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Stone ornaments from Guadeloupe and Martinique Early Ceramic period sites (200 BC – AD 400), detailed analysis and comparison with a Late Ceramic period site (AD 750 – 1000).

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Early Ceramic sites in the Antilles are characterized by a significant presence of stone ornaments, while the later cultural periods are considered less rich in these kinds of artifacts. However, few comprehensive studies have been published on these remarkable pieces of craftsmanship, thus preventing a regional comparison on both geographical and temporal planes. This study offers a complete and detailed description of 124 stone beads and pendants, from three archaeological sites excavated in Guadeloupe and Martinique, two from the Early Ceramic period (Vivé, Morel), and one from the Late Ceramic period (Anse à la Gourde). The comprehensive mineralogical determination through Raman spectroscopy leads to the documentation of twenty-five different raw materials used as gemstones by the Amerindians. This includes quartz, amethyst, calcite, carnelian, turquoise, nephrite, serpentine and many other minerals that can be used to reconstruct past networks and interactions. This dataset, to which previously published data from the Gare Maritime site is added, is then used for inter-site and inter-period comparison. We propose qualitative and quantitative interpretations on the diversity and richness of the

raw materials and typology of these assemblages. The Early Ceramic samples show higher richness and diversity than the Late Ceramic collection, both on stylistic and raw materials aspects, which can be interpreted as a loss of connection with the continent, both in the trade of materials and/or in the will to continue the technological investment of their forefathers.

Les sites antillais du Céramique Ancien se caractérisent par une présence importante d'objets de parure en pierre, tandis que les périodes culturelles plus tardives sont réputées moins riches en ce type d'artefacts. Malgré cette forte spécificité, peu d'études approfondies ont été publiées sur ces remarquables pièces d'artisanat, ce qui empêche une comparaison régionale sur les plans géographique et temporel. Cette étude propose une description complète et détaillée de 124 perles et pendentifs en pierre, provenant de trois sites archéologiques fouillés en Guadeloupe et en Martinique, deux datés du Céramique Ancien (Vivé, Morel) et un du Céramique Récent (Anse à la Gourde). La détermination minéralogique complète par spectroscopie Raman conduit à la reconnaissance de vingt-cinq matières premières différentes utilisées comme matériau gemme par les Amérindiens. Cela comprend le quartz, l'améthyste, la calcite, la cornaline, la turquoise, la néphrite, la serpentine et de nombreux autres minéraux qui peuvent être utilisés pour reconstruire les réseaux et interactions passés. Cet ensemble de données, auquel s'ajoutent les données précédemment publiées sur le site de la Gare Maritime, sert également à établir des comparaisons entre sites et entre périodes. Nous proposons des interprétations qualitatives et quantitatives sur la diversité et la richesse des matières premières et la typologie de ces assemblages. Les échantillons du Céramique Ancien montrent une plus grande richesse et diversité que la collection du Céramique Récent, tant sur le plan stylistique que sur celui des matières premières, ce qui peut être interprété comme une perte de connexion avec le continent, tant dans le commerce des matériaux que dans la volonté de poursuivre l'investissement technologique de leurs ancêtres.

Los yacimientos de Cerámica Temprana de las Antillas se caracterizan por una importante presencia de ornamentos de piedra, mientras que los períodos culturales posteriores tienen fama de ser menos ricos en este tipo de artefactos. A pesar de esta alta especificidad, se han publicado pocos estudios exhaustivos sobre estas notables piezas de artesanía, lo que ha impedido una comparación regional tanto en el plano geográfico como en el temporal. Este estudio ofrece una descripción completa y detallada de 124 cuentas y pendientes de piedra, procedentes de tres yacimientos arqueológicos excavados en Guadalupe y Martinica, dos de ellos de la época de la Cerámica Temprana (Vivé, Morel) y uno de la época de la Cerámica Tardía (Anse à la Gourde). La determinación mineralógica completa a través de la espectroscopia Raman conduce al reconocimiento de veinticinco materias primas diferentes utilizadas como gemas por los amerindios. Esto incluye cuarzo, amatista, calcita, cornalina, turquesa, nefrita, serpentina y muchos otros minerales que pueden ser usados para reconstruir redes e interacciones pasadas. Este conjunto de datos, al que se añaden los datos previamente publicados del sitio de Gare Maritime, se utiliza para la comparación entre sitios y entre períodos. Proponemos interpretaciones cualitativas y cuantitativas sobre la diversidad y riqueza de las materias primas y la tipología de estos ensamblajes. Las muestras de Cerámica Temprana muestran una mayor riqueza y diversidad que la colección de Cerámica Tardía, tanto en aspectos estilísticos como de materias primas, lo que puede interpretarse como una pérdida de conexión con el continente, tanto en el comercio de materiales como en la voluntad de perseguir la inversión tecnológica de sus padres.

Introduction

Early Ceramic (200 BC – AD 400) sites in the Lesser Antilles, roughly equivalent to the Early Cedrosan Saladoid and Huecan Saladoid (or Huecoid) horizons, are characterized by a significant presence of stone ornaments (Boomert 1987; Cody 1993; Crock and Bartone 1998; Murphy et al. 2000; Narganes Storde 1995; Queffelec, Fouéré, Paris, et al. 2018; Rodriguez 1993; Watters and Scaglion 1994). This *spécificité* is recognized as one of the central elements of their cultural identity. The characterization of raw materials also is an unrivalled way for archaeologists to access indigenous exchange networks. Moreover, clear differences in the development of this craft

between the Early Ceramic Age[1] and the later periods (AD 400 – contact) is often recognized in the Lesser Antilles and Puerto Rico (Bérard 2013; Hofman et al. 2007, 2014; Knippenberg 2007; Rodriguez 1993). Based on these observations and through other disciplinary contributions to our current knowledge of Caribbean archae-ology, several authors address this remarkable milestone in the settlement dynamics of the Lesser Antilles at this time of the Early Ceramic period (Bérard 2013, 2018; Fitzpatrick et al. 2010; Hofman et al. 2007; Keegan 2004; Rouse 1986; Siegel 1989).

A change in relations with the South American homeland is one of the key issues for understanding the pioneering versus evolving behavior of the Amerindians peopling the Lesser Antilles during the third and fourth centuries AD. The raw material supply dynamic is a source of evidence for these relations, since the choice of materials can change through time and the source is likely to be of continental origin during the first centuries of colonization. While some islands of the Caribbean are well studied on this specific point (Cody 1991; Falci et al. 2020; Murphy et al. 2000), despite decades of archae-ological research, and despite their size and central location in the Lesser Antilles, the French islands of Guadeloupe and Martinique are still poorly documented.

In this article, we present new elements for reflection on the difference in the lapidary production between Early and Middle/Late Ceramic periods based on the exhaustive analysis of lapidary production at three sites on Guadeloupe and Martinique described in this article, and the already published data from Gare Maritime (Queffelec, Fouéré, Paris, et al. 2018). These are the richest sites with respect to craftsmanship for Early Ceramic (Gare Maritime, Vivé, Morel) and Late Ceramic Age (Anse à la Gourde) on these two islands.

After presenting the context of each site, we focus on the description of lapidary artifacts produced by the Amerindian artisans. On the basis of this object-by-object analysis of the collections, we compare the different sites and time periods, and establish whether or not the classical assumption is verified for this central region of the Antilles.

Archaeological Contexts

The collections under review are from archaeological sites on Guadeloupe and Martinique, three of them previously have not been studied thoroughly (Vivé, Morel, Anse à la Gourde) and one already was published (Gare Maritime) (Queffelec, Fouéré, Paris, et al. 2018). The artifacts are currently located in the warehouses of the Ministère de la Culture, in the Musée d'Archéologie et de Préhistoire de Martinique (Fort-de-France, Martinique) and in the Musée Edgar Clerc (Le Moule, Guadeloupe). We summarize below the archaeological context of these sites (Figure 1; Table 1).

Vivé

The site of Vivé (MA-02) is an archaeological 'reference site' for the Early Ceramic occupation of the Antilles, particularly for the Early Cedrosan Saladoid. Located on the north coast of Martinique at the foot of Mount Pelée, it occupies a coastal plateau about ten meters above sea-level, facing the Atlantic Ocean.

[1] Periodization nomenclature, see Bérard (2019).

Situated between the Capot River and the Rouge River, the archaeological occupations are spread over 15 hectares. The site has been intensively excavated since the 1940s with evolving techniques, including systematic screening, since the excavations of Mattioni (Delawarde 1946; Emond and Vallée 1975; Giraud et al. 1999; Mattioni 1979; Mestre 2006, 2014; Pinchon 1952).

The stratigraphy of the site is characterized by two occupational layers separated by volcanic deposits associated to a Mount Pelée Plinian eruption dated from around cal AD 400. The upper occupational layer, dated to between the 5th and 7th centuries AD, was partially destroyed by colonial agricultural practices. In contrast, the lower layer was protected under the volcanic deposits. This layer represents the Early Cedrosan Saladoid component of the site, dating to cal AD 10 - 400. (Bérard 2018). The collection analyzed includes 38 objects, 37 of which are from the Early Cedrosan Saladoid layer and one (MA-02-018) from the more recent occupation (Appendix 1). Most of the finished beads come from a burial context. They were recovered in the early 1970s by Mario Mattioni during the excavation of the Vivé burial D (Mattioni 1976, 1979:Fig. 20). The five amethyst beads were found between the legs of the deceased, and the other six beads under the mandible. The other artifacts were collected in the late 1990s during excavations conducted by Jean-Pierre Giraud and Benoît Bérard (Bérard and Giraud 2006). Most of them come from a cooking activity area and a midden.

Morel

This Guadeloupean coastal site (GD-02) is famous since the beginning of the 19th century, mainly because of the discovery of the so-called "anthropolithes", today regarded as burials consolidated by beachrock (Delpuech 2005), although at that time they were interpreted as fossils (Hamy 1885; Konig 1814). Despite this early historic interest, it was not until the 1960s that the first stratigraphic approach was applied to the site (Clerc 1968). Edgar Clerc distinguishes, in a still accepted stratigraphy of the site, four more-or-less stratified units or sectors, offering the potential to establish the first evolutionary approach to the Guadeloupean Ceramic Age, supported by radiocarbon dates. Since then, more-or-less official discoveries on the site have followed as the shoreline continues to erode. The most notable is the burial of a woman wearing an elaborate stone necklace, which was saved from destruction by Jean-François Durand in 1987 (Durand and Petitjean Roget 1991). In the early 1990s, a few survey campaigns were carried out as part of a Franco-Dutch collaboration to assess the state of conservation of the site and to define its boundaries (Delpuech et al. 1996, 1997). New graves were discovered, including a child wearing a zoomorphic pendant in association with the remains of a house. Wood remains from a post were radiocarbon dated to cal AD 120 – 590; the associated ceramics confirm its attribution to the Early Ceramic period (Delpuech et al. 1996). In sum, the lapidary collection from Morel derives from multiple contexts, most of which lack systematic screening.

Anse à la Gourde

The Anse à la Gourde (GD-03) archaeological site, located on the Pointe des Châteaux (Guadeloupe), was excavated in the late 1980s with several small tests for which we have no precise information (Delpuech et al. 1997). These were followed large-scale excavations conducted between 1995 and 2000, which revealed the

importance of this site. It is a large coastal site (*circa* 4.5 ha), with a complex stratigraphy integrating middens, habitation areas, and numerous burials. The site has yielded high-quality and highly diverse ceramics, ranging from Late Cedrosan Saladoid to Marmoran Troumassoid, thus covering the entire Ceramic Age (Delpuech et al. 1997; Hofman et al. 2001). The lapidary artifacts recovered thanks to the fine sieving of the sediment. They all were found during the excavation of the Late Ceramic period layers (cal AD 1000-1350), primarily in the habitation zone (n=20), but also in the midden (n=5). Of the 20 artifacts recovered in the habitat area, four came from burials (Appendix 1).

Gare Maritime

The Gare Maritime archaeological site (GD-01) was located on the shore of Basse-Terre, Guadeloupe, just behind the littoral pebble bank and on a river bank. It has been excavated as part of a preventive archaeological project, but the Ceramic period sediments were sieved systematically. The excavation corresponds to a small part of the site (28 m²), that included only midden deposits, which dated to cal AD 250-400. Ceramic analysis allowed attribution of this occupation to the Huecan Saladoid (Romon et al. 2013). For more information on the 50 lapidary artifacts from this site, the reader should refer to Queffelec et al. (2018).

Figure 1. Location of the four archaeological sites included in this study.

Table 1. General information about the three sites from which the studied beads and pendants originate. Information from Gare Maritime are reported for the discussion of the results. *see Queffelec et al. (2018) for more information.

Site	Code	Island	City	Longitude	Latitude	Period	Date (cal. A.D.)	Cultural affiliation
Gare Maritime*	GD-01	Guadeloupe	Basse-Terre	-61,7330	15,9966	Early Ceramic	250 - 400	Huecan Saladoid
Morel	GD-02	Guadeloupe	Le Moule	-61,3317	16,3325	Early Ceramic	120 - 590	Early Cedrosan Saladoid
Anse à la gourde	GD-03	Guadeloupe	St. François	-61,2133	16,258598	Middle/Late Ceramic	1000 - 1350	Middle/recent Cedrosan Saladoid + Marmoran Troumassoid
Vivé	MA-02	Martinique	Le Lorrain	-61,0827	14,8477	Early Ceramic	10 - 539	Early Cedrosan Saladoid

Methods

This paper covers all the mineral artifacts recovered from Vivé, Morel, Anse à la Gourde related to bead or pendant production, along with a discussion of materials from Gare Maritime (see Queffelec, Fouéré, Paris, et al. 2018). As part of a larger project involving the creation of a comprehensive database on Amerindian lapidary artifacts in the Lesser Antilles, each object is named with two letters representing the island on which the site is located (GD for Guadeloupe, MA for Martinique), followed by two digits for the site number on each island (Table 1), and three digits for the artifact number on the site. The typological classification, technological description and measurements of the artifacts were carried out on the basis of the terminology and characteristic dimensions presented in Figure 2, adapted from both Beck (1928) and Carter and Helmer (2015). Artifacts were photographed with macro lens and digital camera, scanned with flatbed scanner, and drawn in Adobe Illustrator®.

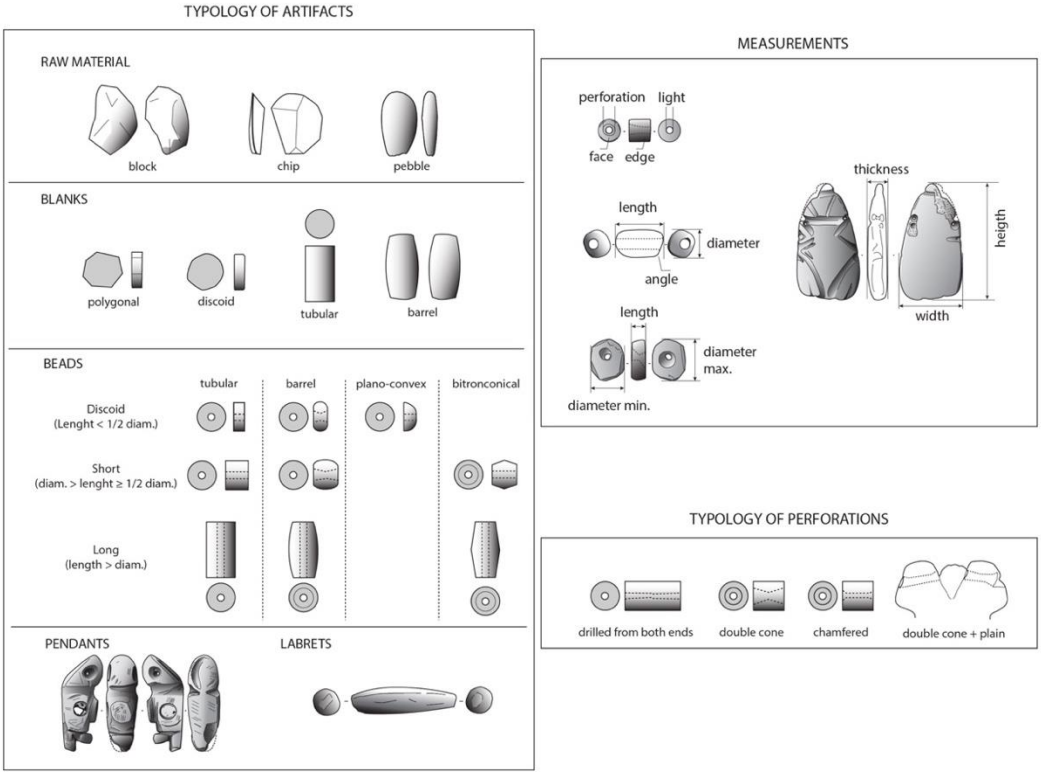

Figure 2. Terminology used in this study for classification, measurement and description of beads, pendants and related artifacts.

