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Bones of giant lacertids from a new site on El Hierro (Canary Islands)

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Abstract. A new deposit of giant lacertids is described from a volcanic cave in the western part of El Hierro island. On the basis of an analysis of the 388 pieces found in this deposit, using both the literature and osteological material from Tenerife and El Hierro, it is concluded that three different species are represented: *Gallotia goliath* (Mertens), now extinct in the Canary Islands, *Gallotia simonyi* (Stein.) and *Gallotia galloti caesaris* (Lehrs). The two last species are still present on the island. The presence of *G. goliath* in this deposit represents the first record of this species in the island of El Hierro.

Introduction

All the lacertids on the Canary Islands belong to the endemic genus *Gallotia* Boulenger 1916 (Arnold, 1973). Four of the six species described from the islands are of considerable size. These four include *G. simonyi* (Steindachner, 1889) from the islands of Tenerife, La Gomera and El Hierro, *G. stehlini* (Schenkel, 1901) from Gran Canaria, *G. goliath* (Mertens, 1942) from Tenerife, La Palma and La Gomera, and finally *G. maxima* (Bravo, 1953) from Tenerife. These last two are likely to be considered a single species as already indicated by Gasc (1971). Populations of *G. simonyi* and *G. stehlini* still exist in the recent fauna of the islands. *G. goliath* is now extinct but the causes and precise data are the subject of frequent speculation and controversy among scientists (Mertens, 1942; Bravo, 1953; Arnold, 1973; Baez, 1983; Hutterer, 1985; Machado, 1985).

It is very unusual to discover fossil remains of these extinct forms in the Canaries, mainly due to the volcanic nature of the islands. However, lava tubes sometimes function as shelters for lizards, which, if they die there, may give rise to accumulations of bones and facilitates the formation of vertebrate deposits.

During March-April 1985, an expedition from the Speleological Research Group of Tenerife (GIET) discovered a new deposit in a cave in the western part of El Hierro.

Three months later A. Alcover and M. Trias visited the area and collected additional material which was kindly sent to us for analysis. This discovery is of great interest since these giant lacertids were not previously known from this island.

Deposit location and description

This deposit, found in a cave known as Cuaclo de Las Moleras, is located in the area of La Dehesa (fig. 1). Access to this cave is relatively easy: It is about 50 m to the left of the track running from Lomo Negroto Orchilla, between the mountains Tenaca and Quemada. The Cuaclo de Las Moleras, of UTM co-ordinates 28R897739, goes underneath a "tabaiba" field, including *Euphorbia obtusifolia, Rubia fruticosa* as well as some scattered *Juniperus phoenicea*, doubtless remnants of the ancient juniper grove which existed there (Darias y Padrón, 1980).

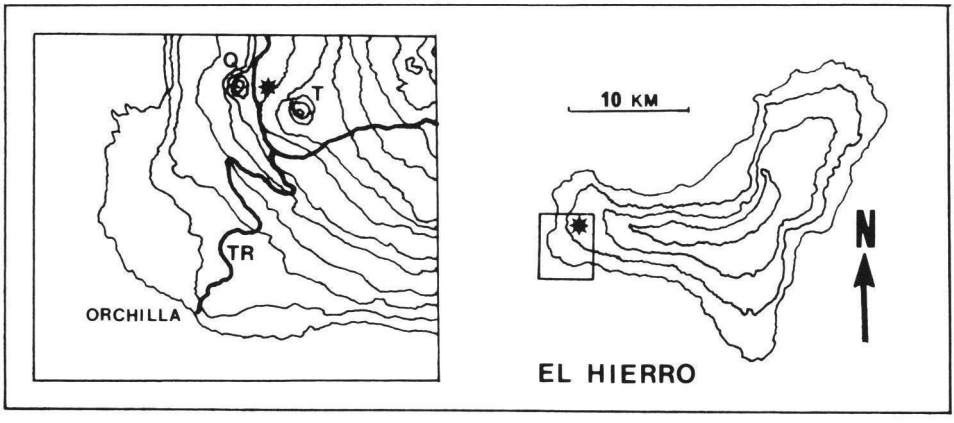

Figure 1. Location of the Cuaclo de Las Moleras deposit. T: Mt. Tenaca, Q: Mt. Quemada, TR: Track running.

