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# CUPULES IN CUBA: A REVIEW

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**Abstract.** Cupules are a form of rock art found in most parts of the world, including the Caribbean islands. Those of Cuba have rarely been considered a distinctive phenomenon. This article attempts to provide a generic summary of Cuban cupules and similar but larger mortar rocks, including a brief history of their discovery. Previously offered interpretations are reviewed, and descriptions of the thirty-four sites of their occurrence are presented. Small cupules tend to be steep-walled and probably involved indirect percussion or drilling, whereas large cupules suggest creation by direct percussion. Frequently groups of small cupules occur together with mortars on portable rock slabs but are more recent than the mortars. This consistency seems to indicate a quite specific cultural behaviour. Nevertheless, the production traces of the cupules are generally consistent with cupules on relatively soft rock elsewhere on Earth.

## 1. Introduction

Cupules are, in most (but not all) cases spherical cap-shaped depressions in natural rock surfaces, in most (but not all) cases under 10 cm in diameter and were mostly made by direct percussion (but not always) but were probably never made by abrasive motion (Bednarik 2008). They can occur in any orientation, and less than half of the world's cupules are found on vertical panels (Bednarik 2008). As a petroglyph, they were made intentionally. They are expected to possess some non-utilitarian or symbolic function, even though their production may also have involved utilitarian dimensions (for instance, in lithophones).

Very limited ethnographic information is available about the purpose and meaning of cupules, even though they are the most common form of petroglyph in the world (Bednarik 2010a). They have been reported from most cultural periods, from the Lower Palaeolithic to the 20th century, making it unlikely that they all shared a single meaning or purpose. Cupules occur on numerous types of rock, of all degrees of hardness up to and including hardness 7 on Mohs Scale. Those rendered on the hardest rock types entailed immense efforts to produce, involving tens of thousands of blows to create a single specimen (Kumar and Krishna 2014).

Cupules have been reported at numerous sites in North and South America, whereas reports from Mesoamerica and the Caribbean are relatively rare (Bednarik 2008, and references therein). In Cuba, the only 'modern' review focusing specifically on this subject shows that this phenomenon needs more investigation on the island (Gutiérrez-Calvache et al. 2014). The cited compilation reported eight petroglyph sites, providing a partial idea of the occurrence of this rock art manifestation. Since then, further historical records of specimens have come to light, and new investigations on Cuban archaeological sites have occurred. Moreover, some records in the Gutiérrez-Calvache et al. (2014) paper require an appropriate evaluation. For example, Cueva de las Charcas (Mayabeque province, western Cuba) was listed as a locality bearing cupules (op. cit., record No. 6 in Table I and II). However, the cup-shaped depressions there are not cupules; they lack the rounded rim shoulders nearly all cupules display. They are related to military activities and are recent traces of drilling the rocks (Fig. 1).

For this review, not only the literature on the topic was reviewed, but also the Cuban 'mortars' in the online collections of the Peabody Museum of Natural History at Yale University, Connecticut, U.S.A.; and the National Museum of the American Indian (Smithsonian Institution), Washington D.C., U.S.A.; the latter with 1709 Cuban archaeological objects from the expeditions of archaeologist Mark Harrington. Additionally, specimens in various museums in Cuba were reviewed, such as those of the Montané Museum of the University of Havana; the Municipal Museum of Rodas, Cienfuegos; the Municipal Museum of Fomento, Sancti Spíritus; and the 'mortar' collection of the Media Luna Museum, Granma province.

This paper will first provide a brief review of the history of Cuban research on cupules and cupule-like phenomena, beginning with the late 19th century and leading up to the present. This will be followed by

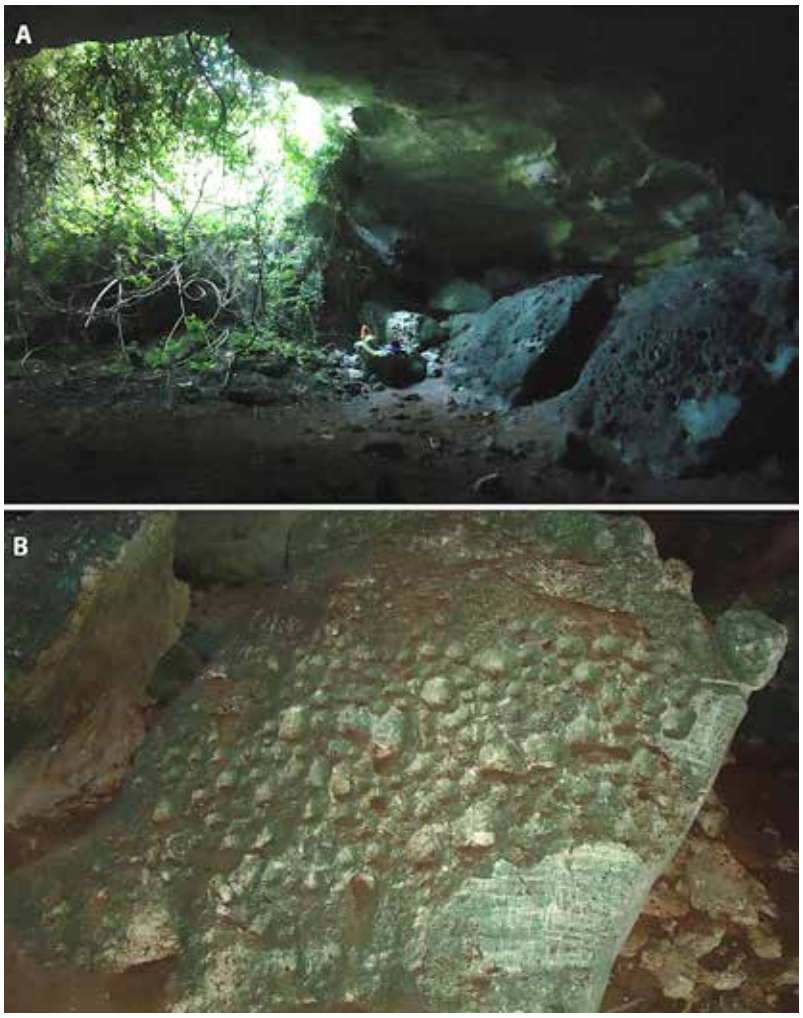


***Figure 1.*** *Cueva de las Charcas (Mayabeque province, western Cuba). (A) Cup-like depressions (not cupules) related to military activities. (B) Close-up of one rock with the drill marks.*

***Figure 2.*** *Depressions on a Cueva del Pueblo rock surface, Maisí, Guantánamo, eastern Cuba. Note the potential hammerstones. Image published by Mark R. Harrington (1921: Pl. XXXV).*

describing these features and their interpretation at all the sites we have considered in our review. Our interpretations of the empirical evidence will then be presented and summarised.

**2. History of research**

Cuban archaeologists did not adopt the term 'cupules' until very recently (Gutiérrez-Calvache et al. 2014). However, it is almost certain that this phenomenon was observed by those who first engaged in archaeological explorations or perhaps by those who visited caves or archaeological sites where they occur. Consequently, archaeologists in the last century used many other names to refer to utilitarian and non-utilitarian rock hollows made by the Indocubans. Much the same has been observed in the rest of the world, and Bednarik (2008) listed no less than 28 published names for the phenomenon. We follow the terminology introduced by the International Federation of Rock Art Organisations (IFRAO; see *http://www.ifrao.com/ifrao-glossary/*).

Thus, the first mention related to cupules or 'dimpled stones' available in the Cuban archaeology literature comes from observations made by the renowned anthropologist Luis Montané Dardé (1849–1936) in the cave known as Pico Tuerto del Naranjal or Gruta del Purial (Banao, Sancti Spíritus province), in 1888 (Morales-Patiño 1950). In his report of 1906 to the Thirteenth International Congress of Anthropology and Archaeology in Monaco, he mentioned '… a series of flat stones […] with the surface depressed to the centre as used by friction (and) a domed flat stone' next to monkey teeth and mandible found in the cave (Montané 1906). One of those stones caught Montané's attention, and ten years later, at the Second Pan-American Scientific Congress held in Washington in 1916, he noted that 'it is the stone called dimpled stone in Argentina. It shows coarsely carved edges and in the centre of both faces a depression that indicates a prolonged use; and on each side of this central depression, a series of conical-shaped excavations, destined to break corojos [oily palm nuts]' (Montané 1916). Montané originally used the name domed stone ('piedra cupulada'). However, years later, he changed to dimpled stones ('piedra de hoyuelos'), a term widely adopted by several Cuban archaeologists of the first half of the last century and since has been usually associated with the activity of breaking seeds.

In contrast, perhaps the earliest mention reporting utilitarian and/or non-utilitarian rock hollows made by the Cuban indigenes was by Mark Harrington (1921), who visited several sites in eastern Cuba about 1915.


