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New data on Pleistocene and Holocene herpetofauna of Marie Galante (Blanchard Cave, Guadeloupe Islands, French West Indies): Insular faunal turnover and human impact

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ABSTRACT

This work presents the herpetofaunal remains collected from Blanchard Cave (Marie-Galante, Guadeloupe Archipelago). This site has yielded the oldest stratigraphic layers (around 40,000 BP) of the island, along with data concerning the herpetofaunal biodiversity of the island from the Late Pleistocene to pre-Columbian and modern times. The study of these fossil remains reveals the presence of at least 11 amphibian and squamata taxa (*Eleutherodactylus* cf. *martinicensis*, *Iguana* sp., *Anolis ferreus*, *Leiocephalus* cf. *cuneus*, *Thecadactylus* cf. *rapicauda*, cf. *Capitellum mariagalantae*, *Ameiva* sp., cf. *Antillotyphlops*, *Boa* sp., *Alsophis* sp. and Colubridae sp. 2) during the Late Pleistocene and Holocene on Marie-Galante Island and provides new evidence concerning extinction times and the introduced or native status of taxa. This study also reveals that this bone assemblage is the result of diverse accumulation processes and provides new morphological data on the past herpetofauna of Marie-Galante.

1. Introduction

Data concerning past Lesser Antillean reptiles and amphibians still remain scant since the pioneering works of G. K. Pregill in this area (Pregill et al., 1988, 1994; Pregill and Olson, 1981). The Guadeloupe Islands are no exception and apart from some data from zooarchaeological studies of pre-Columbian sites (Grouard, 2001), data on past herpetofauna remain sparse. However, more works on the former Guadeloupean fauna are beginning to emerge as a result of pluridisciplinary research programs centered on the past humans, animals and environment of this archipelago. As subfossil data are not equally distributed throughout the islands, for the time being, the biodiversity of Marie-Galante is the most studied of the Guadeloupe Islands, owing mainly to the presence of several caves containing Pleistocene and Holocene fossil-bearing deposits (Lenoble et al., 2009). As a consequence, recent publications focus on the herpetofaunal fossil remains from the sites of Cadet 2 (Bochaton et al., 2015b) and Cadet 3 (Stouvenot et al., 2014) on Marie-Galante. However the discovery of Blanchard Cave, which is now the oldest and largest fossil deposit on the island, provides new data and significantly enhances our knowledge of past herpetofaunal biodiversity on the island.

Blanchard Cave (15°52′56″N; 61°14′01″W) lies on the southern coast of Marie-Galante (Fig. 1), two hundred meters from the shoreline. The cave consists of a 20-m-long corridor opening onto a 15-m-wide and 8-m-high chamber. The cave is formed in neritic limestone of Plio-Pleistocene age (Bouysse et al., 1993). Many characteristics, such as the horizontal development of the cave, its

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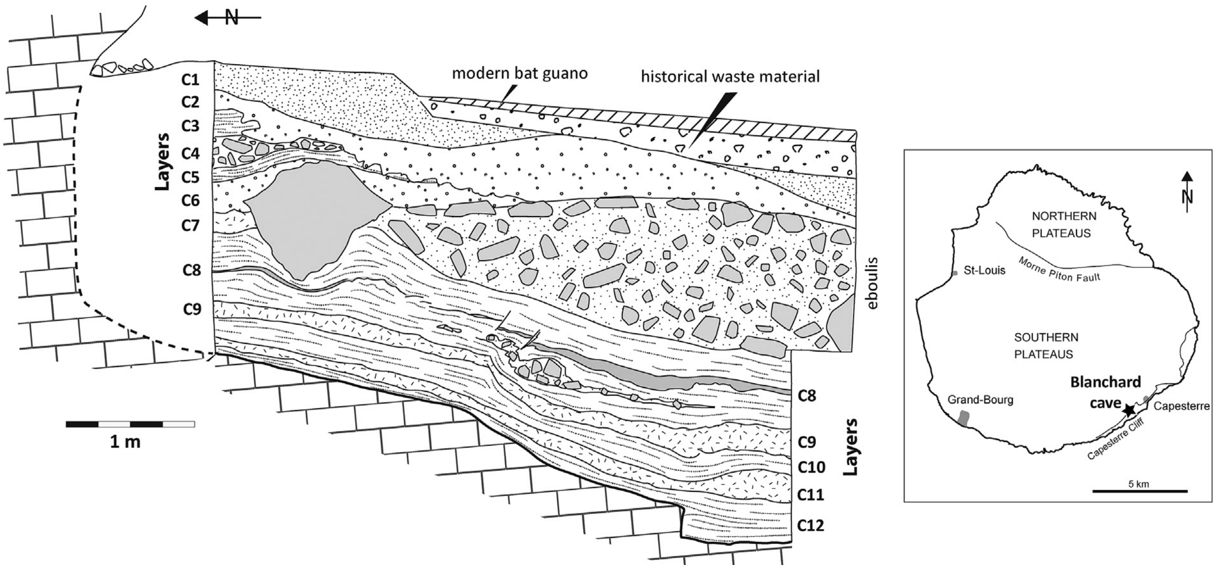

