Journal of Caribbean Archaeology

ISBN 1524-4776

Pre-Columbian Human Osteological Remains from Jamaica: A Review

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Studies of human remains from Jamaica's first inhabitants began as early as the 19th century. Since then, several Taíno burial sites have been discovered across the island. The aim of this work is to summarize these findings and their studies. Most human bones were found disarticulated inside caves. More recently, excavations have been carried out in burial grounds with primary inhumations, in which the bodies were placed in a flexed position. Grave goods such as pottery were found in the inhumations. It is thus known that the Taíno did not only dispose of human remains in secondary places such as caves or rock niches. The studies carried out identified individuals of all ages, of both sexes, most of whom had artificially modified skulls. Preserved teeth show different degrees of wear, caries and a few periapical cysts. Also recorded were congenital and infectious problems, such as treponematoses, and fractures. Isotope studies carried out so far show a diet with predominantly C3 plants. For a better understanding of these populations, it will be important to re-study the human remains existent in national and international institutions, applying current knowledge and techniques, and also to carry out new excavations as appropriate.

Des études conçernant les restes humains des premiers habitants de la Jamaïque ont commencées dès le dix-neuvième siècle. Depuis, plusieurs lieux d'enterrement des Taínos ont été découverts dans l'île. Le but de cette oeuvre est de présenter un résumé de ces découvertes et de ces études. La plupart des os humains était découvert en état désarticulé dans des grottes. Plus récemment, des fouilles ont été menées en lieux d'enterrement en plein air avec des inhumations primaires, où les corps ont été déposés dans une position fléchie. Des biens comme de la poterie ont été trouvés avec ces enterrements. On sait ainsi que les Taínos n'ont pas déposé les restes humains seulement dans des lieux secondaires comme les grottes ou les abris. Les études accomplies ont identifiées des individus de tous les âges, masculins et féminins, la plupart avec des crânes artificiellement modifiés. Les dents conservées montrent des étapes différentes d'usure et du caries dentaire, et aussi quelques kystes périapicals. De plus ont été observés des problèmes congénitals et infectieux, comme des tréponématoses, et des fractures. Les analyses isotopiques faites jusqu'à présent montrent un régime avec des plantes principalement de type C3. Pour mieux comprendre ces populations, il sera important d'étudier à nouveau les restes humains qui éxistent déjà dans les institutions nationaux et internationaux, afin d'appliquer des techniques à notre disposition maintenant, et aussi de mener des fouilles nouvelles, quand ça s'avère souhaitable.

Los estudios de restos humanos de los primeros habitantes de Jamaica comenzaron en el siglo 19. Desde entonces, se han descubierto numerosos lugares de enterramientos Taíno en toda la isla. El objetivo de este trabajo es resumir estos hallazgos y sus estudios. La mayor parte de los huesos humanos se encontraron desarticulados en el interior de cuevas. Más recientemente, se han llevado a cabo excavaciones en áreas de enterramientos con inhumaciones primarias, en las cuales los cuerpos fueron depositados en posición flexionada. En estos enterramientos se encontraron piezas de cerámica a modo de ajuar funerario. Así también se sabe los Taíno no solo ponían los restos humanos en lugares secundarios como cuevas o nichos en la roca. En los estudios realizados se han identificado individuos de todas las edades y de ambos sexos, la mayor parte de los cuales presentaban cráneos modificados artificialmente. Los dientes conservados muestran diferentes grados de desgaste, caries y algunos casos de quistes periapicales. También existen registros de defectos congénitos y enfermedades infecciosas, como treponematosis, así como de fracturas. Los estudios isotópicos realizados hasta el momento sugieren una dieta basada predominantemente en el consumo de plantas tipo C3. El re-estudio de los restos humanos conservados en instituciones nacionales e internacionales, de acuerdo con las técnicas y conocimientos actuales, así como la realización de nuevas excavaciones son necesarias para un mejor conocimiento de estas poblaciones.

Introduction

The first inhabitants of Jamaica are known as Taíno (Rouse 1992; Atkinson 2006a). Their origin and arrival in the Greater Antilles, including Jamaica, is still under debate (Rouse 1992; Lalueza-Fox et al. 2003; Keegan 2004). The time of this pottery using population's arrival in Jamaica is estimated, on the basis of a date from Bottom Bay (M4) of 1300±120 BP (Y-1987), at about 645/898 cal AD (Allsworth-Jones 2008), which accords well with the general scheme proposed by Rouse some time ago and shown in two of his well-known diagrams (Rouse 1992, Figs. 10 and 14). According to historic accounts, their demise started with the European arrival on the island in 1494 and during the 16th century they disappeared as a group (Duerden 1895; Sherlock 1939) eventually with the survival of some individuals (Agorsah 1994; Callum 2001; Rodney-Harrack 2006; Woodward 2006).

