Guasasa, karst massif of Jurassic gray limestones, 6 km North of the Viñales town, Pinar del Río province, Cuba (Fig. 1). Its main access (22.6541N, 83.7139W) is located on the western slope of the mountain, at a height of 70 m above the level of the San Vicente Valley and 210 m a.s.l. The cavern has two levels of locally superimposed main galleries. The lower one is separated into two sections, the first one communicates with the main access and constitutes a practically rectilinear gallery of 1.2 km in length, oriented in an approximate east-west direction. The second section of the lower level presents a gallery of approximately 600 m in length.

The two levels exhibit little meanders, more numerous in the upper level, suggesting the transfluence flow character of the cavity in the early stages of its formation. Secondary formations, clay, carbonated or gypsum sediments cover the pavement of both levels. The upper level is particularly abundant in calcite speleothems (Condis, 2010). The vertebra of *Amphisbaenia* was collected in the lower level, in a clayed area where eroded bone fragments were excavated, some stained with dark pigments of chemical elements contained in local groups of ultrabasic rocks (serpentine).

COLLECTS AND SAMPLE PROCESSING

The bone material was extracted by manual collection and cleaned. It was deposited in the Zoological Collection of the Cuban Academy of Sciences (CZACC), currently Institute of Ecology and Systematics. The osteologic nomenclature follow Zangerl (1945), Bolet *et al.* (2014), and Benites (2015), and the taxonomy is according to Kearney (2003), and Gans (2005).

Fossil was photographed with a stereomicroscope Leica M205a equipped with a digital camera DFC425 using the software Leica Application Suite (3.8). Proportions of exemplars were obtained by measurements relationships. Measurements were made using the software TPSdig (v 2.11).

SYSTEMATIC PALEONTOLOGY

Squamata Oppel, 1811

Amphisbaenia Gray, 1844

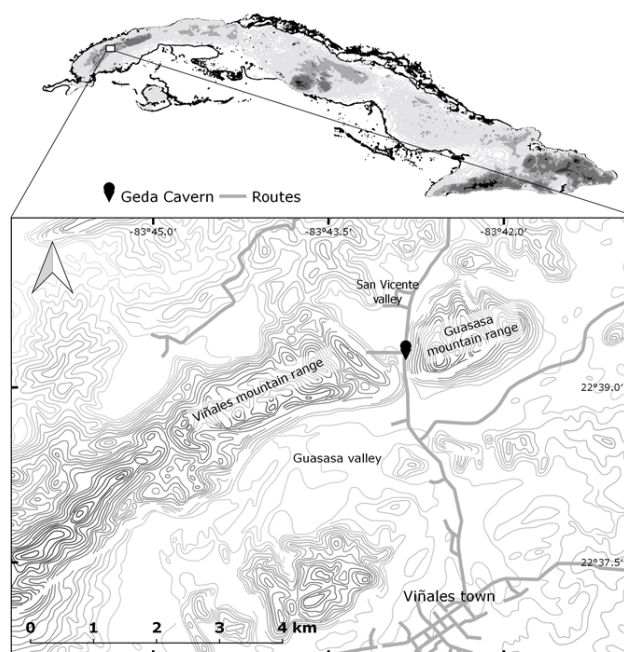


FIGURE 1. Locality of the fossil deposit Geda Cavern, Guasasa Mountain range, Viñales, Cuba.

FIGURA 1. Localidad del depósito fosilífero Caverna Geda, Sierra Guasasa, Viñales, Cuba.

Material. An almost complete vertebra of the middle of the body, CZACC-whithout number, collect number P-399 (Fig. 2).

Comparative material. *Amphisbaenidae*: *Amphisbaena alba* FMNH 195924, *A. cubana* (private collection of Lázaro W. Viñola López, CLV-whithout number) *Cadeidae*: *Cadea blanooides* (CLV-whithout number).

DESCRIPTION OF THE FOSSIL

The vertebra is rather small (1.91 mm of body length), dorso-ventrally compress in general aspect, constricted in dorsal view between the pre- and postzygapophyses show all margins smooth. It lacks left prezygapophyses. Right prezygapophysis is antero-dorsally directed, about 20° up with respect to the transversal axis, and 45° with respect to the longitudinal axis. Articular surfaces are drop-shaped and face upward. It presents a large, blunt prezygapophyseal process, slightly less wide than the articular surface.