Every object was analyzed via Raman spectroscopy combining laboratory and portable instruments. The analysis of artifacts moved from their curation location was performed with a benchtop confocal Raman microspectrometer SENTERRA (Bruker Optics, PACEA lab) using a 532 nm excitation line. Spectra were recorded between 100 and 1555 cm^{-1} with a resolution of 3-5 cm^{-1}, and until 4500 cm^{-1} when necessary. To analyze the samples curated in the museums on Guadeloupe and Martinique, a transportable HE532 (Horiba Jobin-Yvon, MONARIS lab) Raman spectrometer with the same 532 nm excitation line was used for on-site analyses, allowing measurements between 80 and 3300 cm^{-1} with a resolution of about 5 cm^{-1}. For all measurements a long working distance 50x objective was used and spectra were collected on several locations for each artifact to explore the heterogeneity of the materials. All spectra were baseline corrected to subtract the fluorescence background after the correction of the Edge filter transmission.

Mineral identification was achieved mainly by comparison with the RRUFF database (Lafuente et al. 2015), completed with specific publications when necessary. A strict mineralogical denomination was used according to the International Mineralogical Association list (Nickel and Nichols 2009). Rock names for poly-mineralic artifacts and/or gemological appellations also were used to maintain consistency with names commonly used in archaeology. Finally, the term "*greenstone"* is used in the manner typically found in the discussion of stone artifacts in the Antilles and Mesoamerica (though some researchers prefer "*jade"*), which is the category of stones and minerals that are grouped together because of their green color, whose mineral is not identifiable to the naked eye, and that could have been considered equivalent (Tremain 2014).

The diversity of lapidary production at the archaeological sites (characterized by different numbers of artifacts, types, raw materials) is evaluated following ecological methods of quantification. Diversity is calculated for different scales, giving more or less weight to rare mineral species (Marcon 2018; Tóthmérész 1995). This use of parametric families of diversity, instead of classical diversity indices, avoids the inconsistencies sometimes observed when trying to reduce the complexity of a multidimensional entity to a single number (Tóthmérész 1995). In this method, diversity of scale q is noted ${}^{q}D$. ${}^{0}D$ is species richness (the number of species), ${}^{1}D$ is directly related to the Shannon index of diversity [${}^{1}D = \exp(\text{Shannon index})$], while ${}^{2}D$ is a value of diversity less sensitive to the rare species (equivalent to Simpson index) (Hill 1973). While these specific values of q are useful and regularly used in zooarchaeological studies (e.g. Beaver and Dean 2019; Grayson and Delpech 2002; López-García et al. 2014), the most interesting application of this method is plotting diversity profiles.

Despite the small number of artifacts in each site preventing a formal interpretation of the results of such statistical methods, this methodology allows to support observations of other type of representations. A diversity profile situated above another one is declared more diverse. If profiles are crossing, there is no order relation, while it can still be informative to see at which order the profiles cross, since the lower the order, the higher the impact of rare species. Finally, we calculated the Piélou's evenness index (Piélou 1966), which is the Shannon index

divided by the richness, and that states for the equitability of the distribution of the different species. All these calculations were realized with R package *entropart* (Marcon and Herault 2019; Marcon and Hérault 2015).

Table 2. Raw material distribution among the four sites. To simplify the table, unique occurrences are combined in the Other category. It includes 1 prehnite and 1 stalactite beads for Anse à la Gourde, 1 chlorite bead for Gare Maritime, 1 jet pendant and 1 sandstone blank for Morel, and 1 barytine blank, 1 diaspore labret, 1 ochre bead and 1 pumice blank for Vivé. [+] Turquoise bead from Anse à la Gourde is the one bead for which cultural attribution is unclear. [* Anorthite bead from Vivé do not come from the layer under the volcanic ashes deposit. ** From Queffelec et al. 2018]

	Albite	Amethyst	Anorthite	Aventurine	Chalcedony	Calcite	Carnelian	Rock crystal	Diorite	Jasper
Anse à la gourde			1			12			4	
Morel		11		1		4	9	15	10	
Vivé		6	1		2	1	3	1	5	1
Gare Maritime	2	9		1		3		3	1	1

	Marble	Nephrite	Paragonite	Pumpellyite	Serpentine	Sudoite	Turquoise	Other	Undetermined	Total
Anse à la gourde	1			2	1		1[+]	2	1	25
Morel	1	3	1		1	2		2	1	61
Vivé		2	2			1	9	4		38
Gare Maritime		1	1		17	3	7	1		50

Table 3. Distribution of the types of lapidary artifacts among the four sites. [+] One of the discoid beads from Anse à la Gourde is the one for which the cultural attribution is unclear. * One of the discoid beads from Vivé do not come from the layer under the volcanic ashes deposit. ** From Queffelec et al. 2018.

Site	Type	Cylindrical finished/blank	Barrel finished/blank	Discoid finished/blank	Spherical finished/blank	Plano-convex finished/blank	Bitronconical finished/blank	Zoomorphic finished/blank	Other finished/blank	Raw Material	Total
Anse à la gourde	Beads	3/1	2/2	12[+]/.							20
	Pendants								1/.		1
	Other/unknown								./1		1
	Raw material									3	3
Morel	Beads	19/1	15/1	./1	1/.		4/.				42
	Pendants							7/1	3/.		11
	Other/unknown										0
	Raw material									8	8
Vivé	Beads	3/3	4/2	11/2	1/.	2/.	4/.		1/1		34
	Pendants							2/.			2
	Other/unknown								1/.		1
	Raw material									1	1
Gare Maritime	Beads	5/1	2/2	10/7	2/.	1/.			./1		31
	Pendants							3/1	1/.		5
	Other/unknown								1/5		6
	Raw material									8	8

Results

A relatively large number of lapidary artifacts were studied in this work (N=124), with 61 objects from Morel, 38 from Vivé, and 25 from Anse à la Gourde. Our objective is to provide the reader with the maximum amount of information available for every object. The complete data are grouped in Appendix 1. Tables 2 and 3 summarize data by site, raw material information, and typology, respectively.

Morel

The richest lapidary site, Morel, is represented here by 61 artifacts [assembled by grouping together the collections curated by the Musée Départemental, Edgar Clerc, and the Service Régional de l'Archéologie (Ministère de la Culture)], which are mainly cylindrical and barrel-shaped finished beads (Table 3; Figures 3 to 10). It is important to note that 18 of these 61 artifacts come from a single collar, including three large greenstone zoomorphic pendants, (Durand and Petitjean Roget 1991). The 12 cylindrical beads of this *collier* ("necklace") are made of rock crystal (Figure 5), while amethyst is used for the three barrel-shaped elements in the necklace and for other similarly shaped beads found at other parts of the site (n = 9) (Figure 7). Seven other cylindrical beads, made of diorite, as well as a large barrel-shaped bead (GD-02-032), were recovered from the excavation (Figure 9). Two diorite pendants, with transverse and a longitudinal perforations, also are remarkable, especially the one engraved with legs, eyes and a smile (GD-02-051) (Figure 9). These long beads are made of hard to very hard materials; are perforated over several centimeters, most of the time in a straight line with a very thin diameter; and some are highly polished. The quartz beads display clear striations inside the perforation, which are not present on softer materials.

Another significant aspect of the Morel site is the numerous greenstone pendants that have been recovered (Figures 3, 4 and 8), three of them from the necklace found in the burial. GD-02-001 (Figure 3) is a massive zoomorphic pendant (Appendix 1), which clearly represents a frog with a wide and well-exposed head, prominent eyes and snout. The rear legs are folded down, well defined by precise engraving of the highly polished surface. The artifact is made of paragonite, a phyllosilicate close to muscovite, as shown by its Raman spectroscopic signature similar to that of GD-01-018 which was confirmed as paragonite by X-ray diffraction (Queffelec, Fouéré, Paris, et al. 2018). Pendant GD-02-002 (Figure 4), on the other hand, is made of aventurine. It is also of large dimensions (Appendix 1; Table 3). Its form resembles GD-02-001, except for the exposed and striated tail and a smaller head without prominent eyes. These features do not match those accorded the interpretation of frog. GD-02-003, the third pendant of the collar, has a very different shape. It also is green but is more translucent. It is made of sudoite, a mineral of the chlorite group, that has never previously been identified anywhere in the world as a gemstone (Queffelec, Bellot-Gurlet, et al. 2019). This artifact is completely polished, so it is probably finished, but its shape remains difficult to interpret. A head is clearly visible; the perforation probably depicts the eyes. The inferior part looks like a bifid tail, while each side of the artifact is hollowed by perfectly circular depressions that still contain black and white residue, perhaps a glue for a now absent incrustation. It could be a broken pendant, initially comparable to

the "vultures" of Vieques (Chanlatte Baik 1983) or that of Trinidad (Fewkes 1907:Plate 56b). It could have been reshaped to its present form after breakage.

The four other zoomorphic pendants, all made of greenstones, were recovered during the excavation of the site (Figure 8). GD-02-052, made of nephrite, was found in a burial during the 1995 excavation. It is quite similar to the two large pendants of the necklace, albeit smaller. GD-02-050, GD-02-049, and GD-02-036 are other frog pendants, respectively here called (i) a segmented frog (Chanlatte Baik 1983), (ii) a flat nephrite frog-shaped pendant, and (iii) a robust and quite parallelepipedic one made of serpentine. They were discovered by E. Clerc during the excavations and surface collection, and donated to the museum in 1978.

It should be noted that, without the discovery of the necklace, rock crystal only would be represented by a single artifact, leading to an interpretation of an amethyst- and diorite-rich site. One could also emphasize the presence of two artifacts made of sudoite. The presence of a stalactite, polished by the Amerindians but naturally perforated, is also notable (GD-02-037) (Figure 10). These kind of well-developed concretions are rare in the caves of the Lesser Antilles. Indeed, stalactites have only been observed once by the lead author, in the Montbars cave on Saint Bartholomew (Lenoble et al. 2012), despite having visited almost all the caves in the French Lesser Antilles. The fragment of a pendant made of jet, probably representing the head of some animal, is peculiar both for its shape and raw material. Surprisingly, given the small number of carnelian beads (n=2), the only raw stone material at the site is carnelian (Figure 6). These little flakes may be related to the beadmaking, but we cannot exclude the possibility they belong to a different lapidary production, such as the production of manioc grater board teeth (e.g., Walker 1979).

Figure 3. Photos and drawing of the largest pendant from the collar of Morel, identified as paragonite.

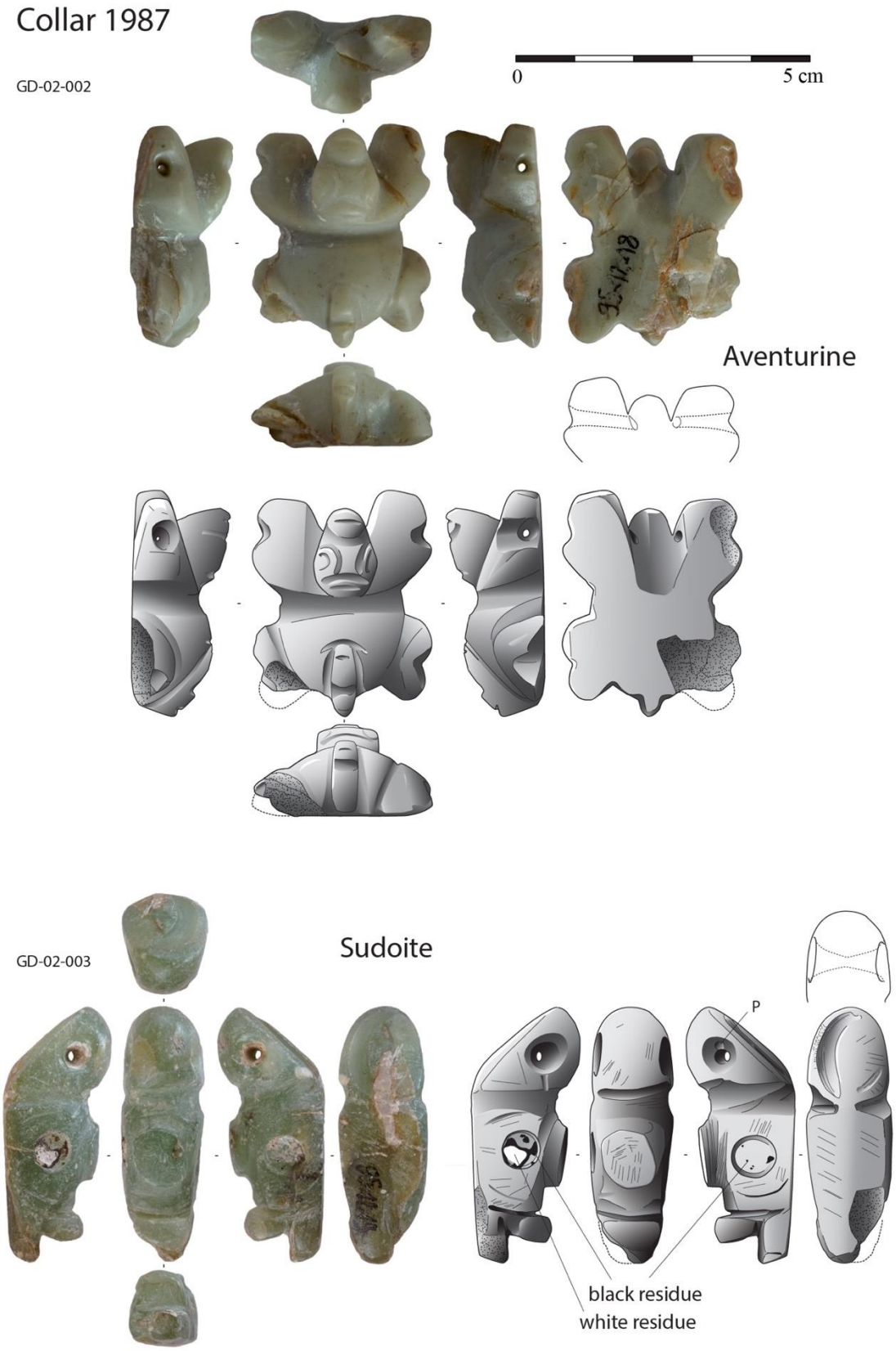

Figure 4. Photos and drawing of the two smaller pendants from the collar of Morel. GD-02-002 is made of aventurine, while GD-02-003 is made of sudoite.

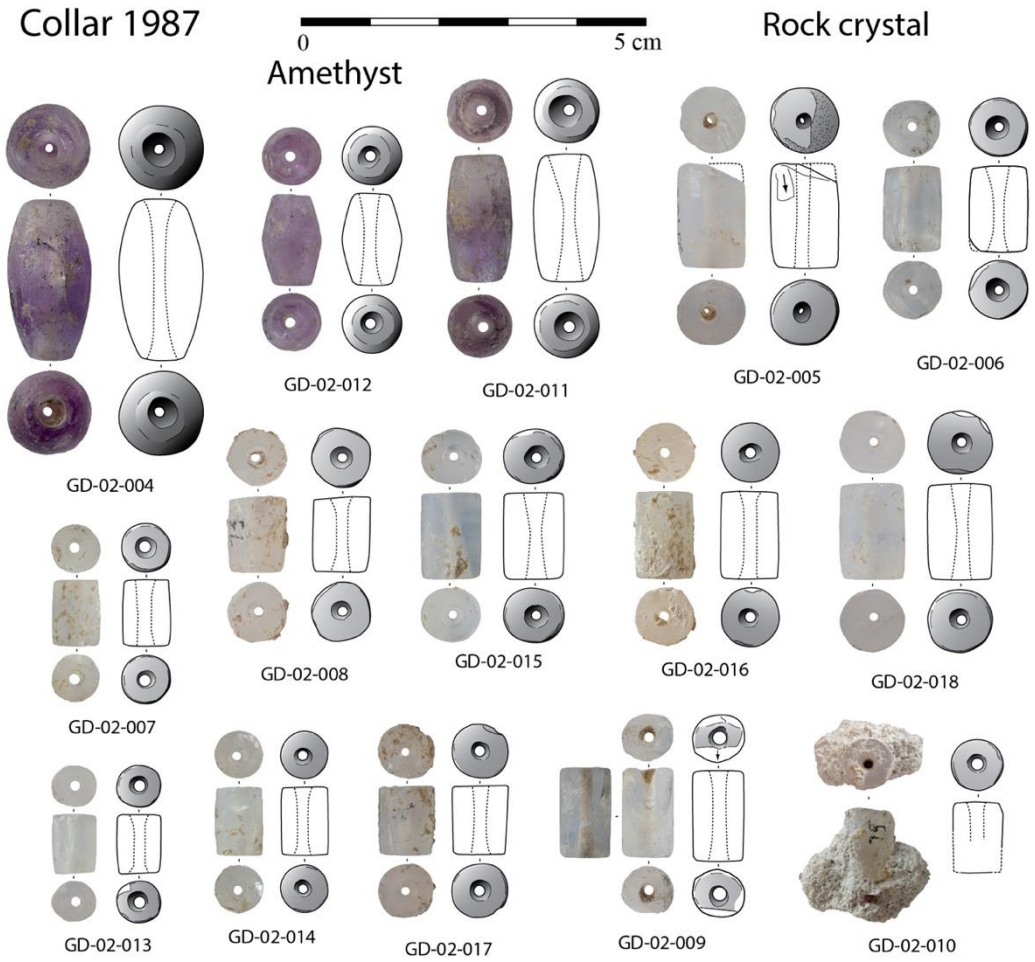

Figure 5. Photos and drawing of the barrel-shaped and cylindrical beads from the collar of Morel, made of amethyst and rock crystal.