Archaeological studies in Jamaica began as early as the 19th century (see Atkinson 2006; Allsworth-Jones 2008; Wesler 2013). From these studies and historic accounts, it is known that Taíno lived in houses, grouped in villages (Oviedo 1959 [1526]; Rouse 1992; Burley et al. 2017), and their subsistence was based on hunting, fishing, shellfish and plant collection, and agriculture (Allsworth-Jones et al. 2001; Keegan et al. 2003; Atkinson 2006b; Gouldwell et al. 2006; Mickleburgh and Pagán Jiménez 2011, 2012). The style of their ceramics was named as Redware (Lee 1980) or Ostionan, later replaced by the Meillacan or White Marl (Howard 1950, 1956, 1965; Silverberg et al. 1972; Vanderwal 1968; Allsworth-Jones 2008: Table 6; Burley et al. 2017). The Taíno also left petroglyphs and pictographs in various caves (Lee 1990).

Current knowledge about these populations also comes from the study of their osteological remains found in primary inhumations, in caves and open-air sites, as well as from secondary deposition of disarticulated bones in small rock niches. This work aims to make a review of existing knowledge based on the studies carried out on Taíno skeletal remains.

Human osteological remains

The first studies of human remains in Jamaica date, at least, from the last decade of the 19th century, with the discovery of Pedro Bluff cave (Flower 1891), a cave at Halberstadt Estate in Port Royal Mountains (Duerden 1895, 1897; Flower 1895), and Richmond Hill and Botany Bay caves (Duerden 1897). The crania found were artificially modified. This agrees with ethnohistorical descriptions that mentioned that Taíno had broad heads and poor teeth (Harper 1961/1962). In Halberstadt Estate, Flower (1895:608) reported that "one of the largest of the femora has the head greatly enlarged and deformed by chronic rheumatic arthritis (…)" and "one of the left tibiae shows throughout the shaft marked evidence of chronic periostitis, the surface being thickened and vascular. A bone of the opposite side, which might have been of the same individual, shows the same condition in a less marked degree." Moreover, the author stated that "none of the bones show any wounds or marks of violence" (Flower 1895:607), which was not contradicted in the following studies. Such anthropological studies happened quite early worldwide, for example the first International Meeting on Prehistoric Anthropology and Archaeology (Spézia, Italy) was held in 1865.

After these pioneering works, there will have been a long period without apparent investigation in this field, until 1946 when a burial cave was discovered in the Cambridge Hill area and reported to C.B. Lewis, then Director of the Institute of Jamaica (Howard 1950: 102-103). This cave is apparently not the same as the one described by Duerden in 1897 and was some distance away from it, although Lee was not able to precisely re-locate either of them (Allsworth-Jones 2008). Lewis's excavations took place between 1946 and 1950, but he never published the results (Braham 2009; Santos et al. 2011). There is a manuscript with an inventory made probably by C. B. Lewis but this is the only direct record we have of his work. Only in 1961/2 did Harper publish his results.

Meantime, during three decades (1959-1986), James Lee inventoried 265 archaeological sites, 24 of which (eight caves and 16 open air) had human remains (Santos 2003; Allsworth-Jones 2008). These were surface findings, collected without an archaeological intervention, and bones and teeth are, in general, fragmented and preservation varies a lot in the same site. Thus,

the estimation of the minimal number of 46 individuals represented (at least 14 were non-adults, 18 adults and for 14 no age range was achievable due to the fragmentation of the bones) should be interpreted with caution. Nevertheless, the laboratory study of more than 2800 bones (mainly fragments) and around 100 teeth brought interesting information (for more detail see Santos 2003, 2008; Allsworth-Jones 2008:129) that is summarized below:

- From Belle Air cave in St. Ann (AC4) bones belonging to both adults and juveniles were retrieved. According to what is known of the context, these remains were recovered from two pots (AC4B69 and U1B68) and from elsewhere inside the cave (AC4B40A, AC4B40C, AC4B46). Although one cannot be certain, it seems safest to treat these three provenances as separate and to calculate the minimal number of individuals present at this site accordingly. Each vessel contained the remains of at least two individuals, and AC4B40A/40C/46 taken together also produced a minimal number of two individuals, making six in total (cf. Allsworth-Jones et al. 2011);
- In the three open air sites: Windsor (A19), Cranbrook (A20), Moneague (A24) all the bones seem to have belonged to adults;
- In Taylor's Hut cave in Clarendon (CC15) was found an artificially modified cranium, probably male, and from C1 (Round Hill) several pieces of skull and long bones were collected;
- From EC13 (Breadnut Wood #1) were recorded at least two individuals, an adult and a juvenile, while in the open-air site E12 (Black River West) the minimal number of individuals determined by the fragments of tibiae was three, one being a juvenile aged less than 15 years. The Lee Collection includes one cranium from Bull Savannah (EC 12) – young to middle aged adult, probably male, with flat frontal and parietal expansion, and no signs of diseases (Santos et al. 2002), and there is another housed at the Anatomy Department at the University of the West Indies (cf. Santos et al 2013, see below);
- H9 (Spaniard Hill) and H13 (Paradise) were sites relatively scarce in human bones, with a minimal number of one individual each;
- By and large, St. James Parish was the most representative of humans. From JC7 (Spot Valley cave) the minimal number of individuals estimated was eight, four adults (one probably a male) and four juveniles (from infant to adolescent). A more detailed description can be found in Stewart et al. (2010). From J1 (Hartfield) four individuals were recorded, two adults and two juveniles (a foetal/infant, and a child between two and six years);
- A juvenile from K13 (Bellevue), as well as one child and an adult from K11 (Chancery Hall), were recovered from Kingston and St. Andrew. The Chancery Hall remains in the Lee Collection do not include all the individuals discovered at the site, of which there were at least seven (see Allsworth-Jones et al. 2001; Allsworth-Jones 2008; Gouldwell et al. 2006).
- Fragments of long bone shafts revealed the presence of two individuals, a juvenile and an adult, at S1 (White Marl) and one individual at S12 (Naggo Head), both sites in St. Catherine. However, it is important to note that previous work at White Marl by Howard (1950, 1956, 1965) and Silverberg (1972) unearthed 15 burials with 16 individuals (cf. Allsworth-Jones 2008:161-168,172-173), and St. Clair (1970) excavated at least 12 individuals from a nearby cave (SC5);
- From the pieces of bone recovered from Trelawny site T7 (Pantrepant) a minimal number of one individual (probably a female) was achieved, and there is also an MNI of one from T2 (Braco) based on one fragmentary long bone;
- All the human remains from Westmoreland were found inside cave sites, two (one probably a male) in WC3 (New Mountain), one (perhaps female) in WC5 (Wire Lane), and one in WC4 (Westcliffe);
- Remains of a child and an adult were found at two open air sites, Y4 (Rio Nuevo) and Y19 (Coleraine), in St. Mary;
- It should be noted that excavations at Green Castle (Y25) later produced the remains of two further individuals, and two more were also recovered from Coleraine as detailed below (Allsworth-Jones and Wesler 2012);
- Finally, one box with bone fragments of unknown origin (U3B50) revealed at least one individual.

Despite the difficulty and the possibility of error in the estimated ages and biological sex in such fragmented materials, the important statement to maintain is that in the Lee Collection all the segments of the population are present, even the very young,

and both males and females. In his study of the Halberstadt Estate cave remains, Haddon (1897:607) also reported that "almost all ages are represented, from children of four or five years to very old persons" and from both sexes, as happened also in Cambridge Hill, Richmond Hill and Botany Bay caves (Harper 1961/2). Metrical analysis is an integral part of an anthropological study, since "population variation in skeletal morphology is the result of genetic and environmental differences among groups" (Buikstra and Ubelaker 1994:69). The list of measurements described for cranial and postcranial bones is vast but its application was limited by the fragmentary nature of the majority of the pieces understudy. For example, adult's stature was impossible to calculate since no single long bone allowed length determination. The dental analysis revealed slight to severe wear, antemortem tooth loss, mainly of molars, and several caries. A mandible of a child (Y4B28A.1) shows hypodontia of the right incisor, a congenital absence (Santos 2003; Allsworth-Jones 2008). Several bones from St. James had joint disease**,** namely osteoarthritis with severe cases of eburnation (Santos 2003; Santos et al. 2002), a condition common in both modern and ancient populations (Rogers and Waldron 1995). The study of the commingled human remains from Spot Valley cave revealed a lumbar vertebra and a left humerus fragment from an adult with osteoarthritis (Stewart et al. 2010) and a femur had new bone formation. The disarticulated nature of the bones did not permit us to determine if they belonged to the same individual (Santos 2003; Allsworth-Jones 2008).