Fig. 1. Blanchard Cave stratigraphy and location of the site on Marie-Galante Island.

rectangular morphology, the orientation of its main axis perpendicular to the shoreline and its abrupt termination, are indicative of a phreatic cave formed at the contact between a freshwater lens and marine water, in the same way as most of the coastal caves of the Antillean carbonate islands (Mylroie and Carew, 1990). The cave was first excavated in 2005 when a small test pit revealed the existence of a pre-Columbian burial in the entrance area of the site (Stouvenot, 2005), but the first paleontological survey began in 2008 as part of a collective research project ("Cavités naturelles de Guadeloupe: aspects géologiques, fauniques et archéologiques"), with the excavation of two test pits in the rear end part of the cave. This first investigation revealed the presence of abundant vertebrate remains in the deposit. Further investigations were then conducted at the site between 2013 and 2014 with the opening of a large excavation of 20 square meters, conducted as part of a European research program; the BIVAAG project focusing on modern (Angin, 2014; Lenoble et al., 2014) and past faunas (Gala and Lenoble, 2015), as well as the paleoenvironment of the Guadeloupe Islands.

In this work we present the first results obtained on the fossil herpetofauna from Blanchard Cave recovered during the 2013 and 2014 field seasons. The comparison of these data with existing works on past Marie-Galante herpetofauna (Bochaton et al., 2015b; Stouvenot et al., 2014) greatly enhances our understanding of the evolution of the herpetofaunal biodiversity of the island during Late Pleistocene and Holocene times.

2. Blanchard Cave

2.1. Stratigraphy

The site is a dry cave, and the present-day floor is covered by a thin layer of modern bat guano. Under this first layer lies an archaeological level with potholes containing evidence of anthropogenic activities (Amerindian ceramics, animal bones and marine mollusk shells) (Lenoble and Grouard, 2010). Beneath the archaeological layer lies a nearly 3 m thick, fossil-bearing natural deposit. Sedimentary facies, bedding and the nature of contacts between the different lenses allow for the distinction of 12 layers (C1 to C12) (Fig. 1), grouped into four different sedimentary facies. The first facies, corresponding to layer C1, contains beige silt composed of fine calcite grains deriving from more or less phosphatized cave wall disaggregation. The second facies (C3, C5, C8, C10 and C12) comprises loose brown laminated organic silt composed of microscopic organic fragments indicative of undisturbed fruit bat guano (Lenoble et al., 2009; McFarlane, 2004). The third facies (C6, C7, C9 and C11) is formed by brown to light-brown massive silts, sometimes including limestone granules and pebbles. In places, the beds of this facies include small burrows around 10 cm in diameter containing abundant bone remains (C7). These burrows and the unconformable lower bed limits provide evidence of the secondary reorganization of the deposit. The fourth facies is composed of fallen rocks of different sizes with interstitial voids filled by small limestone fragments. The two "éboulis" included in this facies (C4 and scree between C6 and C7) were each the result of a discrete event (Ford and Williams, 2007).

2.2. Chronology

Radiocarbon dating was conducted on organic silts (Table 1) as bones were found to contain insufficient collagen to provide dates. Dating provides ages between 38,620 and 39,730 cal BP for the deepest layer (C12) and 9467–11,091 cal BP for the top of one of the uppermost layers (C3). These dates are linearly correlated with stratigraphic depth (Linear regression; $R^2 = 0.96$), thus allowing us to infer that the sedimentation rate did not vary significantly in the sequence. However, the superficial layers C1 and C2 were not directly dated. The only secure information we have is that these layers are overlain by an archaeological layer of pre-Columbian age dated to around 1000 AD (Grouard et al., 2014). This date and the regular rate of sedimentation in the cave point to an early to mid-Holocene age for layer C2, and a mid-to late Holocene age for Layer C1. This estimation is also corroborate by the beige silt facies of layer 1, pointing to a predominant role of salt weathering, and indicating a proximity of the shoreline, which is regionally known to stabilize around its present-day position in the mid-Holocene (Lambeck and Chappell, 2001).

3. Material and methods

The amphibian and squamate bone remains consist mainly of disarticulated elements collected by water-screening some of the