***Figure 3.*** *Rocks with cup marks collected by Mark Harrington about 1915 in Maisí, Guantánamo province (eastern Cuba) and housed in the collection of the National Museum of the American Indian. (A) NMAI-16/1115, stone with five pits, Big Wall Site, San Lucas; (B) NMAI-4/8529, large pitted stone, Laguna Limones Village Site; (C) NMAI- 4/5733, fragment of stalagmite with crude face carved on it, Cave near Jauco, Jauco; scale 10 cm; (D) NMAI-4/4959, two pitted stones, Village Site, Monte Cristo; (E) NMAI-8/2900, fragment of large pitted stone with groove around projecting end, Big Wall Site; (F) NMAI-4/5445, pitted stones (11 specimens), Village Site, Río Caleta, east of Jauco; scale 10 cm.*

***Figure 4.*** *'Rock mortar with dimples' collected by Montané in Gruta del Purial and examined by Morales-Patiño (1950).*

He observed those artefacts on the surface of several rockshelters and named them 'stationary mortars', suggesting a utilitarian character for them (Fig. 2). Additionally, he also collected several petroglyph specimens with cup marks, today housed in the National Museum of the American Indian (Smithsonian Institution), which appear labelled as 'pitted stones' (Fig. 3).

Morales-Patiño was very interested in Montané's research and examined the material collected from Gruta del Purial (also called Cueva del Indio) and deposited it in the Museum of the University of Havana (today Montané Museum of the University of Havana) (Fig. 4). He studied the 'dimpled mortars', regarding them as irregular, round, hemispherical or ovoid, and noted that they show no signs of use. However, he initially believed that their enigma had been solved by the archaeologist René Herrera Fritot, who stated that they were only 'natural cavities in certain stones, precisely used as mortars by the natives' (Morales-Patiño 1950). In September 1946, Morales-Patiño visited the El Garrote site (Banao, Sancti Spíritus province) and found '… 12 large mortars, some double, and one of them with two on the same side. Several of these mortars have pits […] without utilitarian application by the primitive man …'. He also examined two flat stones with multiple hollows from the collection of Dr Juan Cros Capote in Baracoa (eastern Cuba). He learnt that in 'El Mango', Banes, there was a large slab bearing depressions in a river, which he examined a few years later (Morales-Patiño et al. 1950). Unfortunately, there are indications that a certain number of specimens collected by Morales-Patiño from the El Garrote site were transferred to Havana in 1947 by members of the Guamá group, but their whereabouts are today unknown.

Incidentally, Patiño's publications must be considered as the first generic approach to the subject — considering the timeframe — but it did not appear cited in the most recent review (Gutiérrez-Calvache et al. 2014). It was this seminal work of Morales-Patiño et al. (1950) that introduced the terminology of mortars and related dimpled stones (stationary mortars in Cuba, synonymous with 'pylons' [in Venezuela], 'bedrock mortars' and 'cup stones' [in the United States], '*pierre a cupule*' [French denomination], 'portable mortars', 'pestles', 'pitted stones' and 'multiple micro-mortars'). Oswaldo Morales-Patiño made great contributions to Cuban archaeology and had a strong interest in the

dimpled stones and mortars (Fig. 5). His research was presented within the framework of the last session of the Round Table Meeting of Caribbean Archaeologists, which took place in Havana in 1950. There, important discussions were held on the subject, and a scientific exchange was made about this archaeological manifestation in Cuba and other latitudes (Junta Nacional de Arqueología y Etnología 1951). For the occasion, archaeologists from several countries accompanied Patiño and carried out fruitful excavations at various archaeological sites, including El Mango and Mulas (Banes, eastern Cuba). In Mulas, a large stone with 'fixed mortars' was found and briefly investigated (Morales-Patiño et al. 1950).

In the second half of the 20th century, some papers referred to dimpled stones, and in most cases to what has been called 'mortars' in Cuban archaeology (Dacal and Rivero de la Calle 1984), or 'fixed mortars' (Guarch 1978). In the 1980s, archaeological fieldwork continued in Sancti Spíritus, now headed by researcher Luis Olmo Jas, who relocated some of the classic localities visited by Montané, including Gruta del Purial.

Olmo Jas collected several mortars and cupule rocks at El Garrote, one of the classic sites visited by Morales-Patiño. Taking El Garrote as a point of reference, the Banao and Jarico III archaeological sites were located on the left bank of the Banao river, the El Maracho site next to the Manacas stream, and Gruta del Purial, the furthest site, at an elevation close to the Higuanojo river. The sites on which attention was focused were El Garrote, Banao and El Maracho — the first for being the main source of information on Banao rock art, the others because the evidence appeared in them, especially in the recently rediscovered El Maracho, where three mortars with cupules like those of El Garrote were found. Although it was impossible to compare the 'flat stones' observed by Montané in Purial — where nothing remains — with those of the rest of the sites, the new specimens allow a better understanding of the archaeological abundance of the area. The collected material is preserved in the local Samá group, in the museum of La Sierpe and in the Provincial Museum. However, despite these findings and others in other places on the island, cupules went unnoticed due to the assumption that they were used to break seeds until the reports of Guerrero et al. (2000) and Gutiérrez-Calvache et al. (2014).

***Figure 5.*** *Archaeologist Oswaldo Morales Patiño examining the 'rock mortars' and 'dimpled stones' found in the cliffs named 'La Virtud', Banao, Sancti Spíritus. Exploration Guamá group, 1946.*

## 3. Known distribution of the cupules across the island

Our research has yielded a list of thirty-four sites of identified or potential cupules in the territory of Cuba (excluding Cueva de las Charcas). These sites are listed in Table 1. Their locations within the island are indicated in Figure 6, which shows occurrences of such phenomena in six of the territories of Cuba. Nearly all these sites are described in the following subchapters.

### *3.1. Cueva del Pueblo*

The North American archaeologist Mark R. Harrington (1882–1971) explored in 1915 a series of interconnected rockshelters near Jauco, Maisí, Guantánamo (eastern Cuba), and named one of them Cueva del Pueblo (Village Cave). There, he observed several stone mortars, but also stationary mortars, referring