The area of La Dehesa is formed mainly by materials of the Intermediate Serie B (Pellicer, 1977), and the original volcanic cones are still preserved. Tenaca Mountain is likely to have produced the lava that formed and shaped the Cuaclo de Las Moleras. This cave consists of a simple tube extending some 170 m and, according to Montoriol's volcano-speleological classification (Montoriol I Pous, 1973), it is of the volcanic-singenetic-reogenetic-subterranean type. It is divided into two relatively wide sections separated by a smaller inaccessible tube some 50 m long (fig. 2). Its upper section has three openings and therefore is considerably polluted by external material such as goat excrement; this place—a"cuaclo"—originally was used to house goats. Its lower section, located closer to the track, has a single narrow entrance, too low to walk upright along the first 10 metres. The floor is generally rocky, but small deposits of

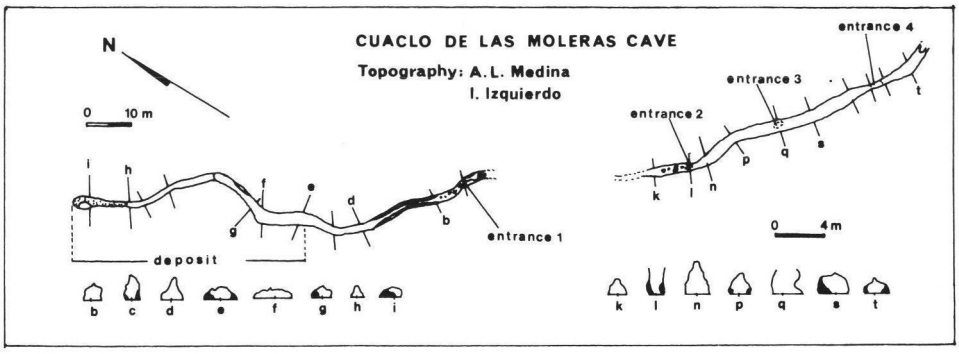

Figure 2. Cuaclo de Las Moleras Cave. Cavity and deposit topographic diagram.

sediment can be found in some places, possibly carried in either by water drainage from the entrance or by seepage through the cave ceiling.

The lacertid remains were found spread around the last 40 m of the lower section (fig. 2), and were probably carried along the cave with the other sediments. Most of the collected material was buried in small depressions in the volcanic rock and was partially covered by sediments. Additional bones were collected in the lowest part of the tube, at a depth of 1 m under a great accumulation of sediments (Alcover, pers. comm.).

Results

The collected bones were mostly in an outstanding state of preservation[1]. This was probably due to the narrow entrance to the cave and the low humidity. The total collection included 388 pieces of bone, which are detailed in table 1.

In order to identify the bones to species, we have consulted several papers on the lacertids of the Canaries (Steindachner, 1891; Schenkel, 1901; Mertens, 1942; Bravo, 1953; Hutterer, 1985). Additionally, we have compared the bones which those of *G. goliath* found in Tenerife[2], and with those of *G. simonyi* from another deposit in El Hierro[3].

Once the bones showing specific taxonomic features had been carefully analysed, we observed the following:

Maxillary and dentary teeth. Our material included teeth of all the three types stablished by Hutterer (1985) as characteristic of *G. goliath, G. simonyi* and *G. galloti*. However,

[1] The majority of this material is deposited in the collections of the Animal Biology Department (Zoology), University of La Laguna. A small fraction of it joined the collections of the Balearic Islands Nature Museum, City of Majorca (MNCM).