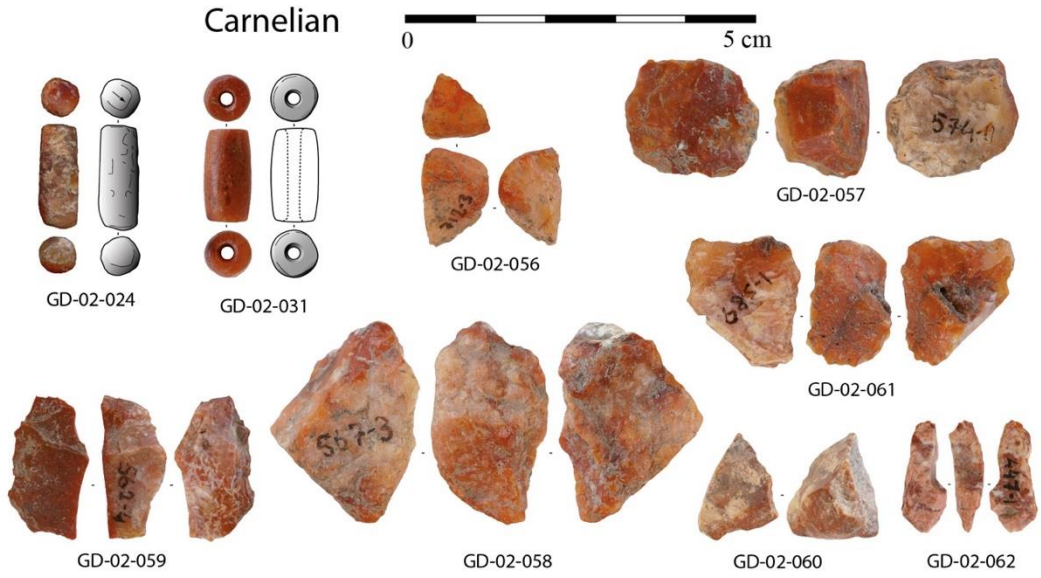

Figure 6. Photos and drawing of the carnelian raw material, blank and bead recovered from site.

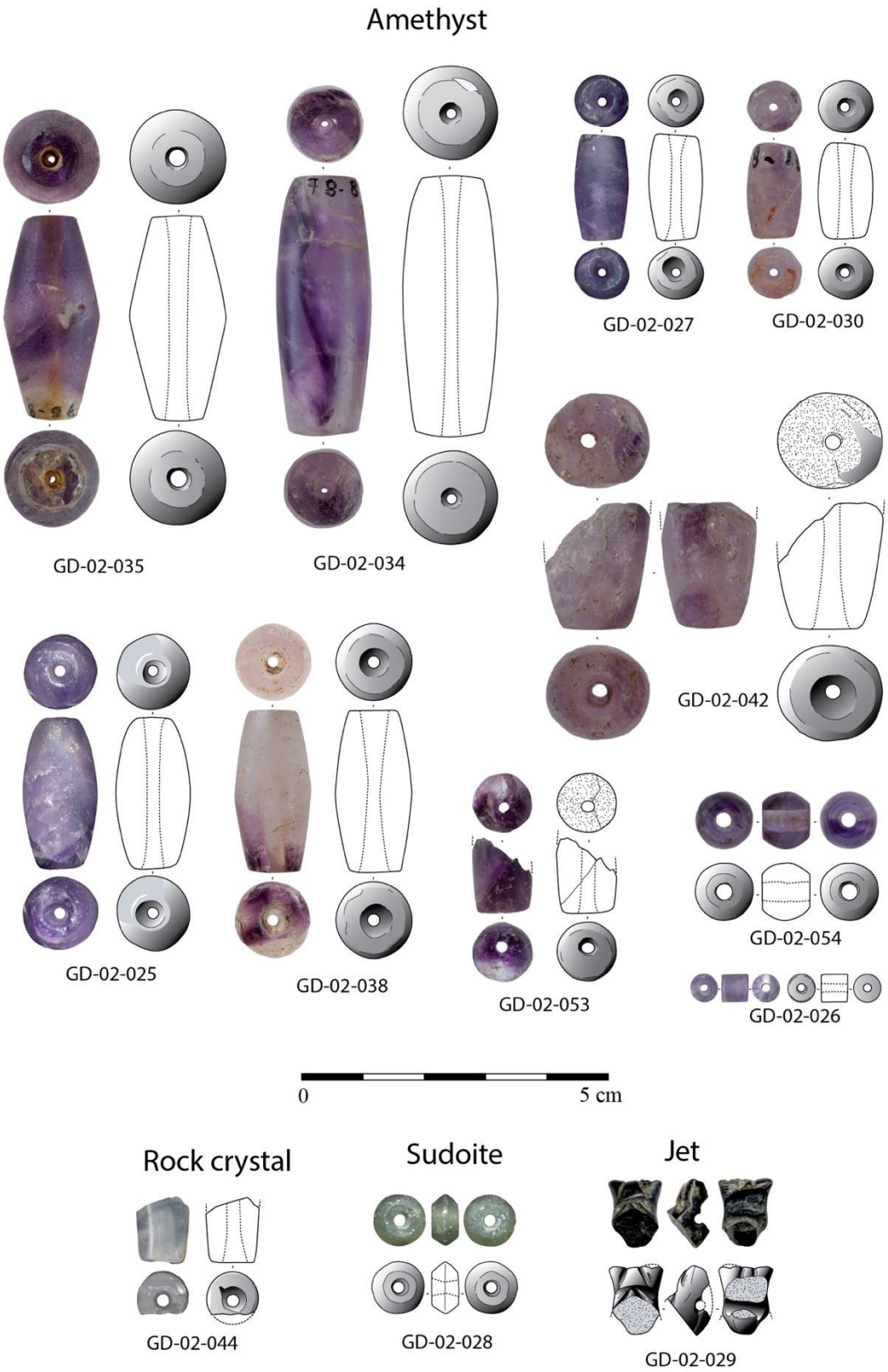

Figure 7. Photos and drawing of the amethyst, rock crystal and sudoite beads from Morel site, as well as the fragment of jet pendant GD-02-029.

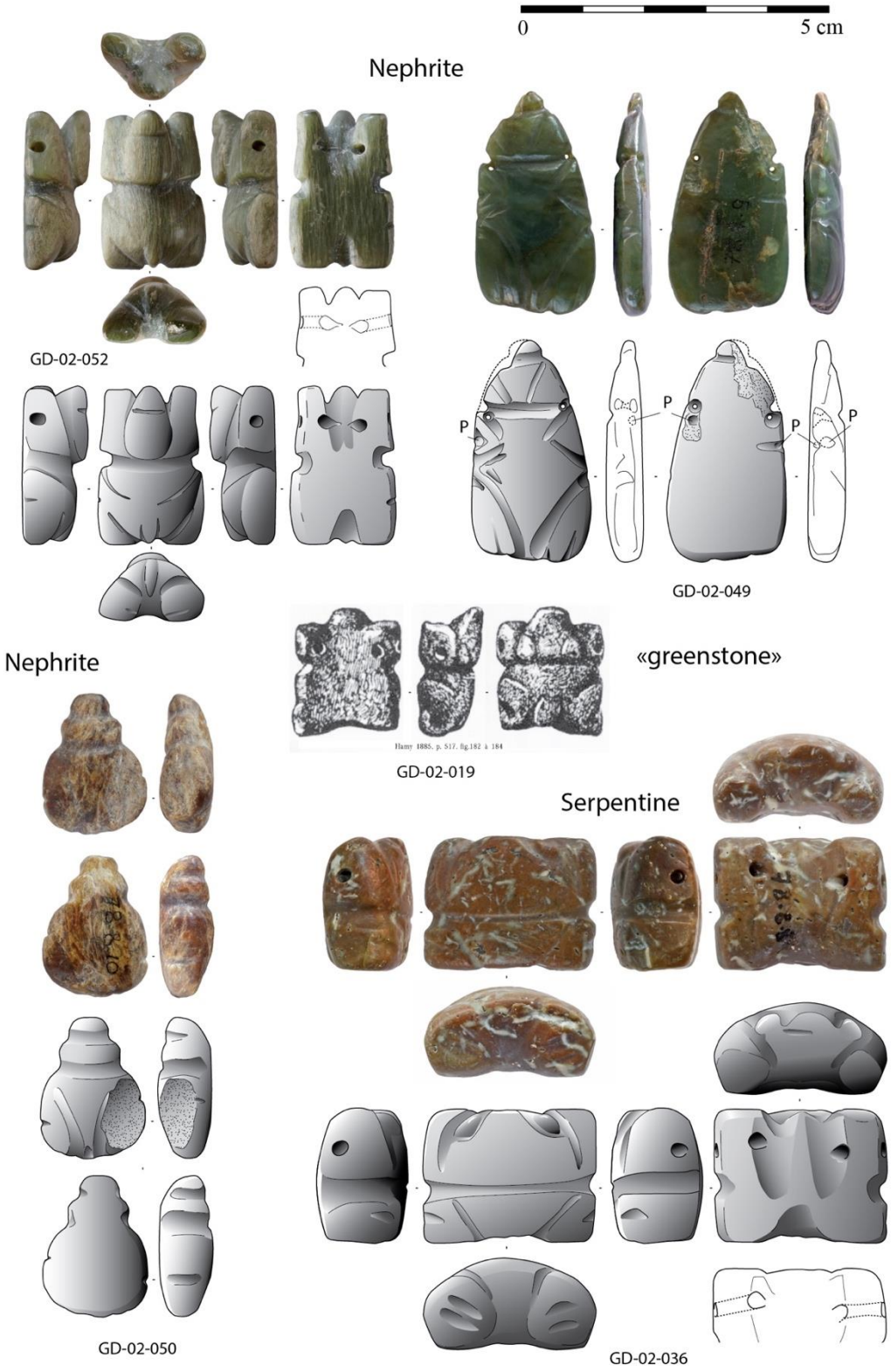

Figure 8. Photos and drawing of the greenstone pendants from the Morel site, identified as nephrite and serpentine. In the center, drawing from a "greenstone" pendant from the site (modified after Hamy 1885) for which we do not know the present location.

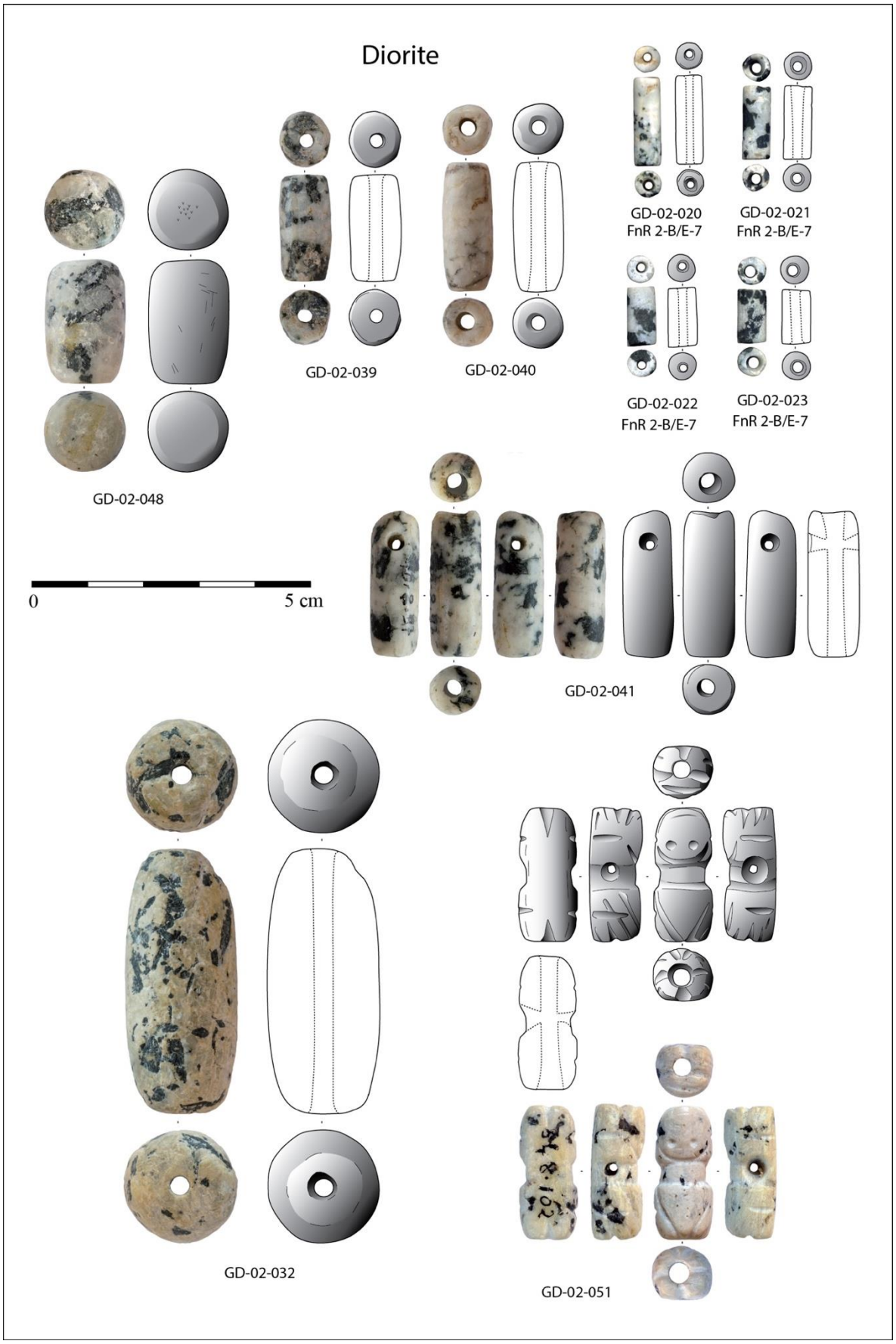

Figure 9. Photos and drawing of the diorite material from Morel.