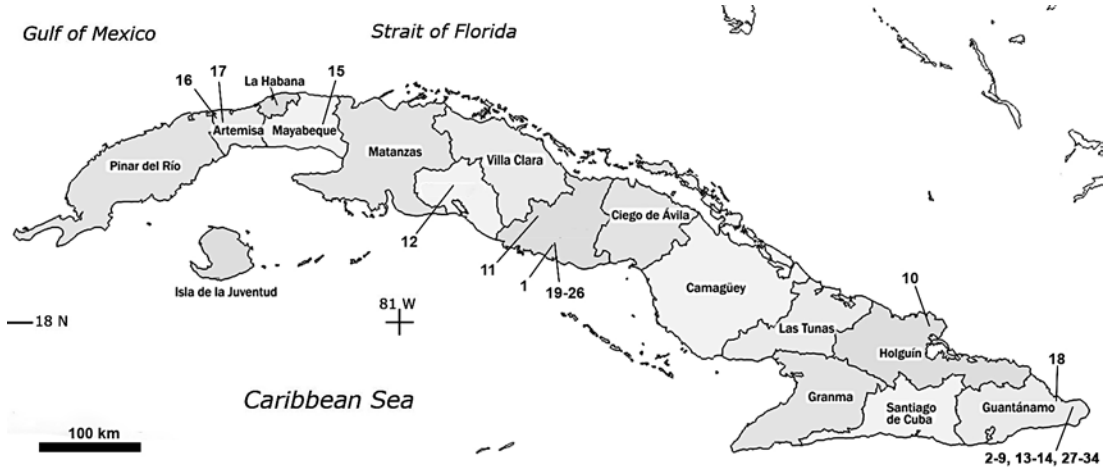


***Figure 6.*** *Map of Cuba, showing the locations of the 34 sites listed in Table 1.*

| # | Petroglyph sites/specimens | No. | C | M | Lithology | Location | Source |
|---|---|---|---|---|---|---|---|
| 1 | Cueva del Purial | ? | ? | ? | | Banao, Sancti Spíritus | Morales-Patiño (1950) |
| 2 | Cueva del Pueblo | 6? | X | | Limestone | Maisí, Guantánamo | Harrington (1921) |
| 3 | Cueva de los Pedernales | ? | | X | Limestone | Maisí, Guantánamo | Harrington (1921) |
| 4 | NMAI-16/1115 - Big Wall-San Lucas | 5 | X | | ? | Maisí, Guantánamo | This paper |
| 5 | NMAI-4/8529 - Laguna de Limones | 2+ | X | | ? | Maisí, Guantánamo | This paper |
| 6 | NMAI- 4/5733 - Cave near Jauco | 2+ | X | | ? | Maisí, Guantánamo | This paper |
| 7 | NMAI-4/4959 - Monte Cristo | 4? | X | | ? | Maisí, Guantánamo | This paper |
| 8 | NMAI-8/2900 - Big Wall | ? | X? | | ? | Maisí, Guantánamo | This paper |
| 9 | NMAI-4/5445 - Río Caleta | 8+ | X | | ? | Maisí, Guantánamo | This paper |
| 10 | Gran laja de los Morteros Fijos | 6 | X? | | ? | Banes, Oriente | Morales-Patiño et al. (1950) |
| 11 | Gavilanes | 5 | X | | Volcanic | Fomento, Sancti Spíritus | This paper |
| 12 | Cueva Tres Bocas de Tanteo | 20+ | X | | Partially silicified limestone | Rodas, Cienfuegos | This paper |
| 13 | Cueva de los Pilones | 7 | ? | ? | Limestone | Maisí, Guantánamo | Gutiérrez-Calvache et al. (2014) |
| 14 | Piedra de los Pilones (María Teresa II) | 6+ | | X | Limestone | Maisí, Guantánamo | Gutiérrez-Calvache et al. (2014) |
| 15 | Solapa de las Tacitas o Morteros | 200+ | X | | Limestone | Madruga, Mayabeque | Guerrero et al. (2000) |
| 16 | Solapa de Sabanilla o de los Sacrificios | 60? | X? | | Carbonate speleothem | San Cristóbal, Artemisa | Gutiérrez-Calvache et al. (2014) |
| 17 | Cueva de la Jarra | 35? | X? | | Carbonate speleothem | San Cristóbal, Artemisa | Gutiérrez-Calvache et al. (2014) |
| 18 | Solapa Cananigüín | 8 | X | | Limestone | Yara, Guantánamo | Fernández-Ortega et al. (2017) |
| 19 | Laja cupulada | 12 | X | | Carbonate schist | Banao, Sancti Spiritus | Olmo Jas (2020a) |
| 20 | Piedra de las Estrellas (2-sided) | 17 | X | | Carbonate-micaceous schist | Banao, Sancti Spiritus | Olmo Jas (2020a) |
| 21 | Mortero de la Osa Mayor | 8 | X | X | Carbonate shale | Banao, Sancti Spíritus | Olmo Jas (2020a) |
| 22 | Guijarro cupulado | 8 | X | | Carbonate shale | Banao, Sancti Spíritus | Olmo Jas (2020a) |
| 23 | Piedra de las Cabritas | 7 | X | | Micaceous schist | Banao, Sancti Spíritus | Olmo Jas (2020a) |
| 24 | Laja cupulada | 3 | X | | Micaceous schist | Banao, Sancti Spíritus | Olmo Jas (2020a) |
| 25 | Mortero doble cupulado (2-sided) | 7 | X | X | Carbonate schist | Banao, Sancti Spíritus | Olmo Jas (2020a) |
| 26 | Mortero cupulado | 6 | X | | Carbonate schist | Banao, Sancti Spíritus | Olmo Jas (2020a) |
| 27 | Cueva de Pinart | 33+ | X? | X? | Limestone | Maisí, Guantánamo | This paper |
| 28 | Cueva de Alta Gracia | 3 | | X | Limestone | Maisí, Guantánamo | This paper |
| 29 | Cueva de las Constelaciones | 8 | X? | | Limestone | Maisí, Guantánamo | This paper |
| 30 | Cueva del Cangrejo | 1 | | X | Limestone | Maisí, Guantánamo | Fernández-Ortega et al. (2017) |
| 31 | Cueva del Guamo | ? | X? | | Limestone | Maisí, Guantánamo | This paper |
| 32 | Cueva de la Vigía No 5 | 4 | X? | X? | Limestone | Maisí, Guantánamo | This paper |
| 33 | Cueva del Bagá, Pozo Azul | 4 | X? | X? | Limestone | Maisí, Guantánamo | This paper |
| 34 | Cueva de la Yagruma | 10 | X | | Limestone | Maisí, Guantánamo | This paper |

***Table 1.*** *Updated list of sites/specimens investigated in this paper (modified from Gutiérrez-Calvache et al. 2014). C = cupules, M = mortars.*

to them as follows: 'The last shelter on the eastern end of the line, next to the Caleta cañon, is formed by an enormous rock which has rolled down from the cliff in ages past, and now stands some distance from it, leaving a small gully between them. We were surprised to find several good-sized mortar holes pecked in the

rock, as shown in the photograph, while another was discovered in the ledge between the last shelter and the brink of the cañon' (Harrington 1921).

The 'mortar holes' were illustrated by (Harrington 1921: Pl. XXXV) and reproduced by Morales-Patiño et al. (1950: Fig. 6) and Gutiérrez-Calvache et al. (2014: Fig. 5B). The original photograph shows at least six holes in an inclined rock surface (Fig. 2). Considering the size of the apparent hammerstones as a scale, the depressions should be more than 10 cm in diameter. They were listed by Gutiérrez-Calvache et al. (2014: No. 1 in Tables I and II) and classified as mortars.

*3.2. Cueva de los Pedernales*

Harrington (1921) mentioned the occurrence of rock mortars at Cueva de los Pedernales: 'Rarer objects were two shell beads, a bone ring or bead of unknown use, and a double stone mortar and its grinding stone, still red for reducing hematite for paint. This was a portable mortar, but there was also a natural shelf at the point shown in the plan containing two stationary mortars — cup-shaped holes pecked into the rock and used for that purpose'. Harrington explored the cave in 1915 and partially described it in his work *Cuba before Colombus* (Harrington 1921). According to this author, the cave is located on the first emerged terrace of Punta de Maisí, Guantánamo province (eastern Cuba), about 5.5 km northeast of Patana Abajo and about 5.0 km south-southeast of the rural settlement of Maisí.

This record was listed by Gutiérrez-Calvache et al. (2014, No. 2 in Table I and II) and classified as a mortar but not illustrated, and according to these authors, there are no published photographs of the specimen.

*3.3. Harrinton specimens*

Harrington also collected, excavated, or acquired some rocks with cup marks from some localities in Maisí, Guantánamo Province (eastern Cuba), in about 1915. These specimens are now housed in the collection of the NMAI under the catalogue numbers NMAI-16/1115, 4/8529, 4/5733, 4/4959, 8/2900 and 4/5445 (Fig. 3).

*3.4. Gran laja de los Morteros Fijos*

Morales-Patiño et al. (1950) reported a stone with six depressions and referred to them as '*La gran laja de los morteros fijos de Banes*' (Fig. 7). The locality was reported as 'in front of the house of Luis Fernández, Vereda de Mulas, Banes, Oriente'. The rock-bearing depression is about 2.20 m in its larger diameter, and 1.90 m in its smaller diameter, with an average thickness of '1.5 feet' as was reported. Originally, it must have had six cup marks, three in its upper part and another three, somewhat more separated from each other in its lower part, but the last one on the right of the lower portion was lost. According to Morales-Patiño et al. (1950), the stone was broken by Mrs Dulce Bacci Facci, known for her activities as a collector of archaeological specimens to sell later. She broke the rock to extract 'one of the mortars', precisely the one in the lower right portion (Morales-Patiño et al. 1950). The whereabouts of this fragment and the main specimen are unknown.

*3.5. Cueva de los Pilones*

According to Gutiérrez-Calvache et al. (2014), at least seven depressions were found in a rockshelter on the cliff of the second level of the emerged marine terraces, about 2700 m south of the settlement of Patana Abajo. The site was reported in the 1990s by members of the Guatiao Archaeological Project, which made explorations in the territory of Punta de Maisí, in the easternmost part of the island. Unfortunately, they did not keep graphic records of their findings. However, according to José González Tendero, cited in Gutiérrez-Calvache et al. (2014), the depressions measure between 5 and 7 cm in diameter and 3 cm deep, are in the rock surface of the shelter and aligned with the edge of the top roof. This record was listed by Gutiérrez-Calvache et al. (2014, No. 3 in Table I and II) but not classified, as there is not enough evidence that allows at least a basic evaluation.

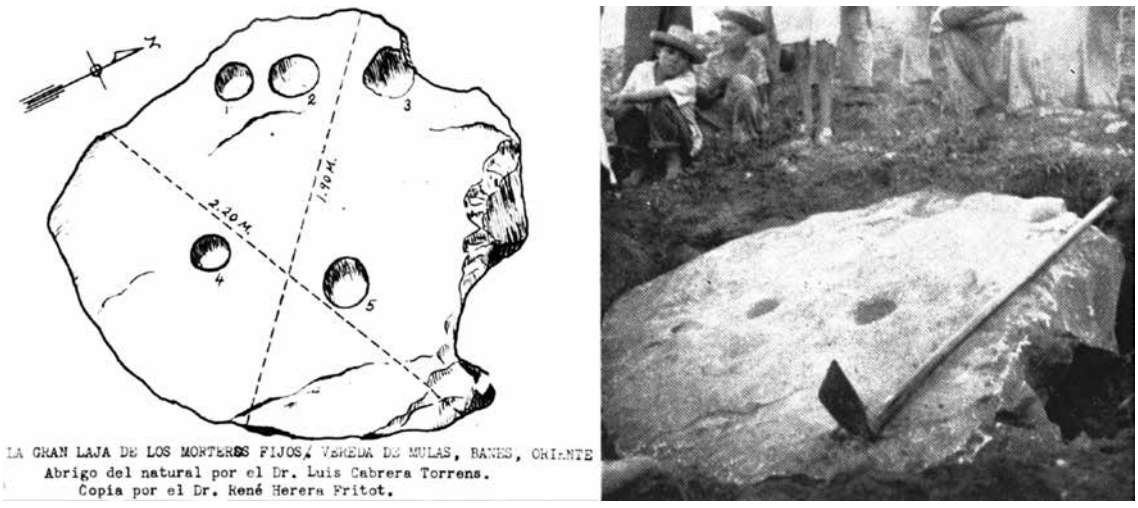


***Figure 7.*** *Gran laja de los Morteros Fijos, Banes, eastern Cuba. Left: line drawing of the specimen by Luis Cabrera Torrens, 1950. Right: original photograph by Morales-Patiño et al. (1950).*

***Figure 8.*** *Specimen named Piedra de los Pilones (María Teresa II), from Maisí, Guantánamo, eastern Cuba. Note the yellow arrow pointing to the potential hammerstone and the heavily weathered pits on the limestone (photo by Daniel Torres Etayo in Gutiérrez-Calvache et al. 2014).*

*3.6. Piedra de los Pilones (María Teresa II)*

This record was listed by Gutiérrez-Calvache et al. (2014, record No. 4 in Table I and II) and classified as a mortar (Fig. 8). The locality is reported as 'about 150 metres to the NW of the dairy water tank that exists today in that area' near the María Teresa II archaeological site, which is located 'about 10 km SW of the town of Maisí, province of Guantánamo, eastern Cuba, in the area between Patana Arriba and Patana Abajo' (Guarch 1978; Gutiérrez-Calvache et al. 2014). There, researchers from the National Centre for Conservation, Restoration and Museology (CENCREM) found a karstic limestone outcrop with numerous depressions, which were considered mortars and, right next to them, a pestle most likely used in the percussion and maceration process (D. Torres Etayo, cited in Gutiérrez-Calvache et al. 2014).