In addition to these works, other laboratory studies were carried out on human remains from Jamaica and these will be presented below in order of their publication date.

In 2009 Braham analyzed in her Master's dissertation the human remains from the Halberstadt Cave, housed in the Duckworth Collection (DC) at Cambridge University in the UK (where there are other bones from Jamaica of uncertain provenance). Three crania, one from a non-adult and two from adults all artificially modified, nine vertebrae (four showing mild to moderate osteophytic growth), patellae (one with a lytic lesion and two with entheseal changes) and fibulae (Braham 2009). This author also evaluated the non-metric traits of both Halberstadt Cave and Cambridge Hill.

The human remains from Cambridge Hill cave were also studied recently (Braham 2009; Santos et al 2011). More than 400 bones were inventoried, from juveniles and adults, of both sexes, and a minimal number of 20 individuals was estimated in the remains housed at the JNHT (Santos et al. 2011). However, Howard (1956) mentioned that "Lewis recovered the remains of at least 40 individuals". Over the years, these bone remains have passed through various locations and also suffered the consequence of past poor storage conditions and hurricanes while they were stored at the Old Naval Hospital in Port Royal. Like other pre-Columbian individuals from Jamaica, the crania were artificially modified having a "parallelo-fronto-occipital" appearance according to the classification in Buikstra and Ubelaker (1994:161). However, Braham (2009:35) reported that not all female individuals had their heads modified, giving rise to the hypothesis "that these females were alien to the groups, possibly the result of exogenous marriage from differing classes or populations". One cranium artificially modified from an adult female displays a neoplastic lesion, probably benign, on the left parietal (Santos et al. 2011) and osteomas are also present in the sample (Braham 2009). The latter author also described a possible trepanation in a juvenile cranium, artificially modified. Teeth show calculus, none to severe wear, also provoked by non-masticatory use of dentition, and a few periapical cysts. Linear enamel hypoplasia was not observed but its absence may be related to ante and postmortem anterior tooth loss (Braham 2009) in all samples. As in individuals from other sites, degenerative changes like lipping are visible in vertebrae and knee joints. In Cambridge Hill, healed fractures were recorded in two ribs, and congenital defects such as lumbosacral transitional vertebrae are present (Santos et al. 2011). Other interesting findings described by these authors include a humerus and a hand bone which apparently have been postmortem altered showing a pencil-sharpened like appearance. A few human remains are charred but this seems postmortem burning, which happened accidently and not a cremation (Braham 2009). Bone damage caused by termites occurs in Cambridge Hill (Braham 2009) as in many other cave sites across Jamaica. Due to the high

number of individuals, and the possibility of its being a primary burial site, Cambridge Hill represents a place of extreme interest for the study of the Taíno. However, the archaeological work at the time was not carried out with current methods, which prevents individual and funerary practices reconstruction.

In 2004 a cave in Belle Air (AC4), identified by Lee in 1986 (as mentioned above), was revisited and an additional fragmented cranium with a "parallelo-fronto-occipital" modification of a young to middle aged female was found. This individual appears to have had craniofacial fibrous dysplasia and presents a large supranumerary bone in the occipital, usually called an "Inca bone" (Allsworth-Jones et al. 2011). A mandible was also found, but it does not seem to belong to the same person, since its characteristics are more common in male individuals (Allsworth-Jones et al. 2011).

Due to its exuberant lesions, the cranium housed at the Anatomy Department of the University of the West Indies from Bull Savannah north of Port Kaiser was the target of a further study. This cranium was found by Lee in a small rock recess (EC12 #2) with another cranium (as mentioned above), both being artificially modified, accompanied by some teeth and fragments of long bones. This adult individual show *caries sicca* in the vault, a lesion pathognomonic of treponematosis (Santos et al. 2013). The spread of these diseases in the Americas, and of syphilis in particular (Powell and Cook 2005), made this finding of particular relevance, because in the Caribbean paleopathological evidence is scarce. The cranium was dated by radiocarbon to the 10^{th}-11^{th} centuries CE making it one of the oldest diagnosed cases in the region (Santos et al. 2013). Other bones show lesions suggestive of this condition, for example from Black River West (E12), also in St. Elizabeth, are fragments of one fibula and two tibiae (as mentioned above) and these have well-remodelled bone formation and a huge increase of thickness that could be related to treponemal infection (Santos et al. 2002). And Flower (1895:608) reported, in the human remains found at Halberstadt cave, that "one of the left tibiae shows throughout the shaft marked evidence of chronic periostitis, the surface being thickened and vascular. A bone of the opposite side, which might have been of the same individual, shows the same condition in a less marked degree." Stable isotopic analysis of the Bull Savannah individual suggests either a mixed C3/C4 plant diet or a more extensive intake of marine resources, the former being considered more likely (Santos et al. 2013:493).