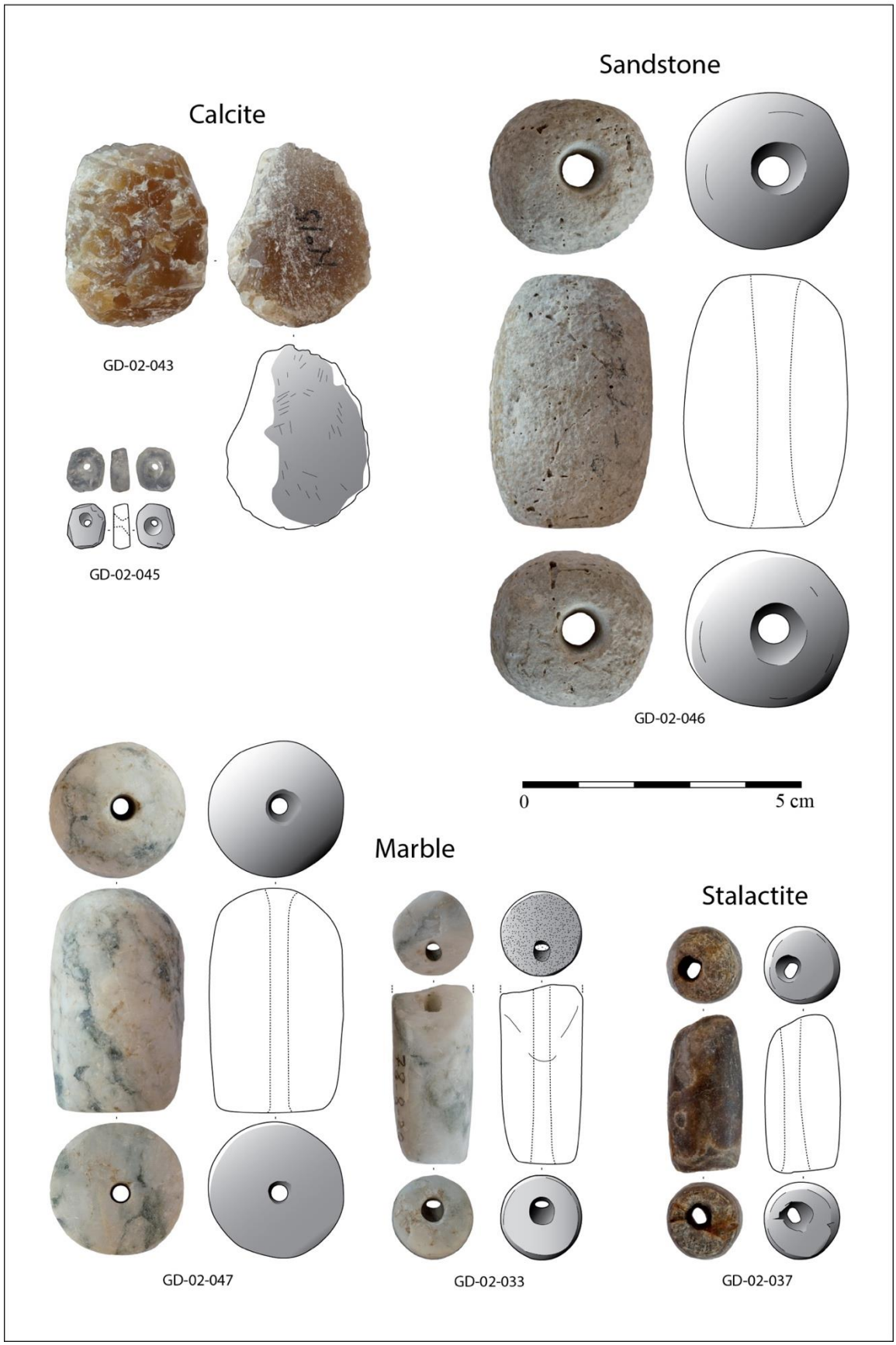

Figure 10. Photos and drawing of the calcite, marble and sandstone material from Morel.

Vivé

The sample is dominated by discoid beads (Table 3), made of diorite, greenstones, and, mainly turquoise (Table 2; Figures 11 and 12). A group of highly polished, bitronconical or spherical amethyst beads is also noteworthy for the investment in their finishing process (Figure 13). The unusual plano-convex beads, made of turquoise as in Gare Maritime (Queffelec, Fouéré, Paris, et al. 2018), are represented here by two objects (Figure 11). Rare raw materials are represented by barytine, sudoite, paragonite, diaspore, which can only be reliably identified through advanced analyses (here by Raman spectroscopy) (Figure 14). There are not many pendants at this site, but the two recovered (MA-02-13 and MA-02-14) are exceptional both in terms of raw material (nephrite) and technical production. Despite being of different colors, both are made of nephrite and are quite similar in style (Figure 11). MA-02-013 is very similar to GD-02-001 (Figure 3), with prominent head, snout and eyes, and a similar thickness for head and body. MA-02-014 shows less details, no eyes, and no grooves on the animal's abdomen. The volume is much smaller, especially because the body is much thinner than the head. There are three perforations on this artifact, since one of them broke (by using the artifact or by finishing the perforation?) and was replaced by a second one just above and on the same side of the animal. Finally, the authors note that the anorthite discoid bead MA-02-018 (Figure 12) is presented here for the record, but does not come from the same layer as the other lapidary artifacts.

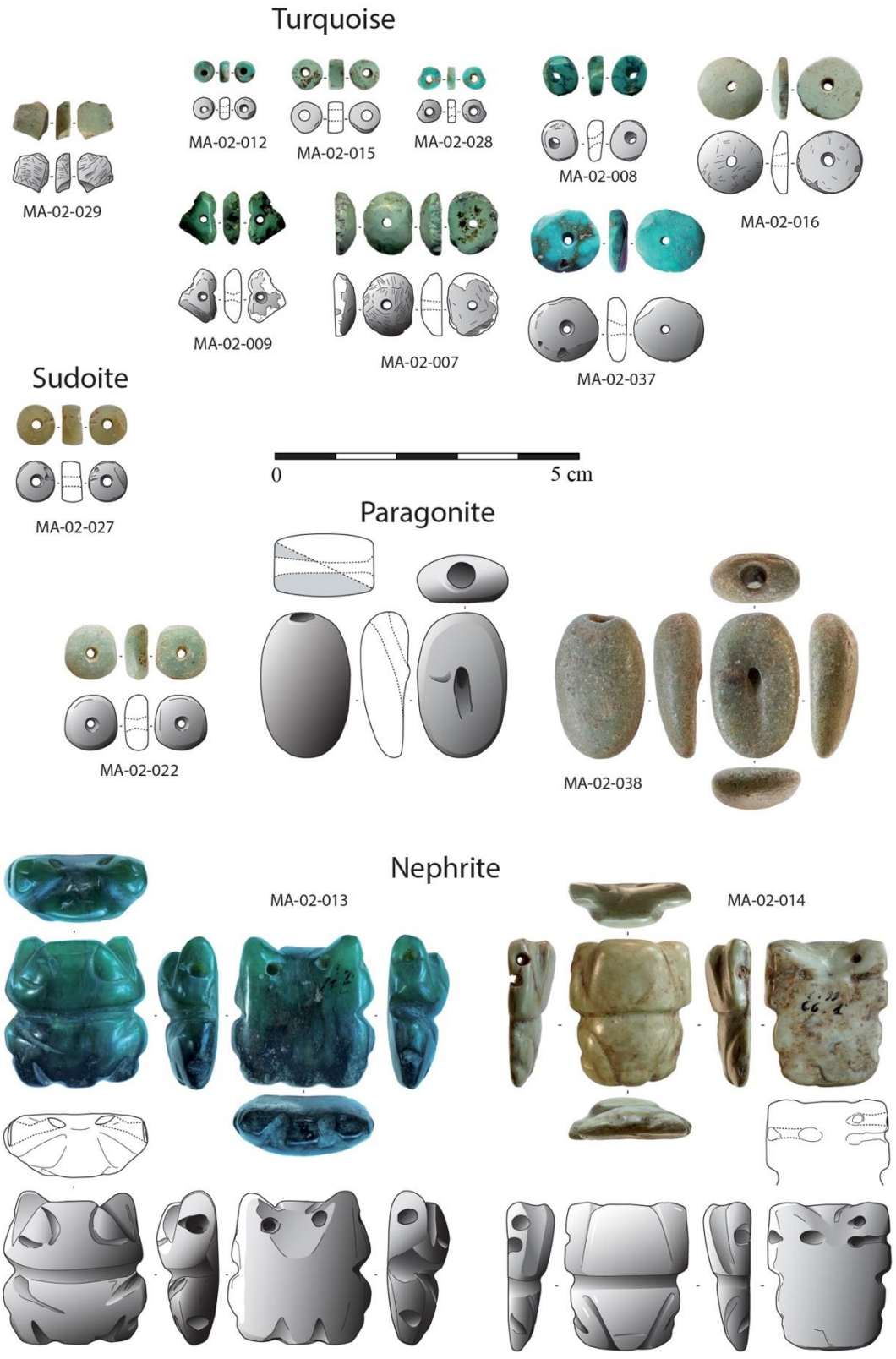

Figure 11. Photos and drawing of the greenstone artifacts from Vivé, including numerous turquoise beads and two carved nephrite pendants.

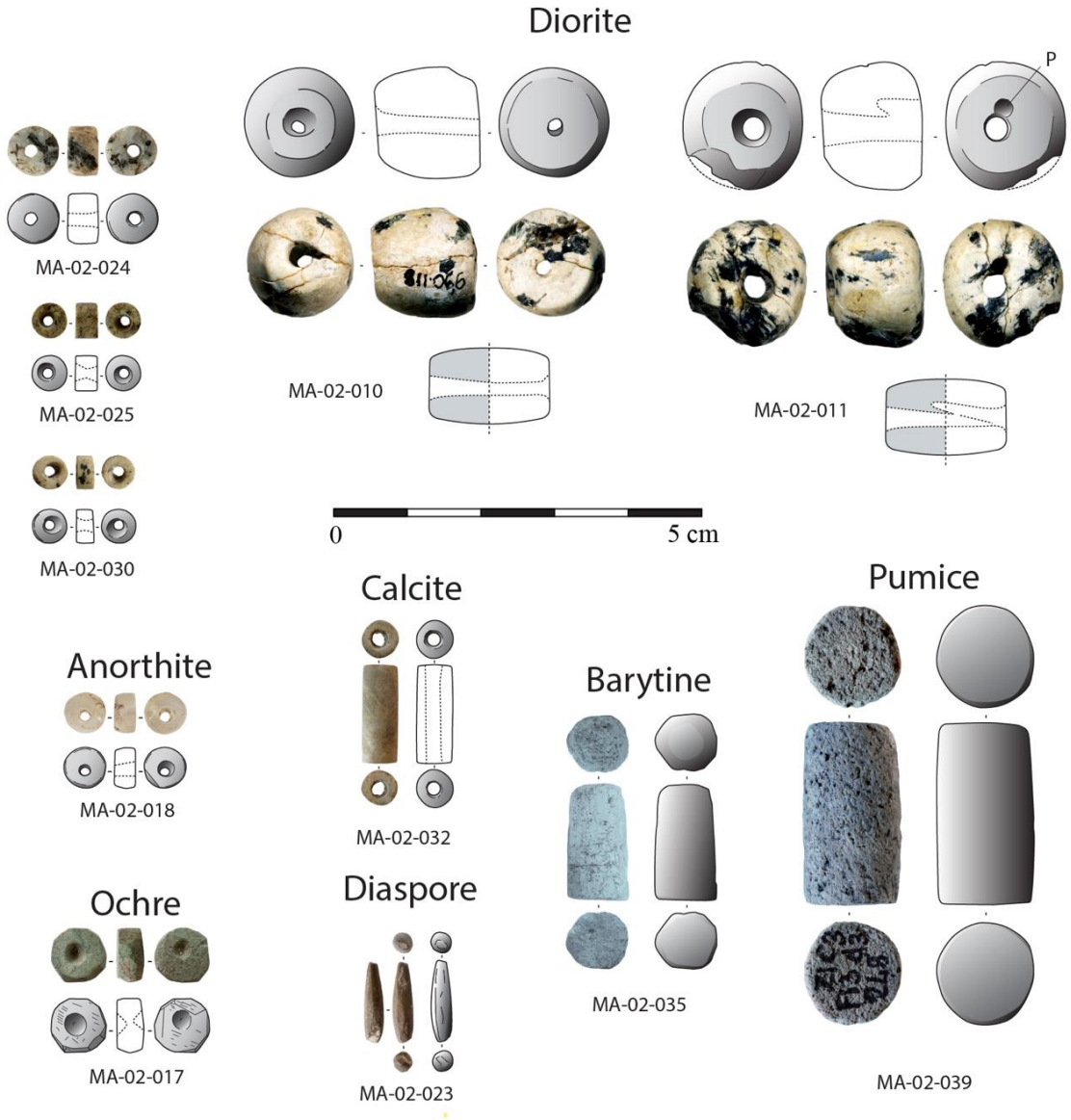

Figure 12. Photos and drawing of the lapidary artifacts from Vivé made of diverse raw materials.

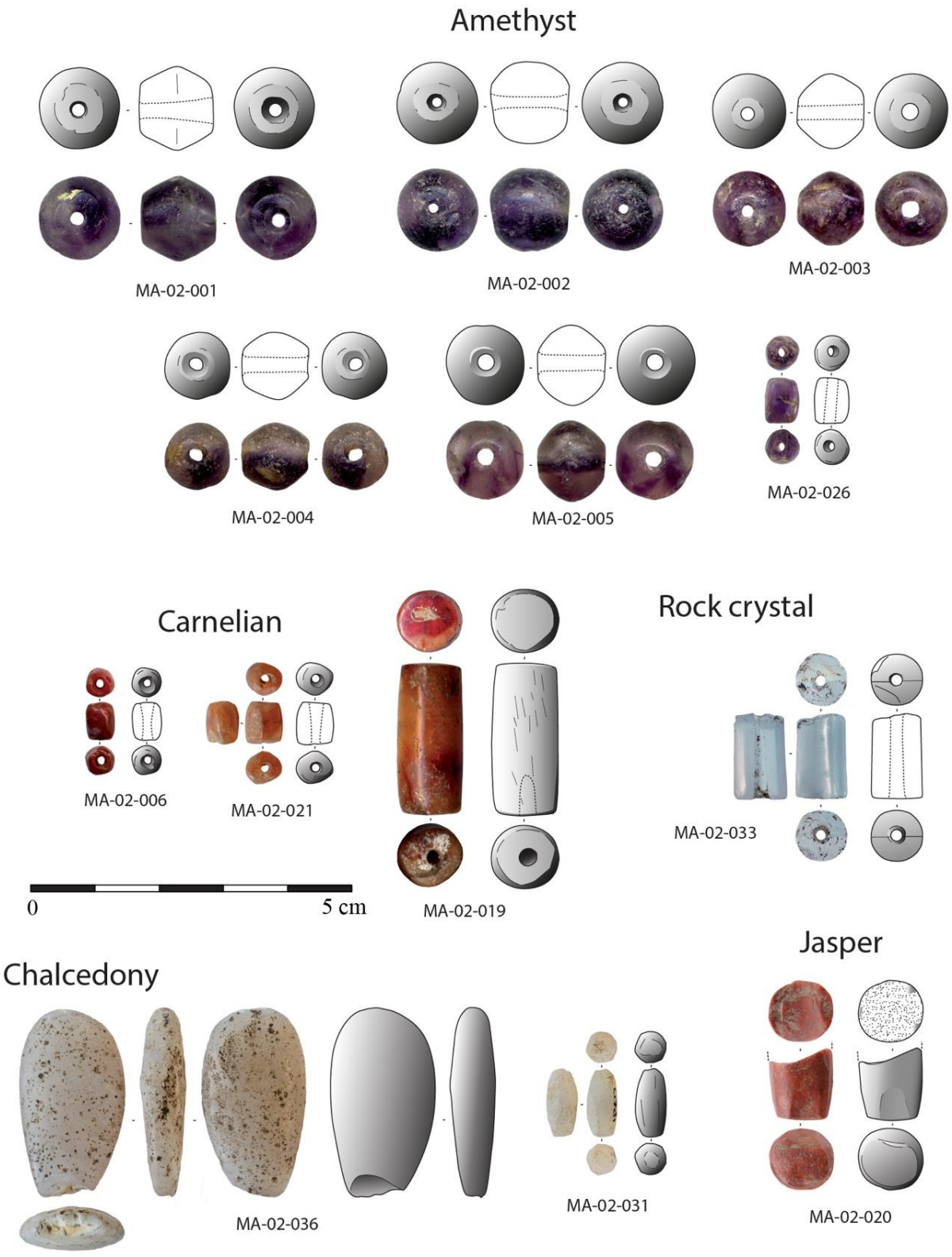

Figure 13. Photos and drawing of the different form of silica: amethyst, carnelian, rock crystal, chalcedony and jasper.