*3.7. Gavilanes*

This specimen is on display at the Municipal Museum of Fomento, Sancti Spíritus province, central Cuba (Fig. 9). It was collected on the surface (without any other archaeological evidence) by a farmer, near Gavilanes, Fomento (Sancti Spíritus), in 1986, donated to Bárbaro Pérez Colina (pers. comm. 2022) and transferred to the museum. The isolation of the specimen suggests that it was removed from its original location. According to Pérez Colina, the rock is likely of volcanic origin, without specifying the type. The diameter of the depressions varies between 2 and 3 cm. This specimen is very similar to the specimen illustrated by Dacal and Rivero de la Calle (1984) (Fig. 10).

*3.8. Cueva Tres Bocas de Tanteo (the Rodas specimen)*

This specimen, which we named the Rodas specimen (Fig. 11), was discovered in 1989 in Cueva Tres Bocas de Tanteo, which also includes pictograms and other petroglyphs. The cave is located between the Anaya, Jabacoa and Damují rivers in Rodas, Cienfuegos, south-central Cuba, and belongs to the Palo Liso – Las Glorias archaeological rock art complex (Rodríguez Matamoros and Borges Sellén 2001). The first information about the existence of rock art in the cave dates to 1987, when members of the Jabacoa speleological group carried out speleological cartography. The initial discoveries were made by José Echeverría, at that time director of the Rodas museum.

On the sediment surface, both outside and inside the cave, abundant lithic remains were collected and observed, among them three flaked cores, 15 irregular flakes and one small, retouched flake. A secondary human burial, with red-coloured bones associated with a stone dagger, was also found in 1994. An analysis of residual collagen in the human bone samples from the burial showed an antiquity of 2120 ± 40 years bp, according to laboratory tests made by Jorge B. de la Torre. A whistle made from a nail of *Megalocnus rodens*, a ground sloth of the Cuban Quaternary fauna, was


***Figure 9.*** *The Gavilanes specimen on display in the Municipal Museum of Fomento, Sancti Spíritus province, central Cuba (photo: Bárbaro Pérez Colina, July 2022).*

***Figure 10.*** *A 'multiple mobile mortar' illustrated by Dacal and Rivero de la Calle (1984).*

also found.

The cave opens in the lower Middle Eocene Rodas Formation, which is characterised by a limestone lithology, including white marls, porous white limestone, partially silicified, compact, clayey limestone, biogenic detrital limestone, light grey or greenish-grey loams and silicates, and it is common to find large blocks and nodules of various sizes. Interestingly, the cave has several cylindrical natural holes (skylights or *claraboyas*) in the roof, and some are apparently intentionally blocked with rocks so that images of half-moons are projected when the sun is at its zenith (C. R. Borges-Sellén, pers. obs.). The possible presence of a primitive seasonal solar marker inside the nearby 'Gruta La Siguaraya' suggests complex socio-religious activities by the groups concerned (Rodríguez Matamoros and Borges Sellén 2001).

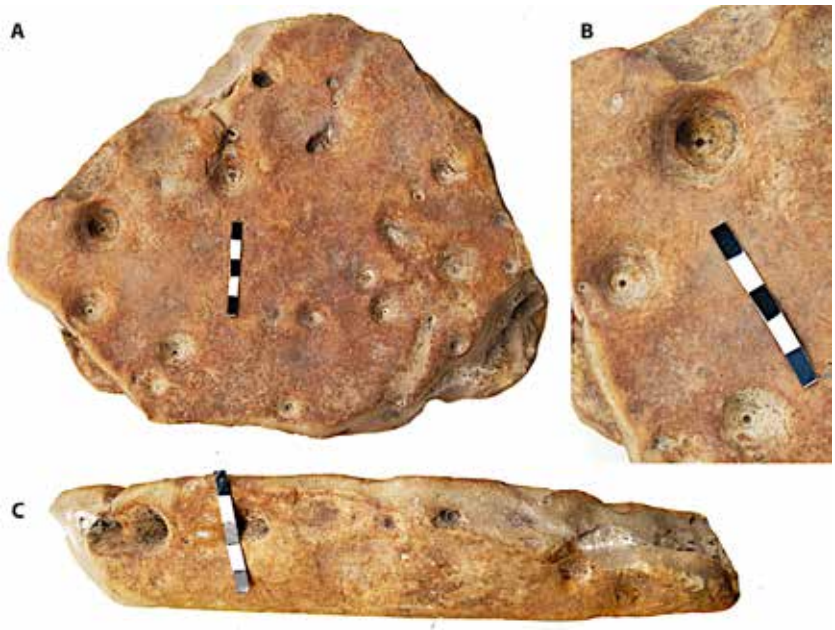


***Figure 11.*** *(A) The Rodas specimen, from Cueva Tres Bocas de Tanteo, Rodas, Cienfuegos, south-central Cuba; (B) close-up of the cupule-like depressions; (C) lateral view of the specimen (scale in cm).*

The Rodas specimen (Fig. 11) seems to be a slab of partially metamorphosed (silicified) limestone of laminar composition. The latter may account for the markings within the cup marks. In our opinion, some of the depressions, especially around the edges and perhaps some of the small pits, are natural features, but the distinctly cupule-like marks are probably artificial. They are certainly not potholes and there is no realistic natural explanation, but their shape is typically cupule-like, with well-rounded shoulders. They could be responses to the natural marks. However, a determination of 100% certainty seems impossible from the photograph.

*3.9. Solapa de las Tacitas o Morteros*

According to González (2011), the rockshelter was discovered or investigated by members of the Alejandría speleological group on 28 February 1998, a date that matches with the beginning of the explorations of the Alejandría group in Biajacas (Madruga, Mayabeque province, western Cuba), as mentioned by Guerrero (1998). Gutiérrez-Calvache et al. (2014) indicated that on 25 July 1998, members of the Alejandría group 'reported to Cuban science a site that they named Solapa de las Tacitas o Morteros' and cited Guerrero et al. (2000). Discovering and reporting might have different dates; however, this rockshelter was known and visited by members of the Copey speleological group of Madruga and Combate de Moralitos of San José de las Lajas since 1986, while exploring the row of shelters near the Biajacas river (Fig. 12).

The site was briefly reported by Guerrero et al. (2000) as a karstic rockshelter with an 'accumulation of numerous cavities or depressions', which constitute 'a kind of petroglyph'. According to Guerrero et al. (2000), the rockshelter is 11 m high, 12 m deep and 20 m long, with the entrance towards the south and about 50 m from the east bank of the Biajacas river, ascending through a profile that presents a referent inclination to the river, of approximately 20° from the shelter's inside to the bank. Inside the shelter, around 200 cupule-like features are distributed on a rock

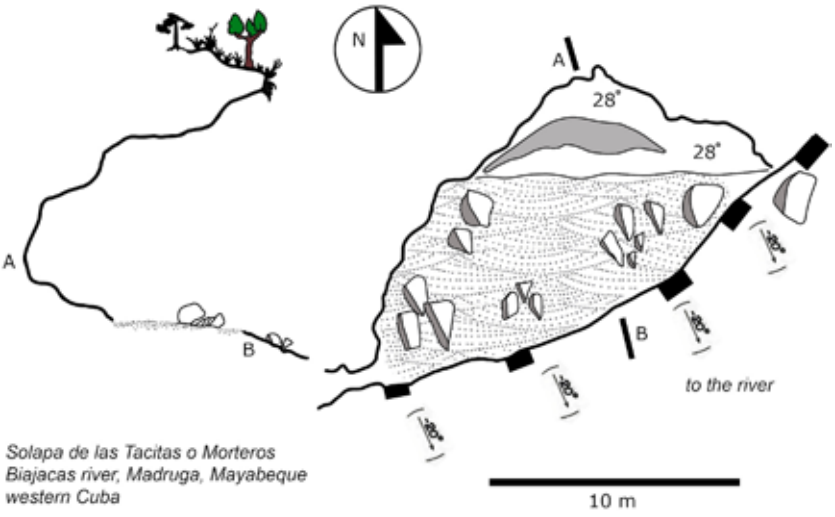


***Figure 12.*** *Cartography of the Solapa de las Tacitas o Morteros (Madruga, Mayabeque province, western Cuba). Cupules occur in the area marked with grey colour (redrawn by JOL from original).*


***Figure 13.*** *Cupules from the Solapa de las Tacitas o Morteros (Madruga, Mayabeque province, western Cuba). (A) Set of cupules on the left part of the shelter; (B–D) cupules with calcium carbonate and ash; (E–F) cupules with black accretion in the bottom.*

surface and inclined at approximately 25° (Fig. 8 in Gutiérrez-Calvache et al. 2014). The rocks in this area belong to the early Miocene Husillo Formation, representing a shallow marine limestone section (Iturralde-Vinent 1972).