Duijvenbode (2017) in her PhD thesis studied individuals from Venezuela and from 12 Caribbean islands, including Jamaica: Abingdon cave (Hanover), Portland Hills (Clarendon) and San Pedro (St. Elizabeth) housed at the Department of Anthropology, Smithsonian Institution; Pedro Bluff Cave, Halberstadt, and others from unknown provenance housed at Cambridge University; and one collected by Lady Blake in 1896, housed in the Peabody Museum of Archaeology and Ethnology at Harvard University. Twenty-two individuals (out of 33, 66.7%) presented intentional cranial modification, six (18.2%) were considered ambiguous and five (15.2%) were not modified (Duijvenbode, 2017:188). According to this study, fronto-occipital (n=16) was the more common type, both in males and females, while the damage to other crania precluded reliable shape determination.

Occasional findings of human remains continue to happen as was the case of a small cave in Coleman's Bay discovered in 2008 (Santos et al. in press; Allsworth-Jones et al. 2018). From the soil surface were collected a cranium - of an adult male, artificially modified, with slight pitting on both left and right temporomandibular joints and a small degenerative rim on the right side - a mandible, a small fragment of the glenoid cavity of a scapula, a femur from an adult male with slight lipping in the condyles, and a tibia and a fibula, all belonging to the left side. They have been identified as belonging to a minimum number of four individuals, three adults and one juvenile. The teeth preserved had moderate wear and calculus. Stature for once could be estimated from the tibia length at 164.9 ± 2.815 cm (Santos et al. in press; Allsworth-Jones et al. 2018).

In preparation is the publication of the paleopathological study of the cranium artificially modified (Hellshire 2) found in 1992 by a villager in a cave in the Hellshire Hills, near Old Braeton. This probably male individual, together with another cranium (Hellshire 1), also artificially modified, and a mandible are housed in the Archaeology Laboratory at the University of West Indies (Mona). Dental calculus, caries, occlusal wear and periapical cysts are observable in Hellshire

1 while in the second cranium the eight teeth are in good condition and dental wear is slight (Gardner et al. 2011).

These studies resulted from analyses of commingled teeth and bones; many are fragmented, which greatly limits the quantity and quality of information rescued. This panorama changed at the beginning of the current century with the properly recorded excavation of archaeological sites. An open-air site at Green Castle (near Annotto Bay) (Y25) was excavated in 2001 (Allsworth-Jones and Wesler 2003; 2012) and two primary inhumations were revealed: an adult (Burial 1) buried with the head to the north, in a flexed position, lying on the left side, and with a ceramic vessel over the lower limbs. The skeleton was poorly preserved and was re-buried but the observation *in situ* revealed an adult, probably a male, with dental wear and a stature around 154.519 ± 3.417 cm (Santos 2012). This burial was directly dated to 660±40 BP (Beta-158969) cal AD 1283-1387. Burial 2 was a 7 years old (± 2 years) child buried with the skull to the northeast, lying on the right side in foetal position, very flexed, with knees near the head suggesting the body was wrapped. This burial was found in the excavators' Colluvial Zone 2 and therefore probably belongs to the uppermost occupation horizon, dated to 330±60 BP (Beta-134379) cal AD 1492-1637 and 430±80 BP (Beta-158966) cal AD 1415-1623.

Coleraine (Y19) was also one of the sites excavated in 2003. Lisabeth Carlson (2012) in the course of her analysis of the fauna found that there were scattered fragmentary human remains belonging to at least two individuals, one adult and one juvenile. Three shark vertebra beads were found in the vicinity, and in Carlson's opinion they likely accompanied these remains. The site yielded only one radiocarbon date judged to be satisfactory of 790±70 BP (Beta-182412) cal AD 1178-1280 from level 5 in square 4.5-5/S6-7 W. The majority of the scattered human remains came from level 1 in square 5-6S/6-7W so they are not likely to be as old as this.