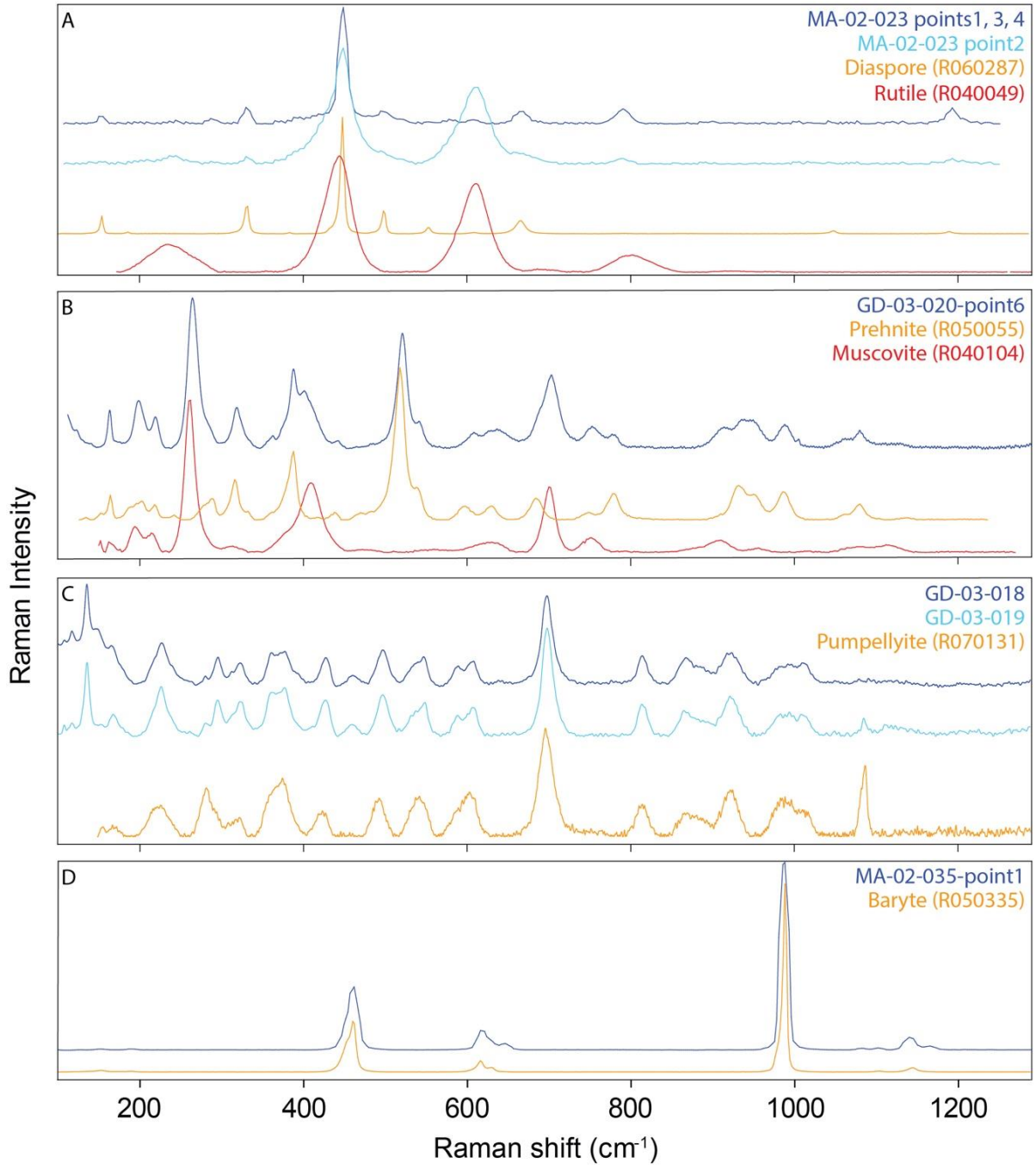

Figure 14. Representative Raman spectra of some minerals identified in the collections, pointing at rare material, hardly identifiable by naked eye, and not previously showed in other articles on this subject. Reference spectra from the RRUFF database are shown for each material. (A) Two titanium oxides composing the possible labret MA-02-023. (B) Prehnite and muscovite mixed in the small white bead GD-03-020. (C) Pumpellyite composing both tiny green chips GD-03-08 and -019. (D) Baryte identified as the raw material of the cylindrical blank MA-02-035.

Anse à la Gourde

The excavations of the more recent archaeological occupations in Anse à la Gourde (Late Ceramic period) have yielded 25 artifacts that can be connected to lapidary craftsmanship (Appendix 1). After careful examination of the field reports and the labeling of each bead, 24 are confidently attributed to the post-Saladoid period: 23 from the main sector of the excavation (Zone 64) and the trench from the 1995 fieldwork, and one (GD-03-003) from the upper part of a test pit attributed to the Troumassoid occupation. Only one bead (GD-03-007) is questionable since the reporting and the labeling of the sample give contradictory information. The description and analysis of this bead is included in this paper but excluded from statistical interpretations.

Discoid beads, mainly made of calcite, are dominant in the sample (Table 3; Figure 15). Calcite being the main raw material used for discoid beads, and also used for long beads, it is clearly the prevalent raw material of the lapidary production of the occupants of Anse à la Gourde (Table 2). Diorite is the second raw material in quantity, used to produce four artifacts: two large, poorly finished discoid beads (GD-03-013 and -014), one small and highly polished short bead (GD-03-023), and a big barrel-shaped blank showing the very beginning of a perforation (GD-03-012) (Figure 16). So-called *greenstone* is rare in this site, and is represented by a single turquoise bead (GD-03-007; the one bead whose cultural attribution is not clear, therefore removed from further statistical treatments), and the unique pendant of the collection. This pendant (GD-03-008), which does not appear to represent any zoomorphic shape (Figure 16), is made of serpentine (Figure 14), and not "jadeitite" as reported in a previous publication (Rodríguez Ramos 2010:Figure 7; probably mistaken by visual inspection only). Two tiny chips of another greenstone (GD-03-018 and -019), are made of pumpellyite, a green sorosilicate mineral associated with low grade metamorphism (Figures 14 and 16); this material has not previously been identified in the Antilles. These chips are probably related to lapidary craft, since it is unlikely that they come from utilitarian lithic craftsmanship, and their saturated green color points towards the Amerindian attraction for greenstones in lapidary production. Nevertheless, no pumpellyite artifact has been identified to date in the lapidary production of Amerindians. As documented above for the Morel site, the presence of a naturally perforated stalactite at Anse à la Gourde is equally as interesting as it is rare in the Lesser Antilles (Figure 15, GD-03-002).

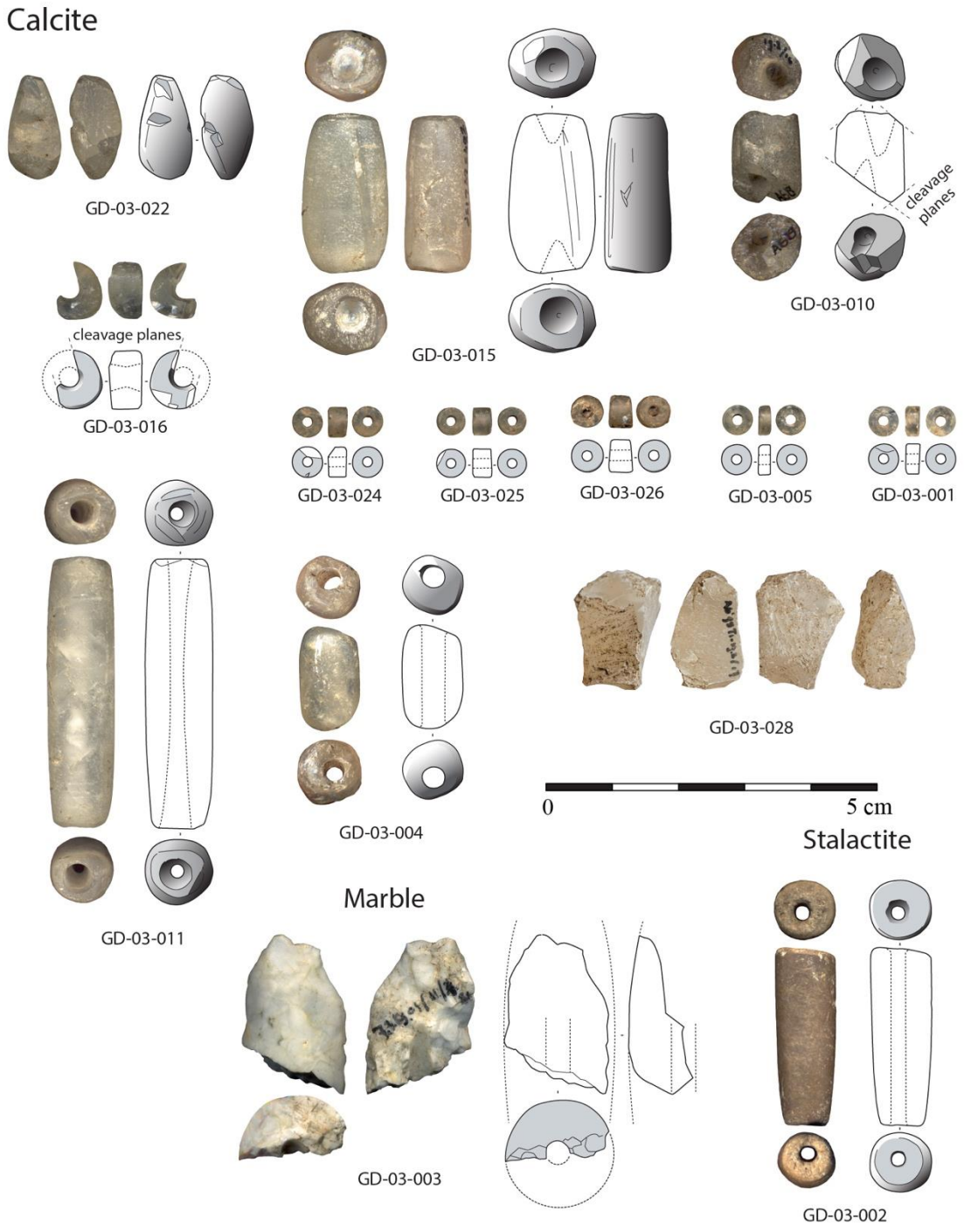

Figure 15. Photos and drawing of the calcite artifacts from Anse à la Gourde.

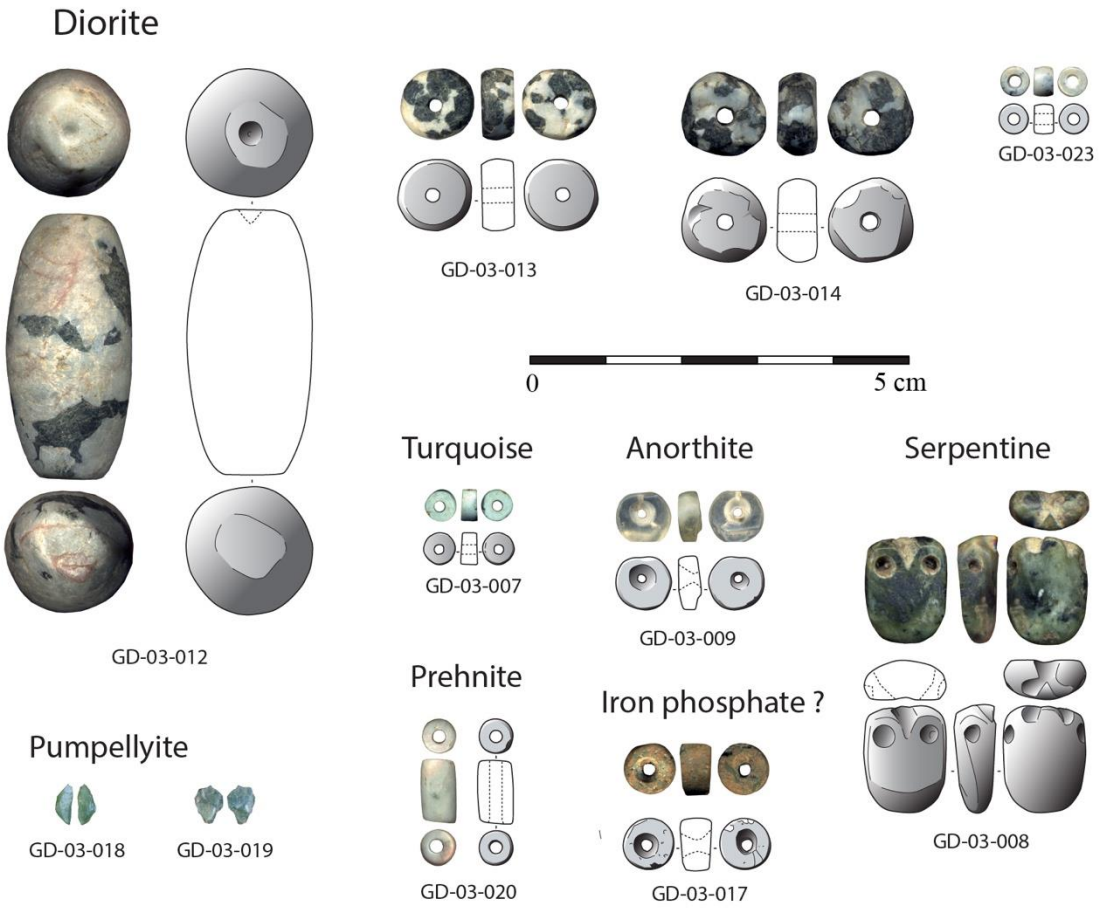

Figure 16. Photos and drawing of the artifacts from Anse à la Gourde made of diorite and other raw materials.

Discussion

Detailed mineralogical and typological analysis of the lapidary production assessed with the same methodology facilitated an inter-site comparison of Vivé, Morel, and Anse à la Gourde, together with the data from Gare Maritime. This discussion of diversity is based on both raw material distribution and the typology of lapidary production using simple histograms and diversity profiles to compare sites with graphical support. By addressing the raw materials, the typology, and the simplified *chaînes opératoires* (production sequence), this study then discusses the similarities and differences among sites and between periods in the lapidary production of Ceramic Age Guadeloupe and Martinique.

Raw material diversity

Comparison of the distribution of the raw material among the three broadly contemporaneous Early Ceramic sites shows a certain homogeneity reflected in the relative proportion of amethyst and the low quantity of calcite artifacts (Table 2, Figure 17). One aspect of this distribution of raw material is the presence of high numbers of artifacts and diversity of raw materials for the so-called *greenstones* in each of these sites, and in particular the presence of rare gem materials: nephrite, sudoite and paragonite. Vivé and Morel

have some common parameters, such as the proportion of diorite, nephrite, amethyst, carnelian (especially if the carnelian chips are not counted in the lapidary artifacts). Morel is unique due to its high amount of rock crystal, but this is biased by the exceptional finding of the necklace, which contains 12 cylindrical beads made of this translucent gem. The other difference between the two sites is the proportion of turquoise in Vivé, which resembles much more Gare Maritime. Gare Maritime, on the other hand, remains quite unique because of its high proportion of serpentine and low quantity of diorite, which are not found in the other sites. In contrast, the Anse à la Gourde collection, which represents the Late Ceramic period, is strongly dominated by calcite. This collection, the smallest of the four sites, also contains specific minerals not present in the larger assemblages from the Early Ceramic sites such as prehnite, pumpellyite, and iron phosphate. Finally, with regard to the diversity of raw materials found in each archaeological site, Vivé is much more diverse than the others given its moderate number of lapidary artifacts (Table 2). The diversity profile of Vivé, positioned above all the others for every value of the scale parameter, indicates that the diversity of this collection is much higher than for the other sites, whatever the importance the rare materials take in the calculation (Figure 18). The profiles of the four sites are quite well separated and allow the interpretation that Vivé is clearly more diverse than Morel, which is more diverse than Gare Maritime, which is much more diverse than Anse à la Gourde. It is not only the small amount of artifacts from Anse à la Gourde that produces the low diversity, it is also the specialization in the use of one raw material (here calcite), as evidenced by the low value of the Piélou evenness index (Figure 18b).

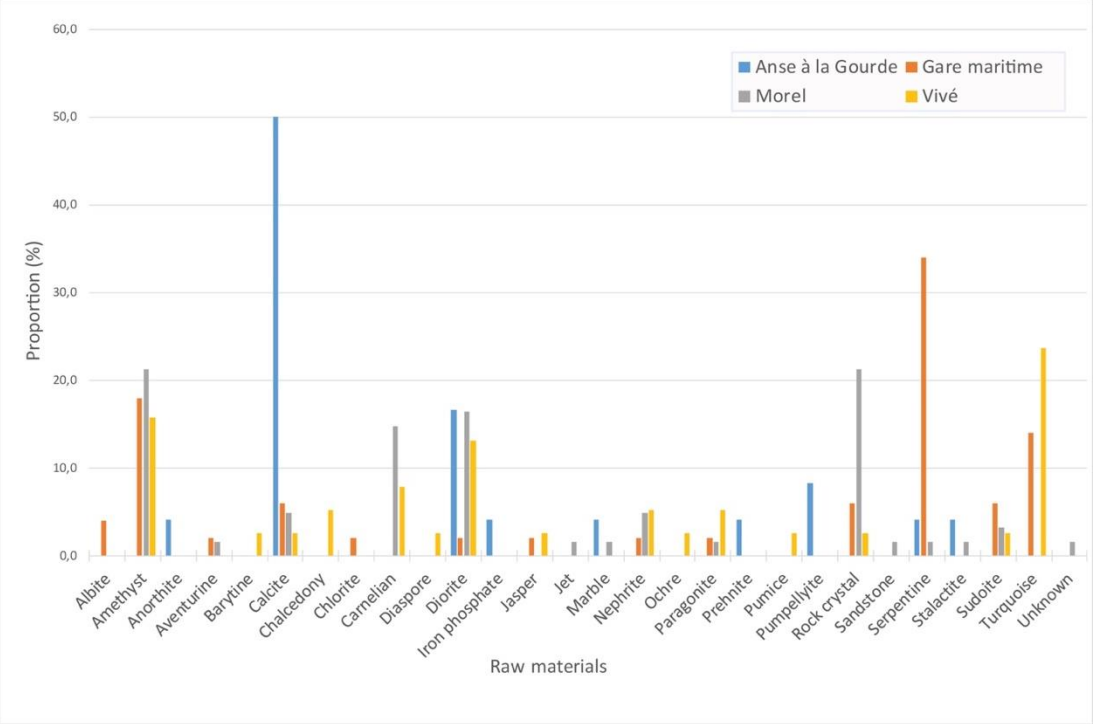

Figure 17. Bar chart representation of the distribution of the raw materials identified in the four sites (data from Table 2).