Gutiérrez-Calvache et al. (2014) reported the depression measurements as between 2 and 9 cm in diameter and between 2 and 5 cm deep, while González (2011) differentiated three sizes: the large ones are 8–9 cm wide by 5 cm deep, the medium ones are 5–6 cm wide by 4 cm, and small ones are 3–4 cm wide by 2 cm deep, and the source (Guerrero et al. 2000) also distinguished three: large (8 × 2.5 cm), medium (6 × 4 cm), and small (2 × 2.5 cm). González (2011) referred to some of these depressions as 'mortars', pointing out that '... a group of them are sealed with a binding material — like a mortar — with calcium carbonate and ash'. However, the non-utilitarian character of the smaller depressions seems unquestionable.

Identifying distribution patterns for the cupules in the Solapa de las Tacitas o Morteros is difficult since it constitutes a large constellation of scattered circles and ovals, without a pattern or apparent organisation (Fig. 13). Cupules are joined from one to several of them, in different combinations, without the presence of other motifs in the shelter. They are both circular

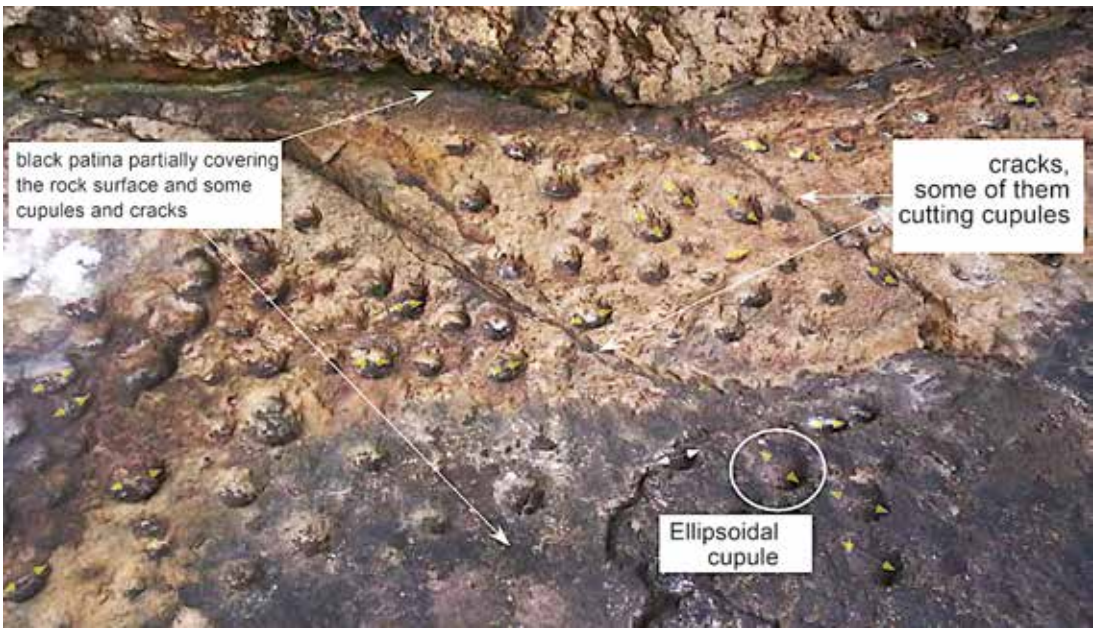


***Figure 14.*** *Solapa de las Tacitas o Morteros (Madruga, Mayabeque province, western Cuba). Note the black patina, some cracks, and the circular and ellipsoidal cupules, the latter with the long axis in different orientations. Photo modified from Gutiérrez-Calvache et al. (2014).*

and ellipsoidal in appearance, the latter with the long axis in different orientations (Fig. 14).

The rock surface includes cracks, some of which transect cupules, suggesting that the cracks postdate the cupules (Fig. 14). A black patina partially covers the rock surface containing the cupules and is also found on the interior of some cupules and cracks but does not reach a set of cupules further to the left. This set has a slightly more polished look that contrasts well with the rough surface of the remaining cupules. The nature of the black patina is unknown, but it could be associated with weathering, organic or mineral matter accretion, or soot deposited from fires. If the black patina can be identified and analysed, perhaps a minimum date could be established through radiocarbon analysis (Bednarik 2007, 2010a). The black patina seems to have spread over the rock surface from the highest part of it, that is, from below the wall to the lowest part or vice versa, being established mainly in the recessed and irregular parts, suggesting the occurrence of a process (natural or anthropogenic) contemporary with, or postdating the creation of the cupules, not before. Whatever the origin of this patina, it seems not to have affected the cupules on the left, favouring the ensemble's anthropic origin. The fact that these manifestations do not occur on the wall or where the inclined plane is ending, nor in the most irregular area within the rock surface, suggests a selectivity in space when producing the cupules, which may explain their grouping. This last feature agrees with other examples in the international literature, where the cupules are preferably located on the highest part of the inclined supports (Ponzio and Reinoso 2013).

In addition, although without dating the situation in time is uncertain, the Solapa de las Tacitas o Morteros is located relatively close to a rich archaeological environment that includes elements that may be related, which requires further investigation. Explorations by the Copey speleological group, as well as field trips carried out by the Alejandría speleological group, have revealed the presence of abundant lithic and shell remains, including flint points, flint fragments, shell and bone workshops, fragments of marine molluscs, hammers, pestles, vessels, earrings, plates, double and single mortars (Guerrero 1998; Guerrero et al. 2000; González 2011). The occurrence of mortars in the nearby area would locate the petroglyph station close to grinding artefacts, which, if the contemporaneity of these sites were confirmed, could further support the idea of the non-utilitarian nature of the cupules of the Solapa de las Tacitas o Morteros. Relatively close is another rockshelter, named 'Solapa funeral El Carpintero', originally known by the Copey group as 'Solapa de las Avispas' (Suárez-Sardiñas, pers. comm. 2022). In the latter, members of the Alejandría and Copey groups found a rich archaeological context with several burials, including several children and at least one adult.

*3.10. Solapa de Sabanilla o de los Sacrificios*

The site was discovered in 1980 by the speleologist Cristóbal Domínguez Lezcano, then a member of the Sabicú speleological group (Gutiérrez-Calvache et al. 2014). However, the discovery was not made public until early 2008, when the speleologist and historian Luis Formigo Espinosa described the morphology of the possible cupules found at the site and defined them as a series of symmetrical dimples, intentionally carved into a speleothem formation (Gutiérrez-Calvache et al. 2014). The site is located in the heart of the Sierra del Rosario, Cordillera de Guaniguanico, at the town of Tranquilidad, near the rural settlement of Niceto Pérez, San Cristóbal, Artemisa province, western Cuba. According to Gutiérrez-Calvache et al. (2014), there is a group of around 60 depressions with diameters between 2 and 7 cm and depths from 2 to

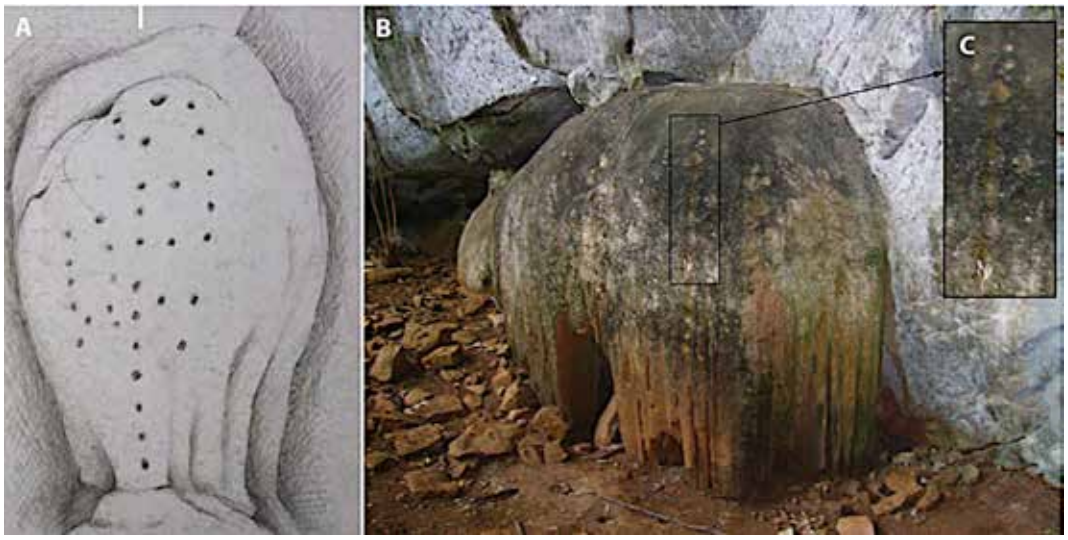


***Figure 15.*** *Poorly documented specimens from caves of San Cristóbal, Artemisa province, western Cuba. (A) Cardboard drawing of the stalagmite with a series of possible cupules, Cueva de la Jarra (drawing by Hilario Carmenate); (B) small depressions on the vertical surface of a secondary formation, Solapa de Sabanilla o de los Sacrificios (photo: Luis Formigo Espinosa [†]), with (C) close-up of the depressions.*