More recently, five individuals were identified at White Marl (S1), three of them being excavated – a non-adult who died between 9-14 years (Burial 1), an adult, possibly male (Burial 2), and a young adult, possibly female (Burial 3) - and dated from 830±30 to 360±30 BP (Beta Analytic) equivalent to cal AD 1221-1641 (Mickleburgh et al. 2018). According to these authors, the individuals were buried apparently without wrapping or body containers, but Burial 3 was covered with flat stones. The position of the bodies differs slightly: both Burial 1 and 3 were placed in a flexed position on the left side and with vessels, the first had the head to the northeast and the last to the west; Burial 2 was with the head to the north, in a supine position with the lower limbs flexed. Burial 3 is the most recent and may have lived after the arrival of Europeans. Isotopic analysis revealed a diet based predominantly on C3 plants and local origin for Burial 1 and 3 while Burial 2 may have come from another area of the island. Starches of *Zea mays* (maize) and *Theobroma cacao* (cocoa) were found in the dental calculus of Burial 1 and wild beans (Fabaceae) in Burial 3.

An attempt was made in this article to synthesize the studies so far carried out on human remains existing in Jamaica. However, the inventory is incomplete as there are certainly more individuals that have not yet been studied, of which Cambridge Hill cave is a good example. The material from that site is clearly in need of a more exhaustive analysis.

Bioarcheology and biological anthropology are disciplinary areas that have evolved a lot in the last decade. However, almost all the studies performed in relation to the human remains result from visual observations. It would be important, among other things, to do isotope and paleoparasitological analyses to assess the individuals' diet and mobility. More radiocarbon dating should be carried out in order to trace the chronology of the sites/individuals.

Moreover, it should be pointed out that ancient DNA (aDNA) studies are now ever more important for the interpretation of the human fossil record on a worldwide scale (Stringer 2021). The Caribbean has not been excluded from this development. It might be apposite to quote just one example of a recent study in this regard (Fernandes et al. 2021). This study was based on information derived from 174 individuals from the Bahamas, Haiti and the Dominican Republic, Puerto Rico, Curaçao and Venezuela, which individuals, based on 45 newly generated radiocarbon dates, lived between about 3,100 and 400 calibrated years ago. That time span covers both the

Archaic (stone tool using) and the Ceramic Age populations concerned. Archaic settlements have yet to be discovered in Jamaica, but elsewhere in the locations studied it was found that Archaic-related lineages were >98% replaced by ceramic users, who in turn were traced back to speakers of Arawak languages in northeastern South America. In the opinion of the authors, this population was small and interconnected, and it is likely to have arrived in the Greater Antilles in a "south-to-north stepping-stone trajectory" over the last 1,700 years. If confirmed, this story is not dissimilar to the main archaeological narrative which has prevailed over the last few years, but clearly there is a lot more to be found out. That applies not least in Jamaica, where similar studies will surely change our perspective in the not-too-distant future.

Final comments

As can be seen from this work, the study of Taíno human remains in Jamaica has great potential despite most of the findings having come from disturbed contexts. Burial areas occurred all over the island in caves and in open-air sites. The inhumations excavated more recently show that bodies of non-adults and adults were placed in flexed positions, the orientation of the head differs, and some of them were buried with ceramic vessels and occasionally other objects, such as the shark beads from Coleraine. Besides primary burials the Taíno also placed parts of the skeletons, namely crania, in rock niches. The few studies about diet revealed a predominance of C3 plants and low marine intake. Amongst the palaeopathological analyses the presence of treponematosis in an individual who lived around the 10th-11th century CE at Bull Savannah cave is unquestionably important, in view of the worldwide interest in this disease and its origin.

For further studies it will be important to re-examine the bones and teeth housed in the various national and international institutions, because methodologies and techniques (e.g., the creation of formulae for sex estimation in these populations, isotopic analysis, dental calculus, aDNA) have improved significantly in the last decades. Another avenue of research will be the controlled excavation of sites previously identified as burial grounds, particularly those under threat, of which White Marl is the most significant example.

***Acknowledgments**: Lesley-Gail Atkinson Swaby for her invitation and suggestions. To the institutions and persons who supported the research of the first author: Fundação Calouste Gulbenkian, Jamaica National Heritage Trust Director, Dorrick Gray and staff, Kaiser Jamaica Bauxite Company, Research Centre for Anthropology and Health (CIAS, UIBD/00283/2020) and the University of the West Indies.*

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