Synapophyses are massive and globular, ventro-laterally directed, and well-defined from the vertebral body. The interzygapophyseal constriction is deep, almost half the width of the distance between postzygapophyses. It describes a regular curve without angulation. Postzygapophyses open laterally, about 22° with respect to the horizontal axis. Articular facets are dorsally sloped, about 28° with respect to the transversal axis. Articular

surfaces are drop-shaped as that of the prezygapophyses.

Dorsal surface is smooth. The neural spine is absent, but a sort of sagittal ridge is developed. Neural arc describes a convex curve, being more evident in anterior view than in posterior. There is no zygantra, nor zygosphene. In dorsal view, the anterior edge of the neural arch is almost straight; it lacks pars tectiformis, whereas posterior edge is mid notched. The median notch is delimited both sides by a small convexity. Dorsal surface of the arch surrounding such median notch form a ridge V-shaped opening backward.

Neural canal has a semicircular shape, dorso-ventrally compressed anteriorly, and laterally compressed posteriorly. Posterior output is higher and wider than anterior. Due to sediment incrustations, it cannot be seen if paracotylar foramen is present. Ventral surface of the centrum is entirely flat and wide, without hemal keel, instead it presents a mid-shallow groove. Lateral edges are almost parallel from the cotyle to the condyle. Both sides in anterior third of the body appear the outline of two foramina subcentralia.

Both, the cotyle and condyle, are dorso-ventrally flattened, they are twice as wide as high. In ventral view, the lower rim of the cotyle is regularly concave and posteriorly placed as compared to the dorsal rim. Condyle is moderately inclined dorsally, with an articular surface slightly visible in ventral view. That is why dorsal edge of the condyle is placed more posteriorly than the ventral edge.

DIFFERENTIAL DIAGNOSIS

We can assume the vertebra as *Amphisbaenian* by the following characters: vertebra generally depressed, condyle is transversely widened, and the ventral face of the centrum is flat and has parallel lateral borders; and neural spines are lacking in the trunk region (Hoffstetter and Gasc, 1969). Also, the presence of a V-shaped ridge in the posterior medial margin of the neural arc is typical of *amphisbaenian* vertebrae (Blain *et al.*, 2010; Bolet *et al.*, 2014). Only *Amphisbaenidae* and *Cadeidae* families are known from the Antilles, it is correct to think that the Quaternary fossil belong to one of them. However, until now, there is no diagnostic characters in *amphisbaenian* vertebrae that provide a differentiation among these families present in the Antilles (Scanferla *et al.*, 2006; Mandriola *et al.*, 2011; Rage *et al.*, 2013; Bolet *et al.*, 2014).

In comparing the fossil with *Cadea* and *Amphisbaena* vertebrae from the same region of the body (Fig. 2), we find that the fossil presents a projected and rounded prezygapophyseal process, as observed in *Cadea*, *Amphisbaena* has a little