***Figure 16.*** *A set of cupules on the vertical surface of a karstic dome, Solapa Cananigüín, Boma, Baracoa, Guantánamo, eastern Cuba.*

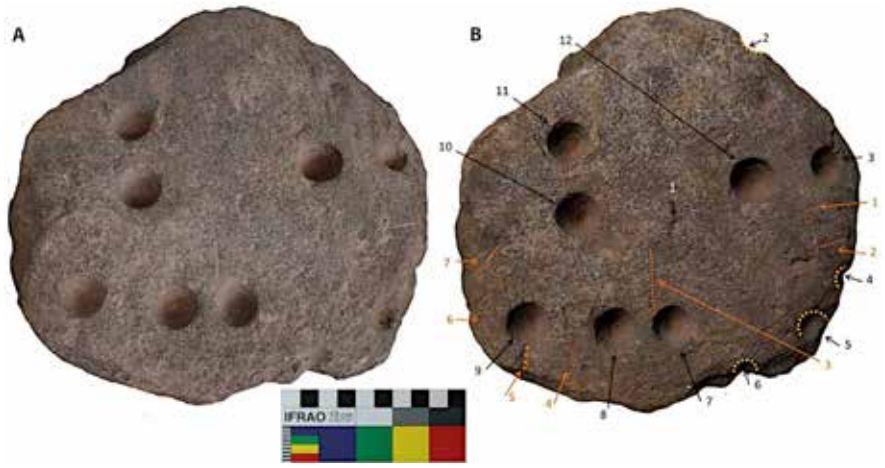


***Figure 17.*** *Petroglyphs from Laja cupulada, El Garrote site, Banao, Sancti Spíritus province, central Cuba (photo: Luis Olmo Jas, June 2022).*

6 cm, which were made on the vertical surface of a secondary formation and grouped linearly. However, only a few marks are observed in the single available photo (Fig. 15B). Interestingly, on the shelter floor, two fractured limestone slabs were found, in whose centre a concave depression resembling a cup mark was observed (Gutiérrez-Calvache et al. 2014). The record was listed by Gutiérrez-Calvache et al. (2014, No. 7 in Tables I and II) and classified as cupules.

*3.11. Cueva de la Jarra*

Cueva de la Jarra is located close to the canyon of the river Santa Cruz, to the east-northeast of the Solapa de Sabanilla or Los Sacrificios. The site was reported in 1980 by the speleologist mentioned above, Cristóbal Domínguez Lezcano (Gutiérrez-Calvache et al. 2014). According to Hilario Carmenate (ibid.), a stalagmite presented a series of about 35 possible cupules on its north face. Unfortunately, this evidence was destroyed, and the only known recording of this specimen is a drawing on cardboard (Fig. 15A) provided by Hilario Carmenate, who made it during one of his visits to the cave. According to the drawing, the cup marks are in a relatively vertical (curved) plane on one side of a stalagmite. However, the drawing without scale and the absence of more data on the archaeological context prevent a proper evaluation.

*3.12. Solapa Cananigüín*

Fernández-Ortega et al. (2017) reported eight cupules in a rockshelter located about 10 m from the dry course of the Cananigüín river in Boma, Baracoa, Guantánamo, eastern Cuba (Fig. 16). The river is currently seasonal, but there is sediment from the river in the entire front of the shelter, suggesting past floods. A clast of approximately 1.50 m in diameter and 0.40 m high is almost in the centre of the shelter, bearing a set of eight corroded cupules. Even when the cupules are located practically below the drip line of the rockshelter, they show evident traces of work. Anthropic debris typical of subsistence activities was observed on the surface of the shelter, such as *Polymita* sp., *Codakia* sp., *Cittarium* sp., *Polydontes* sp., *Zachrysia* sp., *Caracolus sagemon*, *Strombus* sp., *Scarus vetula* (parrotfish) and numerous ceramics remains, which suggest a relatively prolonged occupation at the site (Fernández-Ortega et al. 2017). Furthermore, two 'fixed mortars' were also found in the shelter (R. Ordúñez, pers. comm. 2022).

*3.13. Laja cupulada*

The archaeological site is located 2 km northwest of Banao at an altitude of 127 m, on a cliff southeast of El Garrote hill (Olmo Jas 2020a). The wide rock overhang yielded in its earliest sediment levels *Megalocnus rodens* (Pleistocene and early Holocene ground sloth) bones next to hearth remains, with dietary remains and flint. From excavations during the 1970s and 1980s, overlapping evidence was obtained of appropriating communities in all its stages. From the mound's surface to the right bank of the El Garrote stream, there are signs of a brief human occupation, which left two rock art murals on the cliff and utensil remains scattered in the area.

The engraved slab was collected by the Samá speleological group from the sediment surface of the shelter on 4 August 1969 and includes seven cupules combined with seven faint straight lines (Fig. 17). Its dimensions are: length 26 cm, width 26 cm, thickness 5.7 cm; its weight is 5.1 kg. The cupules were made on a slab of carbonate schist, tabular in shape, with flat surfaces. The rock has fractures probably postdating the cupules or from when they were produced. Some of them formed areas of weakness in the edges of the rock, where it broke, taking an irregular appearance.

Mark 1, very small, was carved into the centre of the rock, from which the remaining 11 depressions radiate, nine of which can relate to virtual lines to form


***Figure 18.*** *Piedra de las Estrellas, El Garrote site, Banao, Sancti Spíritus province, central Cuba, face A and face B (photos: Luis Olmo Jas, June 2022).*

rows of three and four marks. The set can be joined together, establishing geometric figures. Marks 3, 5 and 12, with a small horizontal break in the rock, seen from the appropriate angle, seem to evoke a human face pareidolically, but this is probably fortuitous. Seven straight lines complement the design. If the design were deliberate, it might have had meaning to the artist in his/her ideographic world. If we could know the correct position of the slab in the way that the artist conceived the meaning, perhaps we would reach a more accurate approximation in its interpretation. The uniformity of the components is remarkable. It could represent astral symbols or simply be a random arrangement; significantly, four cupules retain traces of an ochre pigment.

*3.14. Piedra de las Estrellas*

This specimen was collected by the Samá speleological group on 18 March 1971 in El Garrote site, on the floor surface of the shelter (Olmo Jas 2020a). Its dimensions are: length 40 cm, width 28 cm, thickness 8 cm, and its weight is 14.1 kg. It includes 17 cupules carved on both faces of a slab of carbonate-micaceous schist (Fig. 18). It is almost rectangular with two rounded corners, tabular, with flat surfaces affected by solution, and it has a laminar fracture on the rear face that damaged two of its cup marks. Face A (or obverse side) shows 13 cupules with damaged edges caused by the wear of the planes. Further weathering was apparently caused by carbonate dissolution of both cupules and the general surface, thus leaving quartz granules that make the surface rough.

Face B (or reverse side) was the most damaged by weathering. A quartz vein approaches one of its cupules and may bear fractures of crystals dating from when the rock art was produced. Unfortunately, as it was found under shelter, dating by microerosion analysis could not be applied credibly.

*3.15. Mortero de la Osa Mayor*

This specimen was collected by the Samá speleological group on 24 March 2012 in the El Garrote site, on the south surface of the shelter floor (Olmo Jas 2020a). Its dimensions are: length 32.5 cm, width 30 cm, thickness 10 cm; its weight is 10 kg. Consisting of carbonate shale, its shape is irregular, tabular, with flat surfaces highly affected by weathering and blows that produced prominent fractures. The shape of the cupules varies between circular, elliptical and irregular, with rounded edges and mostly hemispherical bottoms (Fig. 19). Traces of abrasion can be observed on some of them. The work area as mortar is well marked, although the fracture of the slab apparently

***Figure 19.*** *Mortero de la Osa Mayor, El Garrote site, Banao, Sancti Spíritus province, central Cuba (photo: Luis Olmo Jas, June 2022).*

***Figure 20.*** *Guijarro cupulado, El Garrote site, Banao, Sancti Spíritus province, central Cuba (photo: Luis Olmo Jas, June 2022).*

sectioned it by more than 50%. The mortar depression seems to be older than the cupules, as implied by the deeper exposure of foliation planes. Therefore, it is possible that after it was fractured, the rock was reused to add the apparently symbolic petroglyphs. The specimen was found with the work surface face down and eight other mortars, some with a very small cupule. It had a reddish ochre stain, possibly due to the grinding of pigments.

*3.16. Guijarro cupulado*

This specimen was collected by the Samá speleological group on 19 November 2017 at the El Garrote site, on the central floor surface of the shelter (Olmo Jas 2020a). It is a small piece that blends in with any of the many natural cobbles present on the site, made up of compact carbonate shale (Fig. 20). Its dimensions are: length 16 cm, width 6.7 cm, thickness 4.8 cm; its weight is 0.704 kg. It has an elongated shape with curved sides, tabular with an irregular surface. The visible colouration is because it was subjected to fire, as a support for a recent hearth, from which it was extracted due to the curious appearance of the depressions.

