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## RESEARCH ARTICLE



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Open Data



Open Code



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## A database of lapidary artifacts in the Caribbean for the Ceramic Age

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### ABSTRACT

Lapidary artifacts show an impressive abundance and diversity during the Ceramic period in the Caribbean islands, especially at the beginning of this period. Most of the raw materials used in this production do not exist naturally on the islands of the Lesser Antilles, nevertheless, many archaeological sites have yielded such artifacts on these islands. In the framework of a four-years-long project, we created a database by combining first hand observations and analysis, as well as a thorough literature survey. The result is a database including more than 100 sites and almost 5000 beads, pendants, blanks and raw material fragments.

**Keywords:** Caribbean; Lapidary artifacts; Ceramic Age, Beads, Pendants, Raw materials

## 1 Overview

### 1.1 Context

#### 1.1.1 The PAAF Project

This database has been created in the framework of the PAAF Project (**Parures Amérindiennes en matériaux lithiques ans les Antilles Françaises**), which were funded from 2016 until 2019 by the French Ministry of Culture and the Guadeloupe Regional Council. This project consisted in three workpackages, including *chaînes opératoires* studies, gemmology, and the creation of a regional database and GIS. More information on the other results obtained during this project can be found in (Queffelec et al. 2018), (Queffelec et al. 2020) and (Queffelec et al., accepted).

#### 1.1.2 Archaeological context

Early ceramic sites in the Antilles, comprising ancient cedrosan Saladoid and huecan Saladoid sites, are well known to deliver remarkable collections of lapidary artwork (e.g. Boomert 1987; Cody 1993; Crock and Bartone 1998; Murphy et al. 2000; Narganes Storde 1995). These first formative occupations of the Antillean archipelago are dated back to the second half of the first millennium BC until the end of the fourth century A.D. Linked to a pioneering agro-ceramist dynamic, these groups are characterized by a predetermined economic system based on horticulture, fishing, hunting, foraging, and associated with the introduction of animal and vegetal species from the continent (Bérard 2013). They are also distinguished by a ceramic and lapidary production testifying of an exceptional social, technological and symbolic investment, and by the settling of important long distance networks. After this specific period of time when the lapidary craftsmanship seems to be at the center of the symbolic production of the inhabitants of the Antilles, the middle, recent and late Ceramic periods decrease their investment in this type of personal ornaments (e.g. Queffelec et al. 2020; Bérard 2013; Hofman et al. 2007; Knippenberg 2007; Rodriguez 1993).

Quite surprisingly, little work has been specifically dedicated to the study of the lapidary personal ornaments in the Antilles, despite the potential information one could extract from it. The most comprehensive study of these artifacts is clearly the one made by Cody (1990, 1993) based on a survey she sent by post to every archaeologist working in the Caribbean area to build a database. This major work enabled her to compare the results she obtained for the site of Pearls, on Grenada (Cody 1991), to the rest of the Antilles by building a first framework of inter-islands relationship.

Since the work done at the beginning of the 1990's, no comprehensive analysis of this part of the material production of the Amerindians has been conducted on a regional scale. Putting together the older data with the recent one will hopefully allow the research community to better understand the changes in the society of the first phases of the Ceramic age.