[2] Barranco La Arena Cave (1986), Barranco de Santos Cave (1986), Arafo Cave (1982), San Marcos Cave (1983); collections of the Tenerife Museum of Natural Sciences (TFMC).

[3] Guinea Deposit, El Hierro (1984). TFMC collections.

Table 1. List of lacertid bones found at Cuaclo de Las Moleras. Total of pieces collected 388.

Bone types	Quantity	Bone types	Quantity
Angulars	9	Clavicles	4
Cephalic capsules	7	Scapulae	6
Coronoids	2	Splenials	7
Dentaries	32	Pelves	20
Ectopterygoids	1	Humeri	7
Frontals	26	Cubits	3
Maxillaries	12	Radii	4
Parietals	19	Femora	18
Postfrontals	8	Tibiae	9
Prefrontals	5	Metacarpals	6
Premaxillaries	2	Metatarsals	1
Pterygoids	14	Sternum crosses	4
Suprarticulars	14	Ribs	57
Jugals	3	Vertebrae	66
Palatines	2	Unidentified bones	20

none of the teeth in these pieces show more than three cusps. The numbers of teeth, perfectly fit the described patterns for these species. *G. goliath*: one single maxillary with 27 teeth (length 51.8 mm), 7 dentaries with 34 teeth (length 53-65.2 mm). *G. simonyi*: 10 maxillaries with 17-24 teeth (length 16.6-30.5 mm), 22 dentaries with 21-26 teeth (length 21.6-38.9 mm). *G. galloti caesaris*: only one dentary with 17 teeth (length 12.6 mm).

Pterygoids. The pterygoid fragments show two types of tooth-bearing areas. Firstly, the characteristic *G. goliath* type exhibits two dental rows which converge towards the back, and secondly, *G. simonyi* has a single dental row. The number of small teeth in the 7 *goliath*-type pterygoids varies slightly (15-18 teeth). These were compared with more material from other deposits in Tenerife (13-25 pterygoidal teeth). In addition to these two dental rows, some of the larger pterygoids include a third dental area which is not as developed as the two rows (fig. 3). The total number of teeth in the third dental area ranged from 30 to 40.

In *G. simonyi* there was important variation, in the number of pterygoidal teeth arranged in the material from Cuaclo de Las Moleras and from the Guinea deposits the total range is from 2 to 9 teeth.

Cephalic capsules. The three pieces found in the Cuaclo deposit have large lateral apophyses; these are representative of *G. goliath*, and their length (22.3, 23.2, 19.7 mm) is twice that of the *G. simonyi* (12.8, 7.4, 7.4 mm) found at the Guinea deposit.

Parietals. The 19 parietals from the Cuaclo deposit all have an open foramen. In relation to the particular form of the parietal processus that constitutes the posterior closing of the skull roof, two well defined types have been noticed. This characteristic is generally accepted for taxonomic distinction, according to Hutterer (1985). Only 12