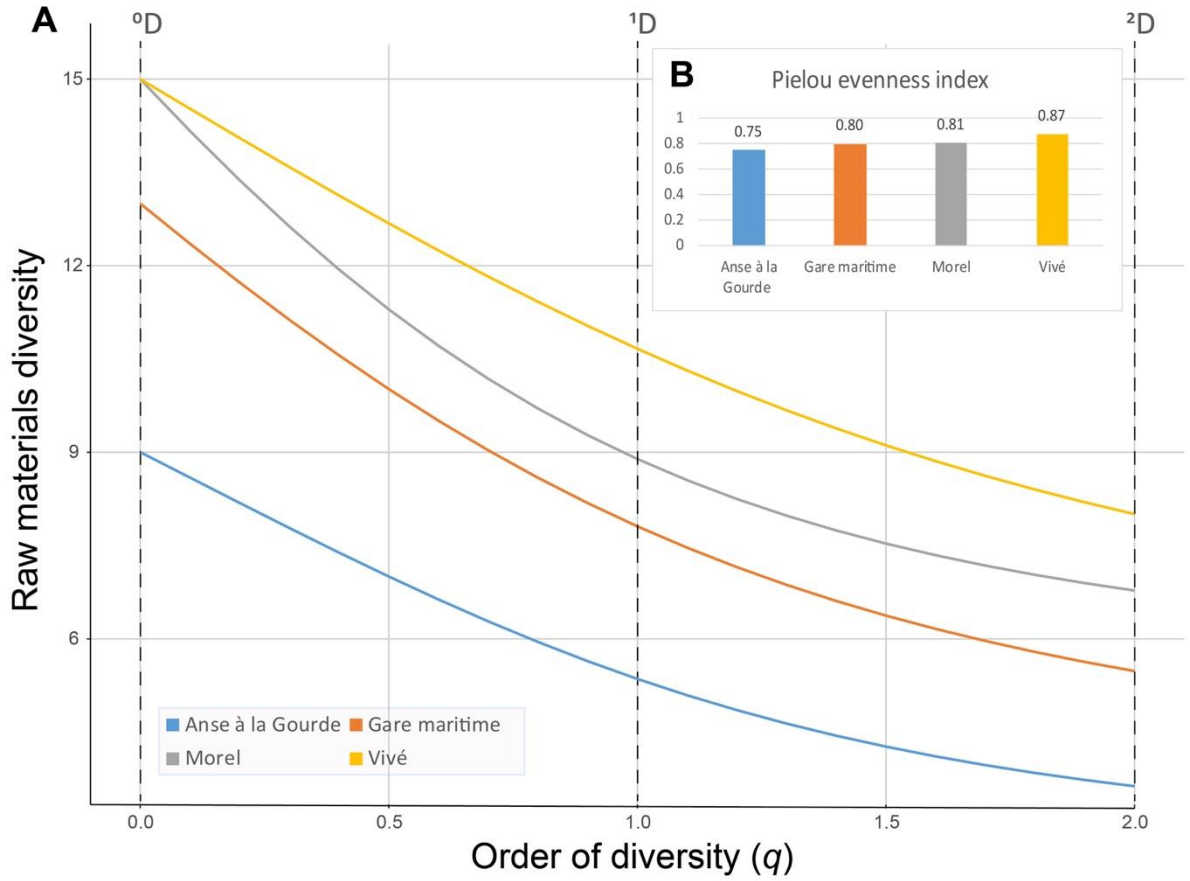

Figure 18. (A) Diversity profiles for the raw materials used in the four sites and (B) Piélou's evenness index to calculate the equitability of the distribution. Calculation made from data of Table 2.

The detailed discussion of the provenance of all the raw materials identified in this study, despite being beyond the scope of this article, can be nevertheless synthesized in three categories: local or potentially local, regional or potentially regional, and extra regional. The two later categories representing what is often named "exotic" (Cody 1991) .The only local mineral well represented is calcite, which can be found in several islands of the Lesser Antilles, including Guadeloupe, even if we are currently unaware of such massive crystallizations allowing the production of long beads. Other volcanic gemstones, rarely used, can be found on the volcanic parts of the French islands: albite, anorthite, and pumice. Jasper is also present on the island of Martinique (Westercamp et al. 1989). As for the other minerals, they can be considered as "exotic" raw materials, meaning there are not coming from the island on which the artifact is discovered. This category of gemstones include therefore almost all the raw materials identified in this study, as it was the case for Gare Maritime (Queffelec, Fouéré, Paris, et al. 2018). As for the regional scale, some gemstones are known to exist at the natural state in the Lesser Antilles, such as diorite in Tobago and Puerto Rico (Snoke 2001; Weaver 1958), stalactite on St. Bartholomew (Lenoble et al. 2012), rock

crystal, chalcedony and barite on Antigua (Murphy et al. 2000), serpentine in the southern Greater Antilles and Tobago (Auzende et al. 2002; Boomert 1987; Haviser 1993). Other are potentially present on islands of the Lesser Antilles given the regional geological background. Marble probably exists in some metamorphosed formations of limestone islands. Most of the green minerals and rocks forming the greenstone category also enter this regional classification, since chlorite, paragonite, pumpellyite and sudoite are minerals all belonging to the high pressure and low temperature (HP-LT) metamorphism facies widespread in the Caribbean (Auzende et al. 2002). Nephrite and turquoise, finally, could be counted as extra regional gemstones. The former is probably originating from ophiolites formation, a type of rocks only found in the peripheral areas of the Caribbean tectonic plate in Cuba, Hispaniola, Guatemala, Panama and Colombia (Acevedo Gómez et al. 2018; García-Casco et al. 2006). The later has never been identified in the Antilles but is known from several copper porphyry deposits, the closest being in Brazil and others in the Andean Cordillera and North of Mesoamerica.

None of these raw materials is directly suitable for provenance analysis by "classically performed analysis" like basic geochemistry. Therefore, the exact sources remain unclear, and clarifying them will require detailed geological fieldwork to study mineralogical associations, gitology studies, and future analytical developments.

Typological diversity

Considering the morphology of the lithic beads, the sites of Vivé and Gare Maritime are comparable, with the sole exception of the total absence of biconical beads at Gare Maritime (Table 3; Figure 19). In both sites, cylindrical and discoid beads dominate, and the rare plano-convex beads, always made of turquoise, are present in both sites. As for Morel, the assemblage is characterized by dominance cylindrical and barrel-shaped beads, even setting aside the collar. The discoid shape is more or less absent. Pendants are always made of *greenstones*, while very hard materials such as rock crystal and amethyst are almost exclusively used for long beads. Discoid beads are mainly made of softer materials such as turquoise, serpentine, diorite, and feldspars for the more common raw materials. Anse à la Gourde, strongly dominated by calcite beads, has both cylindrical and discoid shapes, and is not that different from the studied Early Ceramic sites in this aspect.

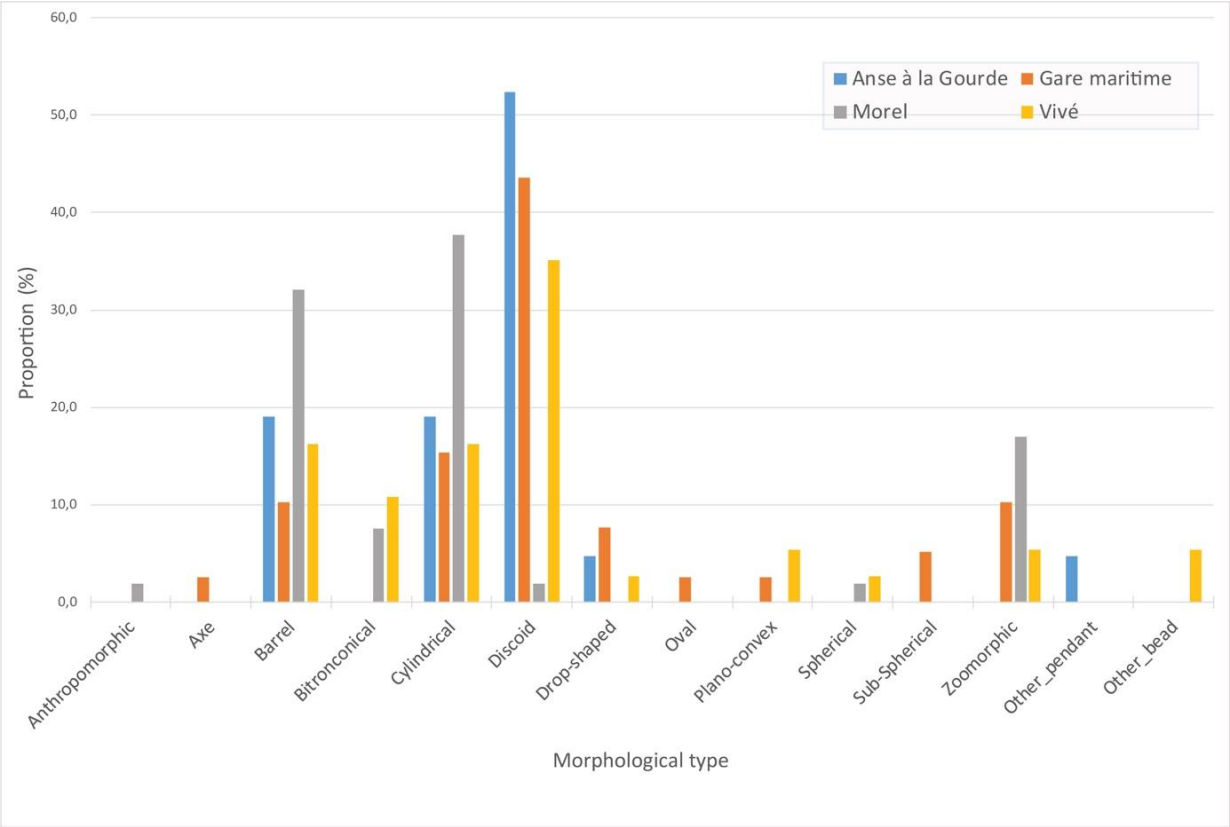

Figure 19. Bar chart representation of the distribution of the types of lapidary artifacts identified in the four sites (data from Table 3).

With regard to the diversity of the types of lapidary production analyzed (Figure 20), the temporal segregation remains clear, with Anse à la Gourde being much less diversified than the other sites, and Vivé being the most diverse. Nevertheless, from this point of view of the collections, Morel is less diverse than Gare Maritime, the latter being quite similar to Vivé. The high specialization in the use of long beads (barrel-shaped and cylindrical) given the high number of lapidary artifacts at the site explains this result. This predominance of a type is also clearly recorded by the Piélou index, which is the lowest for Morel (Figure 20b).

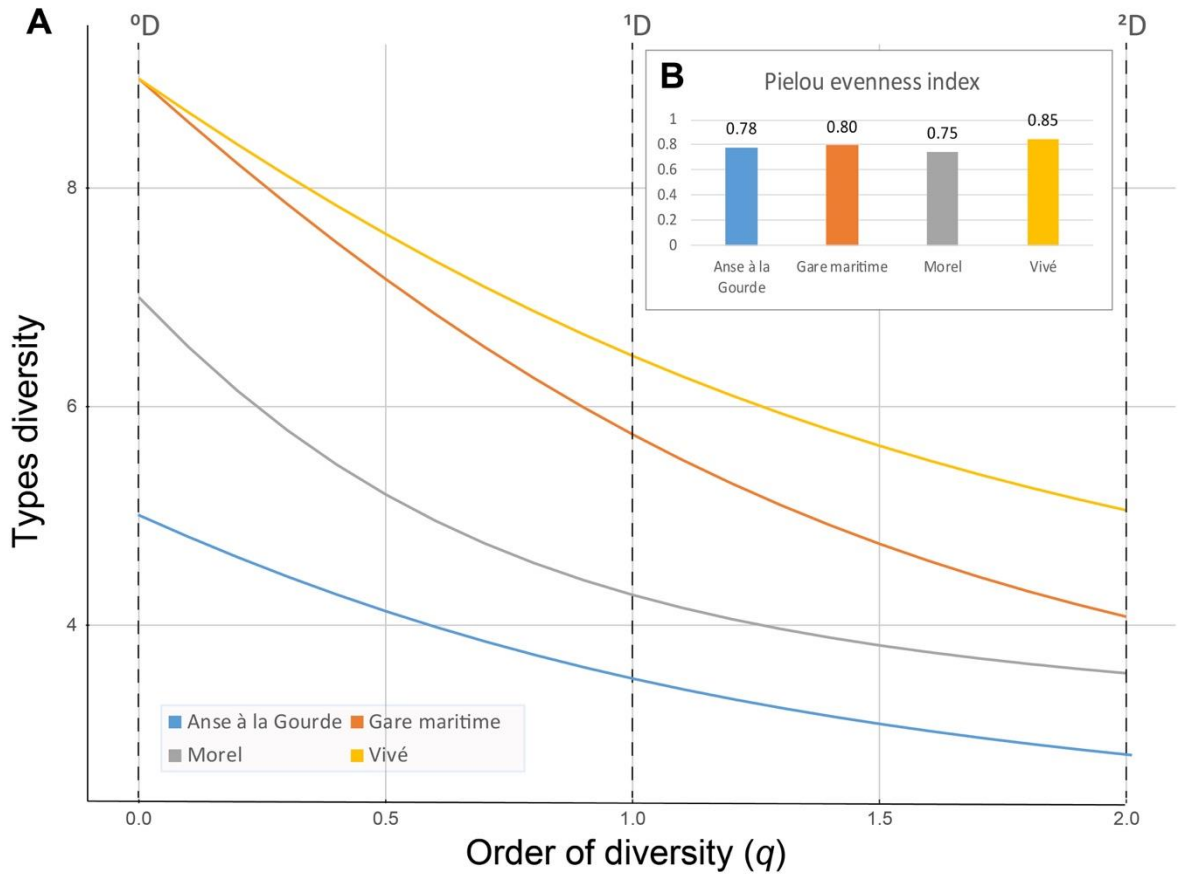

Figure 20. (A) Diversity profiles for types of artifacts (for finished and/or identifiable objects) in the four sites and (B) Piélou's evenness index to calculate the equitability of the distribution. Calculation made from data of Table 3.

The main production of the Amerindian lapidary craft in the Lesser Antilles is clearly the production of beads. Based on Beck's classification (1928), beads only belong to two categories: short beads and long beads (Figure 21). As already noted (Queffelec, Fouéré, Paris, et al. 2018), disc and standard beads are rare. The last category, surprisingly, is represented almost exclusively by the collar found in Vivé's burial, which is made of amethyst and diorite. The homogeneity of the amethyst beads from this collar, similar to the homogeneity of the rock crystal beads from the collar of Morel, demonstrates the craftsmen's ability to produce the required shapes and sizes when desired (Figure 21). The diameter of the perforation tends to increase with the length of the bead, but the pattern is not very clear and does not seem to be related to the difference in raw material (color, hardness, mineralogy), site or period.