*3.17. Piedra de las Cabritas*

This specimen was collected by the Samá speleological group in May 1993 in the Jarico III archaeological site, 2.5 km north of Banao, on the southern flank of El Infierno hill (Olmo Jas 2020a). The specimen was recovered on the site's surface, together with a gouge, fractured flint, quartzite beads and ceramic fragments. Its dimensions are: length 21.4 cm, width 17.3 cm, thickness 5.5 cm; its weight is 2.212 kg. The rock has irregular contours and is composed of low-hardness micaceous schist. The front side, where the main petroglyphs appear, is flat, and the back side, keeled longitudinally, has a solitary depression (Fig. 21). The seven cupules on the obverse are of circular shape. Five have an ogival profile and pointed bottoms deviating from the centre, with erosion on their walls and bottoms. Two of them are hemispherical with rounded edges. The layout of the specimen is difficult to interpret. A visit to the site in September 2017 recognised the place as destroyed by hydraulic work of agriculture, leaving no observable traces of pre-Hispanic habitation.

*3.18. Laja cupulada*

The Samá speleological group collected this specimen on 10 October 2014 in the Banao archaeological site, located in the curve at the entrance to Banao, 150 m upriver, on the left bank (Olmo Jas 2020a). Its dimensions are: length 12.5 cm, width 9.3 cm, thickness 3.8 cm; its weight is 0.440 kg (Fig. 22). The small slab was found in an irrigated ditch at the north end of the

***Figure 21.*** *Piedra de las Cabritas, Jarico III site, Banao, Sancti Spíritus province, central Cuba (photo: Luis Olmo Jas, June 2022).*


***Figure 22.*** *Laja cupulada, Banao site, Banao, Sancti Spíritus province, central Cuba (photo: Luis Olmo Jas, June 2022).*

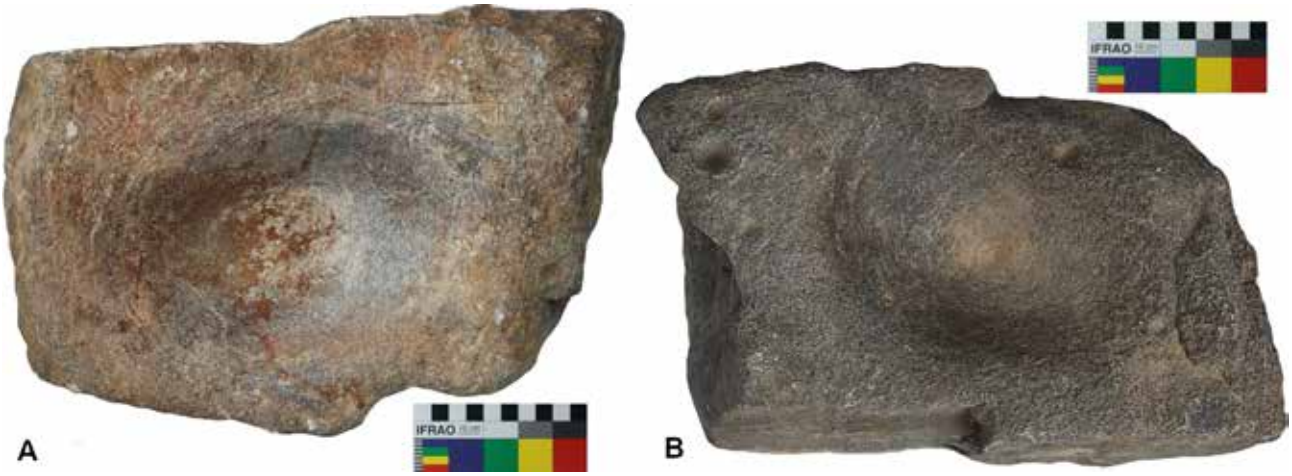


***Figure 23.*** *Mortero doble cupulado, El Maracho site, Banao, Sancti Spíritus province, central Cuba, face A and B (photos: Luis Olmo Jas, June 2022).*

Banao site. The owner of the farm claims to have seen another similar piece in the crop area. The specimen is of micaceous schist of low hardness, a property that made it vulnerable to breakage due to the movement of farming implements. Its shape is irregular; it has two fractures at almost right angles, and one of its sides sectioned mark 3. The cobble can be supported horizontally with respect to the cupules, for which one of the fractures parallel to these serves as a base, so they might resemble the eyes of a face. These two cupules were joined by their proximal edges with a 7.7 mm wide slot, another cut in the upper part, arched, lowering the surface between both domes as if implying the intention of joining them. The morphology of the two cupules resembles that found in the petroglyphs of the Jarico III site, with circular shapes, ogival profiles and acuminate bottoms. In the area where this specimen was found, two carved pebbles were also found, the smaller one with a design faintly resembling a face, the other with linear abstract designs in both sides.

*3.19. Mortero doble cupulado*

This specimen was collected by the Samá speleological group on in El Maracho site in a rockshelter 4 km west of Banao, on the right bank of the Manacas stream, northwest end of the cliff (Olmo Jas 2020a). Its dimensions are: length 26 cm, width 26 cm, thickness 5.7 cm; its weight is 5.1 kg (Fig. 23). The specimen could not be moved due to its weight and the poor access conditions. It remains where it was found. It is a tabular slab with mortars and cupules on both sides. It is compact carbonate schist with calcite betas and polished surfaces; its shape is rectangular, with two rounded corners. The utilitarian areas used as mortars are well marked and smooth by rubbing, without traces of percussion; they have an elliptical shape, and in both cases, their major axes are oriented diagonally, i.e., towards the angular corners. Traces of percussion can be seen on the surface of face A. Three cupules are grouped on the right side and one on the inner edge of the mortar; they are circular, with ogival profiles, pointed bottoms and slightly rounded edges. Marks 2, 3 and 4 have traces of abrasion due to the rotation of ogival implements, which gave their profiles their final shape. Given the compact structure of the rock, the four cupules were polished. On face B is a small dome on the edge of the mortar, circular, with a cupule profile and hemispherical bottom. The meaning of these cupules added to mortars is unknown.

*3.20. Mortero doble cupulado*

This specimen was collected by the Samá speleological group on 7 April 2018 at the El Maracho site, on the floor surface of the rockshelter (Olmo Jas 2020a). Its dimensions are: length 31 cm, width 19.5 cm, thickness 10.2 cm; its weight is 15.95 kg. It is made from a tabular slab of compact carbonate shale with white calcite streaks. It is triangular due to a fracture. The use of the rock as a grinding tool on both sides was a practice this site has in common with El Garrote, where several specimens with similar characteristics were recorded. In one of its ellipses, the obverse has very small percussion marks. The biggest irregularities are caused by roughness due to the dissolution of calcite. The apparently symbolic cupule is located on the left side of the support, it has an elliptical shape and ogival profile. The mortar on the back lost approximately a third of the utilitarian depression due to the same fracture. It has another fracture in the lower right corner. The cupule, located on the edge of the mortar, shows small traces of percussion smoothed by abrasion; it is circular, ogival, with a conical bottom.

*3.21. Mortero cupulado*

This specimen was also collected by the Samá speleological group on 7 April 2018, at the El Maracho site, on the surface of the rockshelter floor (Olmo Jas 2020a). It is a mortar stone made of carbonate-silicate schist with reddish laminations exposed inside the bowl (Fig. 24). Its dimensions are: length 29 cm, width 23.5 cm, thickness 5.5 cm; its weight is 5.1 kg. Its shape is irregular but overall tabular with a near-flat surface.


***Figure 24.*** *Mortero cupulado, El Maracho site, Banao, Sancti Spíritus province, central Cuba (photo: Luis Olmo Jas, June 2022).*

The inside of the mortar bowl is fractured, rough and shows signs of dissolution and traces of what could be percussive action (i.e. cultural modification). In the presumably symbolic pits numbered 2, 3 and 5 the uniformity is remarkable. These are generally circular, of ogival profile with acuminate bottoms deviating from the centre. The cupules likely describe a virtual arch on the edge of the central utilitarian depression, 90% of the mark 3 lies inside the mortar, and mark 2 is on its edge. In cupules 1 and 6, percussion traces are observed. In all cases, their edges are rounded, circular, and in mark 1 elliptical, acuminate in marks 2 and 3, and 5 deviates in ogival form.

*3.22. Cueva de Pinart*

This site was re-located on September 22, 2022, by members of the Baracoa Archaeology Office under the direction of the archaeologist Roberto Ordúñez Fernández. They verified some of the petroglyphic motifs that Alphonse Louis Pinart described in 1880. The rockshelter is located 500 m from and on the SE side of the destroyed bridge at Río Seco in Baracoa (eastern Cuba). On the floor, a set of more than 33 depressions were discovered (Fig. 25C).

*3.23. Other Baracoa specimens*

R. Ordúñez (pers. comm. 2022) referred to seven more sites from Baracoa (eastern Cuba) with probable presence of cupules petroglyphs: Cueva de Alta Gracia, three depressions with a potential hammerstone (Fig. 25A); Cueva de las Constelaciones, eight depressions (Fig. 25B); Cueva de la Vigía No 5, four depressions; Cueva del Bagá, Pozo Azul, four depressions (Fig. 25D); Cueva del Cangrejo, a 'fixed mortar' as was reported by Fernández-Ortega et al. (2017) (Fig. 25E); Cueva del Guamo, some mortar-like depressions (Fig. 25F); Cueva de la Yagruma, a 40 cm stone with ten depressions with an average diameter of 30 mm (Fig. 26). These specimens deserve further investigation.