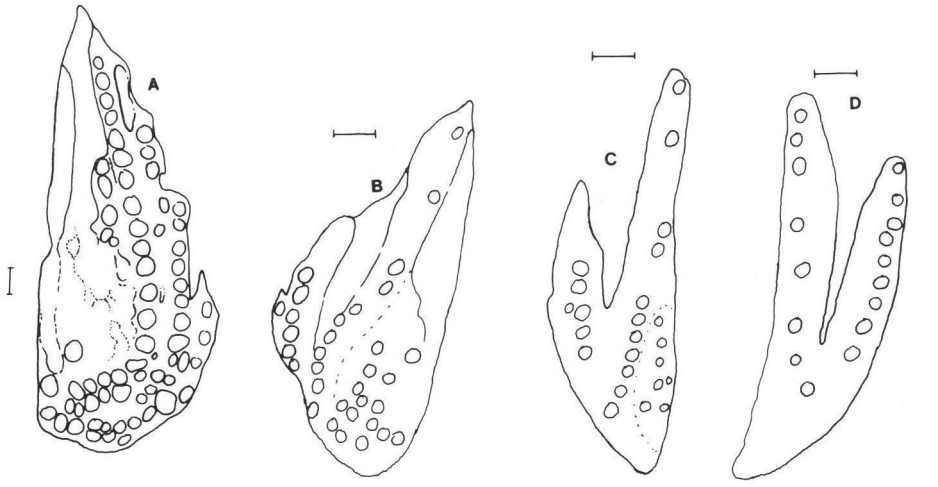

Figure 3. Pterygoid tooth area in various *G. goliath* pieces. A: Bravo's diagram (1953) in the description of *Lacerta maxima*. B: Lateral view of dental row in a specimen from Cuaclo de Las Moleras. C: Frontal view of the same specimen. D: Most frequent pterygoid type in the specimens from Tenerife and El Hierro. Scale: 1 mm.

parietals were analysed, the rest being incomplete. Seven of these were of the *goliath*-type, while the other 5 belonged to the *simonyi*-type (table 2).

Taking into account Hutterer's (1985) remarks about the length of the parietal processus, we have established the relationship 1/2 PGW/PPL (one half of the greatest width of the parietal plate/parietal processus length). The following table gives the results of these measurements, together with data from the bones found at other deposits in Tenerife and El Hierro.

Table 2. List of the 1/2 PWG/PPL ratios of species *G. goliath* and *G. simonyi* from the Tenerife and El Hierro deposits.

species	n	origin	1/2 PGW/PPL
Gallotia goliath	7	Deposit of Tenerife	(0.64-0.74)
Gallotia goliath	7	Cuaclo de Las Moleras	(0.61-0.75)
Gallotia simonyi	2	Guinea, El Hierro	(0.91-1.00)
Gallotia symonyi	5	Cuaclo de Las Moleras	(0.85-1.00)

From this table it can be deduced that the ratios 1/2 PGW/PPL varies from 0.61 to 0.75 for *G. goliath*, while it is higher for *G. simonyi*, approaching 1.00. However, the number of pieces analysed is still too small as to affirm that each of the species possesses a specific or characteristic ratio.

Discussion

The bigger specimens from this deposit were about 115 cm long as can be deduced from the measurements of the remains obtained. This large size is undoubtedly attained by lizards of the *goliath*-type and exceeds all figures given for *G. simonyi* in El Hierro Island (see Steindachner, 1891; Böhme and Bings, 1977; Martínez Rica, 1982). For this reason, it is possible that the historical evidence about the presence on the island of giant lizards of a size greatly exceeding that of *G. simonyi*, may in fact refer to *G. goliath*, and not to *G. simonyi*, as already suggested by Mertens (1942) (see Steindachner, 1891; Mertens, 1942; Bischoff et al., 1979; Martínez Rica, 1982).

The observed variations in the number of pterygoid teeth, both in bones from Tenerife and those found in El Hierro, do not conform to the observations of Hutterer (1985) on Canarian lizards. In *G. goliath* the teeth are typically in two converging rows, and the number of teeth varies even among pterygoids of the same size. The two pterygoids which have an additional tooth-bearing area, lateral to the main rows, agree perfectly with the drawing of Bravo (1953) in the original description of *Lacerta maxima*. It therefore seems doubtful whether variations in the pterygoids indicate the presence of two distinct species: it is more likely to represent variation within the species *G. goliath*, and may even be related to diet (Martın Oval, pers. comm.).

This discovery provides important information on the distribution of *G. goliath* on the western islands. Thus, three lacertid species are now known from El Hierro as well as from La Gomera and Tenerife. According to Abdel-Monem et al. (1972), the volcanic rocks of El Hierro were formed approximately 1.5 million years ago. This relatively young age of the island together with its remoteness from the African Continent, demonstrates the relative ease with which these lacertids have colonized the islands.

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