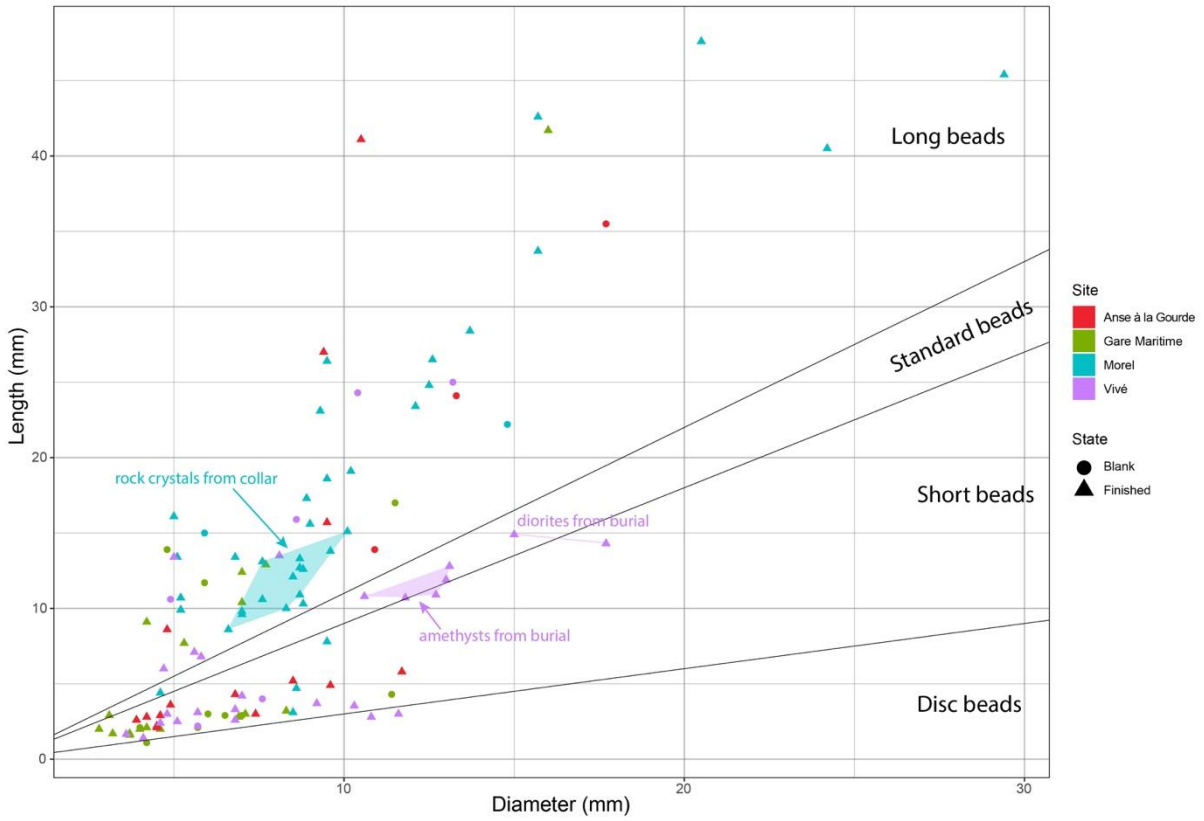

Figure 21. Plotting of the dimensions of the beads from the Anse à la Gourde, Gare Maritime, Morel and Vivé. Layout of the separation between the types defined by Beck (1926).

Finally, with regard to the distribution of zoomorphic pendants among the sites, the situation is quite confusing. Only one type of pendant is present in Vivé: typical early Cedrosan Saladoid frog-shaped pendants, massive, thick, with a prominent head and well engraved front and rear legs (Figure 11, MA-02-013, -014). This type is also well represented in Morel, especially in the collar (Figures 3 and 4), but other shapes are also present at this site (Figure 8). These more stylized shapes are the only one found in Gare Maritime (Queffelec, Fouéré, Paris, et al. 2018: Figure 3). All the pendants are made of different *greenstones*, even the one from Anse à la Gourde. This last pendant (GD-03-008), however, is not clearly zoomorphic, and differs greatly from those of the Early Ceramic. This heterogeneity could be related to the small sample, and a study of the zoomorphic pendants at a regional scale is necessary.

Chaînes opératoires

Concerning the *chaîne opératoire* of the different sites and raw material, it is very difficult to identify general trends because of the great diversity of raw materials in the Early Ceramic period sites, and the diversity of the proportions that each raw material represents in each site. This also requires sieving of the sediments to search for small bits of stone debitage, not always carried out during the excavation. Getting into the details and trying to infer the specific *chaîne opératoire* for each type, material, and site, is beyond the scope of

this article. However, some general observations can be made. For the raw materials sufficiently represented, the presence of each main step of the *chaîne opératoire* is summarized in Table 4. Most gemstones are clearly absent in the raw state in all sites, as is the case for anorthite, diorite, turquoise, nephrite, rock crystal, paragonite, sudoite, and most other rare materials. This absence implies that the material was not transported raw to the site and, that, probably, the blanks were also quite advanced in the manufacturing stages while transported since the reduction chips are not present either. It can also be noted that rare and very hard materials are mainly present in the form of finished objects (with the exception of amethyst in Gare Maritime). Evidence of the reduction process on site is only visible for amethyst and serpentine (Gare Maritime), carnelian (Morel), and probably pumpellyite (Anse à la Gourde). Pendant blanks are rare, and only found as finished objects lacking only perforation. The absence of this last step, however, may also be related to the use of miniature objects of similar shapes in other ways than pendants (charms, valuable goods for exchange…).

Integrated comparison of the Early Ceramic period sites

With regard to the three sites from the Early Ceramic period, which are Gare Maritime, Vivé, and Morel, similarities and differences can be observed and tentatively interpreted. On the one hand, there are consistencies in the relatively high amount of lapidary artifacts, the great diversity especially for raw materials, the high proportion of exotic raw materials including many different *greenstones*, the quantity of pendants, all made of *greenstones*, and the use of very hard gemstones (rock crystal and amethyst) to produce beads. These characteristics could demonstrate the level of investment in these kinds of personal ornaments. Indeed, the importance of the production and diversity of lithic beads and pendants and the existence of significant long-distance exchange networks can be considered as shared characteristics by all the Early Ceramic groups. Vivé, Morel, and Gare Maritime confirm, with this detailed analysis, their participation in the pattern already described for the sites of this period (Cody 1993; Crock and Bartone 1998; Murphy et al. 2000; Narganes Storde 1995; Rodriguez 1993).

Table 4. For the different raw materials and for each site, each main step of the *chaîne opératoire present in the site is indicated by a green box*.

		Morel	Vivé	Gare Maritime		Anse à la Gourde
Amethyst	Raw material					
	Blank					
	Finished					
Anorthite	Raw material					
	Blank					
	Finished					
Calcite	Raw material					
	Blank					
	Finished					
Carnelian	Raw material					
	Blank					
	Finished					
Diorite	Raw material					
	Blank					
	Finished					
Serpentine	Raw material					
	Blank					
	Finished					
Turquoise	Raw material					
	Blank					
	Finished					
Nephrite	Raw material					
	Blank					
	Finished					
Rock crystal	Raw material					
	Blank					
	Finished					
Paragonite	Raw material					
	Blank					
	Finished					
Sudoite	Raw material					
	Blank					
	Finished					

Nevertheless, this thorough examination, rarely undertaken, leading to an exhaustive identification of raw material, a complete typological study, as well as a quantified comparison between sites, also reveals differences that would not be highlighted by a less complete approach. Indeed, discrepancies are visible, such as differences in the dominant raw materials, in the dominant type and in the diversity of these two parameters. The generalization of the *chaîne opératoire* also proves difficult, as each site brings a contradiction to the other on the presence or absence of the

different steps of the process. This heterogeneity reflects the current views on Early Ceramic period, namely that "the general similarities in Saladoid material culture are now far outweighed by the differences between sites and islands" (Keegan and Hofman 2016, p. 82). These differences could indeed be the consequence of a palimpsest of causes such as difficulties/inconsistencies in the supply of raw materials, differences between groups, differences in the geographical location of sites, changes in trade routes, and, of course, among many others, the absence of a real contemporaneity of the three sites. Unfortunately, the excavations were not carried out the same way for all of them, which hampers the full potential of these observations: Morel's collection is a mixture of early excavation (without sieving), surface collection, and an exceptional find in a burial; Gare Maritime, which delivered the largest quantity of raw material and blanks, was entirely sieved and excavated by hand. Vivé and Anse à la Gourde, two extensive sites, were also excavated recently and the sediment was sieved. Considering the relatively small surface excavated at Gare Maritime compared to the other sites, the great diversity and quantity of lapidary production on this site, the large quantity of raw materials and blanks, and the absence of well-endowed burial, it is likely that Gare Maritime was more related to lapidary craftsmanship than the other sites.

One point that seems clearer is the typological diversity of amulets, which may reflect the cultural diversity of the Early Ceramic period in the central Lesser Antilles. Indeed, the cultural affiliation of the Early Ceramic component in these three sites is not identical. The Morel site is characterized by the presence of both Huecan and Early Cedrosan Saladoid components (Hofman et al. 2001; Keegan and Hofman 2016) while Vivé is only characterized by an Early Cedrosan component (Bérard 2000) and Gare Maritime by Huecan only (Romon et al. 2013). It could therefore be argued that the massive and more realistic representations are related to the Early Cedrosan Saladoid, while the flat, smaller and more stylized zoomorphic pendants are representative of the Huecan Saladoid sub-series (Chanlatte Baik and Narganes Storde 2005). Morel's collection contains both styles, while Vivé's collection contains only massive pendants and Gare Maritime only stylized ones. Finally, it should be noted that the Morel pendant GD-02-003, part of the collar found in the most ancient layers of the site's stratigraphy, tentatively attributed to a bird shape (Durand and Petitjean Roget 1991), may indeed reflect a relation with the Huecan bird pendants from Puerto Rico (Chanlatte Baik 1983).

Chronological comparison

For decades, a significant distinction has been made between Early Ceramic period communities and later ones with regard to the use of lapidary artifacts (Bérard 2013; Hofman et al. 2007, 2014; Knippenberg 2007; Rodriguez 1993). The results of the detailed study presented in this article reinforce this distinction, once again, by comparing and finding many differences between three Early Ceramic period sites and a site with Late Cedrosan Saladoid and Troumassoid components. There are many qualitative differences, such as the low quantity of artifacts given the high volume of the excavation, the ultra-dominance of calcite beads, the low diversity of raw materials and types, the low number and non-zoomorphic shape of pendants, the

absence of rock crystal and amethyst long beads etc. The quantitative approach to diversity in lapidary craft, based on ecological methodology, also confirms this clear distinction. Anse à la Gourde is clearly the least diversified collection, both in terms of raw materials and the typology of finished objects. All these differences can lead to a single interpretation: the importance of lapidary artifacts in the cultures of Lesser Antilles inhabitants decreased after the first pioneering settlers, leading to a lower investment both in terms of quantity of objects produced and worn, and of diversity of shapes and exotic raw materials used. This observation seems to be confirmed by the fact that during other recent excavations on the same islands, including a systematic sieving procedure of sites dated from Middle to Final Ceramic period in Martinique (Anse Trabaud, Carbet [Pory-Papy & Perrinon-Doume], Dizac, and Macabou), in Guadeloupe (Stade José Bade in Marie-Galante) only a few or even no lithic bead and pendant was found in each site (Queffelec et al. 2018; Queffelec et al. 2019).

The reason for this significant change can be many and varied. It can simply be the result of a shift in the production of personal ornaments from lithic raw materials to other materials (e.g., shell, feather, cotton, seeds) or other forms of body ornamentation (body painting) that can, furthermore, be perishable. Although direct access to some of these elements is impossible due to their highly perishable nature, Late and Final Ceramic period sites are characterized by a large presence of spindle whorls, and ceramic bodypainting stamps (Allaire 1977; Torres and Carlson 2014). So, what could have been the reason(s) for this loss of importance of the production of lapidary personal ornament after the Early Ceramic period? Hypotheses can be proposed. Perhaps exotic raw materials originating from the continent were missing in the Caribbean region due to the discontinuation or, perhaps even more so, due to the change of the Early Ceramic Pan-Caribbean exchange networks, either voluntarily or not. It is clear that the lithic personal ornaments of Anse à la Gourde consist of less exotic rocks The comparison between Early Ceramic sites and later ones on this topic shows that the older ones are less rich and more diverse. This point can be considered as the reflection of the importance of the social investment (norm) associated with this production during the Early Ceramic period. This observation can also be linked to the changes observed in pottery production during the transition from the Early to the Middle Ceramic period which have been described in exactly the same terms (Bérard 2013). Broadening the comparison with other types of personal ornaments, especially the ubiquitous shell beads and pendants, would be of great interest in testing this observation.

Conclusions

Three major archaeological collections of lapidary artifacts from the Ceramic period of Guadeloupe and Martinique, collected over a long period of time, over different seasons of excavation, by different archaeologists, and curated in different institutions, are being studied thoroughly in this work. The total number of artifacts presented here reaches 124, representing numerous types of beads and pendants, as well as 25 different raw materials mainly properly identified thanks to Raman spectroscopy. These raw materials are mostly originating from outside the two islands, and are suggested to

come from the continent and the Greater Antilles.

Thanks to this detailed analysis, based on the same approach used to study the 50 artifacts of Gare Maritime, these collections can henceforth integrate comparison studies. Diversity of raw materials and types has been compared between sites and between chronological periods, demonstrating the greatest diversity for the lapidary production found in Vivé (Martinique). Morel and Gare Maritime (Guadeloupe) are slightly less diverse, the first being more diverse than the later in terms of raw materials, and the contrary for typology. Qualitatively, many differences between the three rich collections of the Early Ceramic period of Guadeloupe and Martinique are observable. A link between the typology of zoomorphic pendants and the cultural context remains the only character that has been found significant. At the inter-periodical scale, several distinctive features differentiate the Middle/Late Ceramic period site of Anse à la Gourde from the others, both qualitatively and quantitatively. The use of greenstone and other exotic materials is rarer, the production of beads being mainly centered around calcite, while the production of zoomorphic pendants is absent. The low diversity of Anse à la Gourde's collection is also clearly attested, validating once again the distinction between Early Ceramic and Middle/Late Ceramic sites in the Lesser Antilles as for the investment in lapidary production.

Are these differences and similarities the result of cultural, chronological, or geographical factors? To address the questions associated with pre-Columbian stone ornaments in the Lesser Antilles, it is imperative to extend the study of lapidary production to a wider area and to share data by creating a regional database that includes high-quality data: complete collections analysis, advanced mineralogical identification, and detailed qualitative and quantitative studies.

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APPENDIX I

Description of the complete inventory of lapidary of Anse à la Gourde, Morel and Vivé. Data between brackets are for incomplete artifacts for which the data is a minimal value given only for information. * Measurements from published drawing. MEC stands for Musée Edgar Clerc, MAPM for Musée d'Archéologie et de Préhistoire de Martinique, SRA-G and SRA-M for Service Régional d'Archéologie of Guadeloupe and Martinique respectively.