**Figure 25.** *Baracoa specimens referred to by Roberto Ordúñez (pers. comm. 2022). A) Cueva de Alta Gracia, B) Cueva de las Constelaciones, C) Cueva de Pinart, D) Cueva del Bagá, Pozo Azul, E) Cueva del Cangrejo, F) Cueva del Guamo.*

## 4. Discussion

We have briefly described the occurrence of a variety of small and large round, hollow carvings found in caves and rockshelters of Cuba, some on portable rock slabs, others directly on bedrock or speleothems. Although these likely anthropogenic manifestations are more common than formerly perceived, they have received scant scientific attention in Cuban archaeology. If they are to be of any relevance to archaeology, it is essential that their origin, production and cultural context is established.

The first step is to eliminate the possibility that such features may be natural phenomena (Bednarik 2010b). The natural rock markings most often mistaken for cupules are potholes, lithological cup marks, solution phenomena (e.g. carbonate scalloping), and occasionally vesicles. Few of the specimens listed above seem to fall into these categories, although such phenomena do occur in Cuba (e.g. Olmo Jas

2020b). However, some of the depressions observed on the Rodas specimen (Fig. 11), especially along the laminae exposed around its margins, are regarded as natural. They appear to be solution traces related to carbonate-silicate replacement cycles. The sloping, densely pockmarked rock panel in Cueva de las Charcas, which bears engraved graffiti, is certainly man-made, but it has been created with metal drills by military personnel.

The remaining corpus of evidence considered here presents artificial rock hollows that can essentially be separated into three forms by their sizes:

a. Small cupules: rounded and of about 2 to 3 cm, and sometimes even up to 5 cm diameter, tend to occur in larger assemblages. They are found on structural surfaces or bedrock, as well as on portable or loose rock slabs. They are frequently steep walled, with an ogival profile and a pointed or acuminate bottom, proving that they were not completed by direct percussion.
b. Large cupules: these are up to 10 cm in diameter but can be occasionally larger, approaching the global maximum size of cupules, which is 13 cm (at Moda Bhata, India). They are, in most cases, relatively shallower than the small cupules, i.e. they have a higher ratio of depth to diameter and display well-rounded shoulders. These are reported from Cueva del Pueblo (Fig. 2), Gran laja de los Morteros Fijos (Fig. 7) and Solapa Cananigüín (Fig. 16).
c. Mortars: measuring in the order of 15 to 20 cm. Portable mortars have been found at three sites on relatively small rock slabs, and these are of carbonate-silicate schist, carbonate schist and carbonate shale (Table 1). Some of these mortar slabs are double-sided, i.e. they bear mortars on each of their flat surfaces, as well as small cupules.

Importantly, the mortar slabs also displaying cupules provide evidence that the two forms of treatment are of different ages. The carbonate shale specimen from Mortero de la Osa Mayor (Fig. 19) features the preserved part of a mortar hollow and eight small cupules on one flat surface. The rock's foliate structure has been emphasised by extensive weathering of its laminations, exposed as stepped terraces in the mortar. The cupules, however, show significantly less weathering and only very limited lamination evidence. Therefore, the two traces of human activity are of significantly different antiquities. Similarly, the six cupules on the carbonate silicate schist from Mortero cupulado (Fig. 24) also appear more recent than the preserved mortar hollow, which may have been fractured before the six cupules were added. Also, the formerly ground surface of the mortar is considerably more coarsened than that of the cupules. In the double-sided carbonate schist specimen from Mortero doble cupulado, the temporal relationship between the two elements is somewhat less clear. However, at least some of the cupules appear to have been added after the mortar's disuse. This applies at least to face B (Fig. 23B), where the surviving surface of the mortar is considerably coarser and more weathered than that of the cupules. These details suggest that the three specimens were re-used by adding grouped small cupules long after the mortars served to grind or macerate material. The consistency of this behaviour at different sites is thus significant in interpreting these objects.

**Figure 26.** *Cupule petroglyph from Cueva de la Yagruma, Maisí, Baracoa, eastern Cuba. This stone is about 40 cm, and the cupules measure an average of 30 mm in diameter (photo: R. Ordúñez, 2022).*

Another consistency is the production of very small rock slabs bearing rather tightly packed, small cupules at several sites, including Big Wall Site, Laguna Limones Village Site, Monte Cristo Village Site, Río Caleta Village Site, the Gavilanes specimen, those from Solapa de Sabanilla o Los Sacrificios and Cueva de la Jarra, the Rodas specimen, and one each from Guijarro cupulado and Laja cupulada. Their similarities are also suggestive of quite specific behaviour, which may have been utilitarian but was perhaps more likely ceremonial, judging from the limited ethnographic data we have about cupule production (Bednarik 2010c).

Of particular interest is the major concentration of small cupules at Solapa de las Tacitas o Morteros (Fig. 13). The tribological traces illustrating their production method are especially apparent in Figures 13E and 14, showing indirect percussion extraction marks in the walls of several cupules. The evidence is very similar to that described from other relatively soft lithologies, such as the very soft limestone of Ngrang Cave in western Victoria, Australia (Bednarik and Montelle 2016). Extensive replication experiments there have shown that the site's deep cupules were most probably made with fractured macropod long bones applied in indirect percussion. McNickle's Shelter in north-western Australia (Bednarik 2008: Fig. 38) is another example providing many cupules with extraction marks, as are hundreds of cupules on schist in the Henan and Hubei Provinces of China (Tang et al. 2017; 2018; 2020). At the Chinese sites, numerous cupules have been observed that are of ogival profile (or 'conical

section'; Kumar and Krishna 2014) and were made by indirect percussion using metal tools. These surveys demonstrate the expediency of tribological studies of cupules. In general, the Cuban cupules reported here all occur on relatively soft rock, up to hardness 4 on Mohs scale. Few harder rocks are available at these sites, but the preference for soft rocks is repeated in many parts of the world.

One of the most recently published reports pertains to a set of eight cupules (Fernández-Ortega et al. 2017). However, these authors did not discuss the orientation of and erroneously illustrated the panel as occurring on a horizontal surface. The cupules occur, instead, on a vertical surface (R. Ordúñez, pers. comm. 2022). This is a key aspect to keep in mind when illustrating specimens as, in general terms, the secure identification of cupules is greatly facilitated by their occurrence on walls (Bednarik 2008). Likewise, Gutiérrez-Calvache et al. (2014: Fig. 14) illustrated a suspected petroglyph of depressions (Stone No. 1 in Ordúñez et al. 2013), which was found by Roberto Ordúñez and Yosmani Correa at the Cuatro Lunas site in Baracoa (eastern Cuba) on October 4, 2008. Ordúñez et al. (2013) provided a description of this specimen and did not include cupules.

Concerning the age of the Cuban cupules, detailed research on their chronology has not been carried out so far, so we cannot suggest any date for the cupules. Even if some of the faunal/human remains are dated, they cannot be associated with the cupules without any direct, associable-contextual evidence (which is lacking in these sites). As far as the radiocarbon dates have shown, humans arrived in Cuba about 6–5 ka BP, in the mid-Holocene (Cooper 2007, 2010; Cooper and Thomas 2011; Nägele et al. 2020). However, these early cultures were very archaic, and the cupules were likely made by the later — technologically more advanced — Taino groups, which arrived in Cuba after 2 ka BP. The large sloths seem to have survived way past these dates, into the pre-Columbian/Amerindian subinterval of the late Holocene (Orihuela et al. 2020). However, there is yet no direct evidence so far of human overkill/hunting of this megafauna. We encourage future researchers to follow the methods of estimating the ages listed in Bednarik (2010b) to achieve better dating information on the specimens.

We suggest that future cupule research in Cuba, just as in the rest of the world, could focus especially on two subjects: the direct dating of cupules (e.g. via accretionary deposits), and their tribological characteristics. The latter includes analytical studies to explain details of their production (Bednarik 2015). Other useful research would be creating a comprehensive record of all cupule sites on the island and investigating the preservation of these sites.

## 5. Conclusions

Here we provided a detailed record of cupules and mortar stones from the Cuban archaeological record. Due to a lack of direct dating, these phenomena could not be chronologically contextualised or associated to any specific cultural group (i.e. pre- and post-Columbian Amerindian or colonial). Some examples discussed could be natural (non-cultural) modifications but require further analysis concentrating on microscopic research of marks left by fabrication, use, wear, or chemical and trace-element studies.

The manifestations found in Cuba show a range of variations that can be grouped into three categories: small (<5 cm), large (>5 cm) and portable mortar stones. The differences in morphology seem to suggest an intent in manufacture with a difference in purpose and use. Their manufacture and usage could have ranged from food-processing (plant-seed milling, grinding, pounding), ritualistic, water collection and storage, toolmaking (e.g. paint manufacture for use in cave art or funerary sphere manufacture) or associated with astronomical phenomena. However, it is difficult to ascertain their intent and use with the evidence at hand.

Reports of cupule sites in the Caribbean are sparse. So far, there are reports from Dominican Republic (Hayward and Cinquino 2019), Puerto Rico (Loubser 2010), Grenada (Allen and Groom 2013; Hayward and Cinquino 2019) and Martinique (Perrot-Minnot 2016). Therefore, the Cuban record here discussed and described adds a substantial example for the study of this type of rock markings in the Caribbean. Furthermore, it adds complementary evidence to the ethno-biography of Caribbean native behaviour and culture.

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