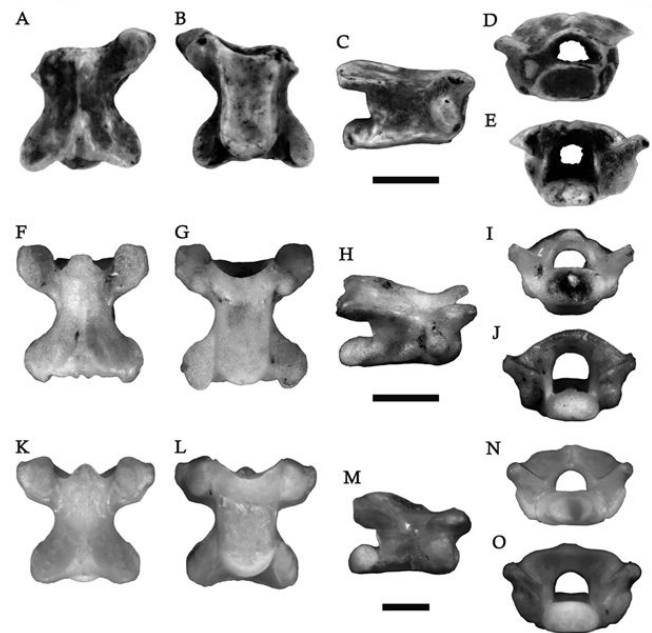


FIGURE 2. Middle body vertebrae of Fossil CZACC (without number, A-E) in (A) dorsal, (B) ventral, (C) lateral, (D) anterior, and (E) posterior views; *Amphisbaena cubana* (F-J), and *Cadea blanoides* (K-O) in the same views respectively. Scales 1 mm.

FIGURA 2. Vértabras del medio del cuerpo del fósil CZACC (sin número, A-E) en vista (A) dorsal, (B) ventral, (C) lateral, (D) anterior, y (E) posterior; *Amphisbaena cubana* (F-J), y *Cadea blanoides* (K-O) respectivamente en las mismas vistas. Escala 1 mm.

development of this process. In the fossil as in *Cadea*, the synapophysis has an oval, massive shape, with almost the prezygapophysis width, different from *Amphisbaena* where the synapophysis is almost spherical, less massive, and almost half of prezygapophysis width. This two features bring the fossil closer to *Cadea* genus, although Syromyatnikova *et al.* (2020) already pointed out that there is a morphological overlap between the vertebrae of the two families that makes it even more difficult to distinguish them.

REMARKS

Geda Cavern is relevant as a paleontological locality, due to the content, typology and conservation of its fossil fauna record, being in addition, a type locality of the extinct phyllostomid bat *Cubanycotis silvai* (Mancina and García-Rivera, 2005). In the sediments that contained the vertebra of *Amphisbaena*, paleontological remains of amphibian (*Peltophyrne* sp.), reptiles (*Anolis* sp.), undetermined birds, and mammals (*Acratocnus antillensis*, *Parocnus browni*, *Megalocnus rodens*, *Neocnus gliriformis*, *Geocapromys columbianus*,

Mesocapromys sp., and *Capromys pilorides*) were identified (Condis, 2010, and author OJ observations).

The amphisbaenian fossil record is very scarce, due to its small elements, but also to the lack of skeletal anatomy studies (Kearney, 2002). In this case, it is necessary to get a better understanding of the Cuban amphisbaenian skeleton, despite the previous studies on *Cadea* morphology (Zangerl, 1945; Vanzolini, 1951; Zug and Schwartz, 1958; Gans and Alexander, 1962), in order to a better taxonomic delimitation of recent paleontological remains.

An amphisbaenian for Geda Cavern increase their fossil record, as well as their importance as Pleistocene - Holocene paleontological deposit. To date, this is the second locality in Cuba with remains of Amphisbaenian specimens, but certainly, we have a lot to explore. Amphisbaenian in Cuba have a national distribution. *Amphisbaena cubana* inhabits all the archipelago, even in some cays; *A. barbouri* occupy western Cuba, while *A. carlgansi* occupy eastern Cuba. The last one being restringed to Cabo Cruz peninsula. *Cadea blanoidea* also has a national distribution, while *C. paliostrata* has been only found in Isla de la Juventud, at the South of the main island.

Amphisbaenians are completely fossorial, however, its appearance inside the cavern does not necessarily mean that he lived inside it. Like much of the fossil fauna found in the deposit, it may have been drawn inward from external sediments (Condis, 2010). Recent individuals have been reported from beneath limestone rocks, in lowland forest floor, near brooks, inside caves entrances, in cane fields and orchards (Henderson and Powell, 2009). Also, it has been reported from caves entrances, in Santo Tomás cave, Pinar del Río Province (Zug and Schwartz, 1958), close to the fossil deposit locality.

By references of others amphisbaenians of the Antilles area (Thomas & Hedges, 2006), they are commonly found under rocks, logs, and accumulations of decaying plant matters, where humidity is relatively high. Their appearance among vertebrate fossils of Geda cave deposit, indicate the presence of this taxon in the surrounding area, and supports the high humidity conditions of the karstic area.

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