N° artifact	Curating institution	Year of discovery	Structure	Stratigraphic unit	Square	Layer / Feature	Z	Object	Type	State	Weight (g)	Bead length / Pendant height (mm)	Bead diameter / Pendant width (mm)	Light diameter / Pendant/blank thickness (mm)	Gem
GD-03-001	SRA-G	1999	-	-	zone 64 sector 43 sq 74	1981	-	Bead	Discoid	Finished, Complete	0.05	2.2	4.5	1.7	Calcite
GD-03-002	SRA-G	1998	-	1	zone 64 sector 56	-	0-10	Bead	Cylindrical	Finished, Complete	3.4	27	9.4	2.7	Stalactite
GD-03-003	SRA-G	1998	Midden	11	zone 73 sector 19	-	100-110	Bead	Barrel	Finished, Fragment	(3.2)	(20.5)	(16.3)	3.8	Marble
GD-03-004	SRA-G	1998	-	1	zone 64 sector 63 sq 17	1156	0-10	Bead	Cylindrical	Finished, Complete	1.9	15.7	9.5	3.4	Calcite
GD-03-005	SRA-G	1999	-	-	zone 64 sector 43 sq 74/84	1982	-	Bead	Discoid	Finished, Complete	0.05	2.1	4.5	1.7	Calcite
GD-03-007	SRA-G	1999	Midden	6	zone 73 sector 03 test pit 3	-	50-60	Bead	Discoid	Finished, Complete	0.05	2.16	4.2	1.3	Turquoise
GD-03-008	SRA-G	1999	-	13/23	zone 64 sector 45	2112	-	Pendant	Undet.	Finished, Complete	1.4	14.2	10.9	5.3	Serpentine
GD-03-009	SRA-G	1995	Burial	-	zone 64 sector 74 sq 38	139	-	Bead	Discoid	Finished, Complete	0.3	3	7.4	1	Anorthite
GD-03-010	SRA-G	1995	Midden	-	trench	19-2	-	Bead	Cylindrical	Blank, Fragment ?	2.2	13.9	10.9	10.1	Calcite
GD-03-011	SRA-G	1996	Burial	-	zone 64 sector 74 sq 48	207	-	Bead	Cylindrical	Finished, Complete	6.9	41.1	10.5	2.2	Calcite
GD-03-012	SRA-G	1996	Burial	-	zone 64 sector 74 sq 28	108	-	Bead	Barrel	Blank, Complete	17.4	35.5	17.7	17.3	Diorite
GD-03-013	SRA-G	1996	Pit	-	zone 64 sector 54	216	-	Bead	Discoid	Finished, Complete	0.9	4.9	9.6	2	Diorite
GD-03-014	SRA-G	1997	Midden	8	zone 64 sector 93 sq 11	-	70-80	Bead	Discoid	Finished, Complete	1.3	5.8	11.7	2.2	Diorite
GD-03-015	SRA-G	1997	-	1	zone 64 sector 64	-	-	Bead	Barrel	Blank, Complete	5.6	24.1	13.3	10.4	Calcite
GD-03-016	SRA-G	1997	-	-	zone 64 sector 54 sq 01/02	263	40-50	Bead	Discoid	Finished, Fragment	(0.4)	5.2	8.5	3	Calcite
GD-03-017	SRA-G	1997	-	-	zone 64 sector 64	453	-	Bead	Discoid	Finished, Complete	0.3	4.3	6.8	2.2	Iron phosphate ?
GD-03-018	SRA-G	1997	-	III	zone 64 sector 64 sq 32/42	634	-	Raw material	Chip	-	0.1	-	2.2	2.1	Pumpellyite
GD-03-019	SRA-G	1997	-	-	zone 64 sector 64	858	-	Raw material	Chip	-	0.1	5.1	3.5	1.5	Pumpellyite
GD-03-020	SRA-G	1997	Pit	-	zone 64 sector 54 sq 04/05	418	12-20	Bead	Barrel	Finished, Complete	0.4	8.6	4.8	1.7	Prehnite
GD-03-022	SRA-G	1999	Pit	3A	zone 64 sector 44 sq 50/51	1913	-	Labret ?	Drop-shaped	Blank ?, Complete	1.4	15.9	8.1	7.8	Calcite
GD-03-023	SRA-G	1996 ? 1997 ?	Burial	-	zone 64 sector 54 sq 62	206	-	Bead	Discoid	Finished, Complete	0.05	2.6	3.9	1.6	Diorite
GD-03-024	SRA-G	1999	-	-	zone 64 sector 43 sq 74/75	1982	-	Bead	Discoid	Finished, Complete	0.05	2.9	4.6	1.6	Calcite
GD-03-025	SRA-G	1999	-	-	zone 64 sector 43 sq 74/75	1982	-	Bead	Discoid	Finished, Complete	0.05	2.8	4.2	1.7	Calcite
GD-03-026	SRA-G	1999	-	-	zone 64 sector 43 sq 74/84	1982	-	Bead	Discoid	Finished, Complete	0.05	3.6	4.9	1.8	Calcite
GD-03-028	SRA-G	1995	Midden	-	trench	19-2	-	Raw material	Block	-	3.82	20.9	14.4	11.9	Calcite
GD-02-001	MEC	1987	Burial	Collar	-	-	-	Pendant	Zoomorphic	Finished, Fragment	79.4	49.2	41.6	28.1	Paragonite
GD-02-002	MEC	1987	Burial	Collar	-	-	-	Pendant	Zoomorphic	Finished, Fragment	20.1	38.5	30.6	16.2	Aventurine
GD-02-003	MEC	1987	Burial	Collar	-	-	-	Pendant	Zoomorphic	Finished, Fragment	14.2	43.5	14.5	18.5	Sudoite
GD-02-004	MEC	1987	Burial	Collar	-	-	-	Bead	Barrel	Finished, Complete	4.7	23.4	12.1	1.5	Amethyst
GD-02-005	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Fragment	(2.5)	15.1	10.1	2.3	Rock crystal
GD-02-006	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	1.5	12.1	8.5	1.4	Rock crystal
GD-02-007	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	0.8	9.6	7	2.3	Rock crystal
GD-02-008	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	1.4	10.9	8.7	2.1	Rock crystal
GD-02-009	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Fragment	(1.0)	13.1	7.6	2.5	Rock crystal
GD-02-010	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	-	10.6	7.6	2	Rock crystal
GD-02-011	MEC	1987	Burial	Collar	-	-	-	Bead	Barrel	Finished, Complete	2.4	18.6	9.5	1.7	Amethyst
GD-02-012	MEC	1987	Burial	Collar	-	-	-	Bead	Bitronconical	Finished, Complete	1.3	13.3	8.7	1.6	Amethyst
GD-02-013	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	0.6	8.6	6.6	1.6	Rock crystal
GD-02-014	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	0.8	9.8	7	1.7	Rock crystal
GD-02-015	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	1.7	12.6	8.8	1.6	Rock crystal
GD-02-016	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	1.5	12.7	8.7	1.9	Rock crystal
GD-02-017	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	1.2	10	8.3	1.5	Rock crystal
GD-02-018	MEC	1987	Burial	Collar	-	-	-	Bead	Cylindrical	Finished, Complete	2.2	13.8	9.6	2.7	Rock crystal
GD-02-019	Unknown	-	Burial (child)	-	-	-	-	Pendant	Zoomorphic	Finished, Complete	-	20*	17*	9*	Not analyzed
GD-02-020	SRA-G	1993	-	under a pot	-	2-B/E-7	-	Bead	Cylindrical	Finished, Complete	0.67	16.1	5	2.2	Diorite

GD-02-021	SRA-G	1993	-	under a pot	-	2-B/E-7	-	Bead	Cylindrical	Finished, Complete	0.64	13.4	5.1	2.3	Diorite
GD-02-022	SRA-G	1993	-	under a pot	-	2-B/E-7	-	Bead	Cylindrical	Finished, Complete	0.56	10.7	5.2	2	Diorite
GD-02-023	SRA-G	1993	-	under a pot	-	2-B/E-7	-	Bead	Cylindrical	Finished, Complete	0.5	9.9	5.2	2.5	Diorite
GD-02-024	SRA-G	1999	-	III	zone 70 sector 90	-	-	Bead	Cylindrical	Blank, Complete	0.84	15	5.9	5.6	Carnelian
GD-02-025	SRA-G	1995	-	32	D1	32	0-10	Bead	Barrel	Finished, Complete	4.91	24.8	12.5	3.5	Amethyst
GD-02-026	SRA-G	1995	-	fond	-	201	-	Bead	Cylindrical	Finished, Complete	0.16	4.4	4.6	1.8	Amethyst
GD-02-027	SRA-G	1995	-	32	D9	32	80-90	Bead	Barrel	Finished, Complete	2.1	17.3	8.9	1.5	Amethyst
GD-02-028	SRA-G	1995	-	32	D9	32	80-90	Bead	Bitronconical	Finished, Complete	0.47	4.7	8.6	1.9	Sudoite
GD-02-029	SRA-G	-	-	-	-	-	-	Pendant	Anthropomorphic	Finished, Fragment	(0.26)	(10.6)	(9.0)	(7.3)	Jet
GD-02-030	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Complete	1.8	15.6	9	1.6	Amethyst
GD-02-031	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Complete	1.0	13.4	6.8	2.2	Carnelian
GD-02-032	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Complete	33.0	47.6	20.5	3.1	Diorite
GD-02-033	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Fragment	(11.6)	(32.4)	15.3	3.0	Calcite
GD-02-034	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Complete	16.6	42.6	15.7	2.6	Amethyst
GD-02-035	MEC	-	-	-	-	-	-	Bead	Bitronconical	Finished,	10.4	33.7	15.7	2.8	Amethyst
GD-02-036	MEC	1978	-	-	-	-	-	Pendant	Zoomorphic	Finished, Complete	15.7	22.1	28.2	15	Serpentine
GD-02-037	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Complete	8.0	28.4	13.7	4.2	Stalactite
GD-02-038	MEC	-	-	-	-	-	-	Bead	Bitronconical	Finished,	6.1	26.5	12.6	2.0	Amethyst
GD-02-039	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Complete	3.6	19.1	10.2	2.2	Diorite
GD-02-040	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Complete	3.1	23.1	9.3	2.2	Diorite
GD-02-041	MEC	-	-	-	-	-	-	Pendant	Cylindrical	Finished, Complete	3.8	26.4	9.5	9.0	Diorite
GD-02-042	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Fragment	(7.4)	(20.7)	(17.3)	2.6	Amethyst
GD-02-043	MEC	-	-	-	-	-	-	Raw material	Chip	-	24.2	33.7	25.9	23.4	Calcite
GD-02-044	SRA-G	1999	-	III	zone 70 sector 90	-	-	Bead	Barrel	Finished, Fragment	0.86	10.3	8.8	2.7	Rock crystal
GD-02-045	SRA-G	1999	-	II?	79_99_79_II	-	-	Bead	Discoid	Finished ?, Complete	0.27	3.1	8.5	1.3	Calcite

GD-02-046	MEC	-	-	Morel n°6	-	scree 5.2.62	-	Bead	Barrel	Finished, Complete	57.5	45.4	29.4	5.2	Sandstone
GD-02-047	MEC	-	-	-	-	-	-	Bead	Cylindrical	Finished, Complete	40.1	40.5	24.2	4.3	Marble
GD-02-048	MEC	-	-	-	-	-	-	Bead	Barrel	Blank, Complete	8.8	22.2	14.8	14.6	Diorite
GD-02-049	MEC	1978	-	beach section 6	-	-	-	Pendant	Zoomorphic	Finished, Complete	7.1	36.2	19.5	6.2	Nephrite
GD-02-050	MEC	1978	-	Surface collection	-	-	-	Pendant	Zoomorphic	Blank, Complete	4.7	22.9	17.2	8.8	Nephrite
GD-02-051	MEC	-	-	Surface collection	-	-	-	Pendant	Zoomorphic	Finished, Complete	4.1	24.1	10.7	9.5	Diorite
GD-02-052	MEC	1995	Burial	-	-	-	-	Pendant	Zoomorphic	Finished, Complete	7.6	25.9	17.1	11.1	Nephrite
GD-02-053	MEC	-	-	-	-	-	-	Bead	Barrel	Finished, Fragment	(1.4)	(12.2)	(9.8)	2.3	Amethyst
GD-02-054	MEC	-	-	-	-	-	-	Bead	Spherical	Finished, Complete	1	7.8	9.5	2.3	Amethyst
GD-02-056	MEC	-	-	-	-	-	-	Raw material	Chip		1.2	14.2	8.9	8.3	Carnelian
GD-02-057	MEC	-	-	-	-	-	-	Raw material	Chip		6.1	19.2	17.1	13.6	Carnelian
GD-02-058	MEC	-	-	-	-	-	-	Raw material	Chip		8.4	28.8	20.7	15.5	Carnelian
GD-02-059	MEC	-	-	-	-	-	-	Raw material	Chip		2.4	20.6	11.9	8.9	Carnelian
GD-02-060	MEC	-	-	-	-	-	-	Raw material	Chip		1.9	15.1	13.3	10.9	Carnelian
GD-02-061	MEC	-	-	-	-	-	-	Raw material	Chip		4.1	21.4	18.3	12.2	Carnelian
GD-02-062	MEC	-	-	-	-	-	-	Raw material	Chip		0.4	16	6.2	4.5	Carnelian
MA-02-001	MAPM	1979	Burial	-	-	Burial D	-	Bead	Bitronconical	Finished, Complete	2.6	11.9	13	2.1	Amethyst
MA-02-002	MAPM	1979	Burial	-	-	Burial D	-	Bead	Spherical	Finished, Complete	3.1	12.8	13.1	1.6	Amethyst
MA-02-003	MAPM	1979	Burial	-	-	Burial D	-	Bead	Bitronconical	Finished, Complete	1.9	10.7	11.8	2.1	Amethyst
MA-02-004	MAPM	1979	Burial	-	-	Burial D	-	Bead	Bitronconical	Finished, Complete	1.6	10.8	10.6	2.7	Amethyst
MA-02-005	MAPM	1979	Burial	-	-	Burial D	-	Bead	Bitronconical	Finished, Complete	2.2	10.9	12.7	2.6	Amethyst
MA-02-006	MAPM	1979	Burial	-	-	Burial D	-	Bead	Cylindrical	Finished, Complete	0.1	6	4.7	1.7	Carnelian
MA-02-007	MAPM	1979	Burial	-	-	Burial D	-	Bead	Plano-convex	Finished, Complete	0.5	3.54	10.3	1.4	Turquoise
MA-02-008	MAPM	1979	Burial	-	-	Burial D	-	Bead	Discoid	Finished, Complete	0.1	2.6	6.8	0.9	Turquoise

MA-02-009	MAPM	1979	Burial	-	-	Burial D	-	Bead	Other	Finished ?, Complete	0.2	3.1	8.9	1.1	Turquoise
MA-02-010	MAPM	1979	Burial	-	-	Burial D	-	Bead	Barrel	Finished, Complete	4.1	14.9	15	3.9	Diorite
MA-02-011	MAPM	1979	Burial	-	-	Burial D	-	Bead	Barrel	Finished, Complete	4.6	14.3	17.7	3.5	Diorite
MA-02-012	SRA-M	2000	Occupation layer	3	E10	5	-	Bead	Discoid	Finished, Complete	0.1	1.66	3.6	0.9	Turquoise
MA-02-013	SRA-M	1999	Occupation layer	3	D11	3	-	Pendant	Zoomorphic	Finished, Complete	10.5	25.3	23.8	10.6	Nephrite
MA-02-014	SRA-M	1999	Occupation layer	3	C6	top	-	Pendant	Zoomorphic	Finished, Complete	5.3	24.5	20.3	7.7	Nephrite
MA-02-015	SRA-M	1999	Occupation layer	3	C12	5	-	Bead	Discoid	Finished, Complete	0.1	2.5	5.1	1.8	Turquoise
MA-02-016	SRA-M	1999	Occupation layer	3	C7	2	-	Bead	Plano-convex	Finished, Complete	0.4	2.8	10.8	1.6	Turquoise
MA-02-017	SRA-M	1999	Occupation layer	3	D11	2	-	Bead	Discoid	Blank, Complete	0.3	4	7.6	2.4	Ochre
MA-02-018	SRA-M	2000	Occupation layer	1b	Sond23	5	-	Bead	Discoid	Finished, Complete	0.2	3.1	5.7	1.4	Anorthite
MA-02-019	SRA-M	2000	Occupation layer	3	C7	3	-	Bead	Cylindrical	Blank, Complete	4.4	24.3	10.4	2.5	Carnelian
MA-02-020	SRA-M	1998 ? 2000 ?	Occupation layer	3	D9 ? D11? E6?	1? 4? 3?	-	Bead	Barrel	Blank, Fragment	(1.6)	(10.9)	(10.3)	(9.6)	Jasper
MA-02-021	SRA-M	2000	Occupation layer	3	E7	5	-	Bead	Barrel	Finished, Complete	0.3	6.8	5.8	1.3	Carnelian
MA-02-022	SRA-M	2000	Occupation layer	3	B10	6	-	Bead	Discoid	Finished, Complete	0.5	3.7	9.2	1.3	Paragonite
MA-02-023	SRA-M	2000	Occupation layer	3	F8	3	-	Labret ?	Drop-shaped	Finished, Complete	0.1	11.4	2.9	2.7	Diaspore
MA-02-024	SRA-M	1998	Occupation layer	3	D10	2	-	Bead	Discoid	Finished, Complete	0.3	4.2	7	1.9	Diorite
MA-02-025	SRA-M	2000	-	3	Sond 23	-	-	Bead	Discoid	Finished, Complete	0.1	3	4.8	1.4	Diorite

MA-02-026	SRA-M	2000	Occupation layer	3	Sond 22	5	-	Bead	Barrel	Finished, Complete	0.3	7.1	5.6	1.5	Amethyst
MA-02-027	SRA-M	1999	Occupation layer	3	B14	4	-	Bead	Discoid	Finished, Complete	0.3	3.3	6.8	1.9	Sudoite
MA-02-028	SRA-M	2000	-	3	Sond 22	4	-	Bead	Discoid	Finished, Complete	0.1	1.4	4.1	1.4	Turquoise
MA-02-029	SRA-M	1998	Occupation layer	3	E12	2	-	Bead	Discoid	Blank, Complete	0.1	2.2	5.7	6.2	Turquoise
MA-02-030	SRA-M	1999	Occupation layer	3	Sond 20	-	-	Bead	Discoid	Finished, Complete	0.1	2.4	4.6	1.7	Diorite
MA-02-031	SRA-M	1998	Occupation layer	3	C17	1	-	Bead / Labret ?	Barrel	Blank ?, Complete	0.4	10.6	4.9	4.6	Chalcedony
MA-02-032	SRA-M	1996	-	3	Sond 9	-	-	Bead	Cylindrical	Finished, Complete	0.5	13.4	5	1.8	Calcite
MA-02-033	SRA-M	1999	Occupation layer	3	F12	4	-	Bead	Cylindrical	Finished, Complete	1.7	13.5	8.1	1.8	Rock crystal
MA-02-035	SRA-M	2000	Occupation layer	3	E9	3	-	Bead	Cylindrical	Blank, Complete	3.1	15.9	8.6	7.7	Barytine
MA-02-036	SRA-M	1999	Occupation layer	3	F12	3	-	Raw material	Pebble	-	4.7	29.3	16.5	7.1	Chalcedony
MA-02-037	SRA-M	1999	Occupation layer	3	C12	5	-	Bead	Discoid	Finished, Complete	0.6	3	11.6	1.3	Turquoise
MA-02-038	SRA-M	1999	Occupation layer	3	C6	top	-	Bead	Other	Finished, Complete	4.1	23.9	14.9	2.5	Paragonite
MA-02-039	SRA-M	1999	Occupation layer	3	F13	3	-	Bead	Cylindrical	Blank, Complete	2.6	25	13.2	14	Pumice