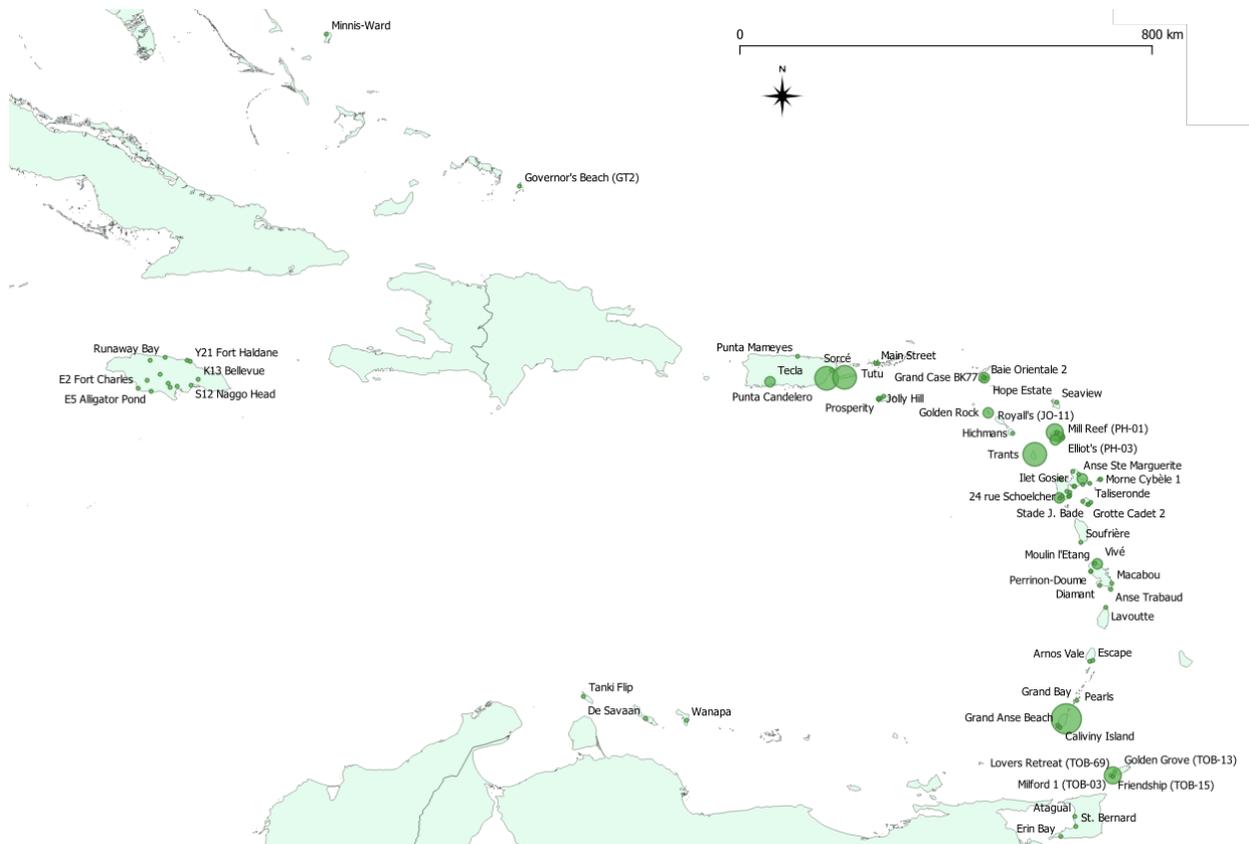
### 1.2 Spatial coverage

The geographic distribution of the dataset encompass the complete archaeological record of the Caribbean islands. However, some islands did not yield any lapidary artifacts, or at least none that we could find in the literature. We registered the lapidary artifacts for all the regions of the

Caribbean arc which can be divided in the Lesser Antilles (Leeward Antilles, Leeward Islands and Windward Islands), the Greater Antilles (Puerto rrico, Hispaniola, Jamaica, Cuba) and the Lucayan archipelago (Bahamas, Turks and Caicos Islands). The northernmost site in our dataset is Minnis-Ward, the southernmost is Erin Bay, the easternmost is Lovers Retreat (TOB-69) and the westernmost is E2 Fort Charles (Fig. 1, Table 1).

**Table 1.** Spatial coverage of the dataset

Island	Index_Site	Site	Longitude	Latitude	ref_biblio_1
Trinidad	TR-03	Erin Bay	-61.72190	10.08838	Fewkes 1914
Bahamas	BH-01	Minnis-Ward	-74.51969	24.09849	Blick et al. 2010
Jamaica	JA-04	E2 Fort Charles	-77.80000	17.91667	Roobol & Lee 1976
Tobago	TO-01	Lovers Retreat (TOB-69)	-60.77424	11.22533	Harris 1980



**Figure 1.** Map of the distribution of the sites registered in the database. The size of the circle is related to the number of lapidary artifacts.

### 1.3 Temporal coverage

The database compiled in this study aims at consolidating and disseminating data about lapidary artifacts in the Caribbean islands recovered from archaeological excavations or surveys for the period before the arrival of the Europeans in the archipelago. Thus, while the end limit is well known around the end of the 15th century (depending on the islands), the start limit may be different for each island based on the current knowledge of the first human occupations in the Antilles (Napolitano et al. 2019). However, the start of Early Ceramic period, supposed to represent the beginning of lapidary production in this region, is generally set to ca. 400 calBC. Most of the archaeological sites registered in the database relates to the Early and Middle Ceramic period (mainly Saladoid culture) and some to the Late/Final Ceramic period (mainly Troumassoid and Barrancoid cultures). Only one site from the Contact Period (Cayo culture) is registered. The periodization used in this work is the one proposed by Bérard (2019).

## 2 Method

### 2.1 Steps

The database compiled in this work has been created based on two different methodologies: piece by piece first-hand analysis, and literature screening. Both methods were used in parallel for the duration of the project. Presently, the dataset of lapidary artifacts contains 4991 entries, originating from 87 sites. Data about lapidary artifacts in the French islands of the Antillean (from south to north: Martinique, Guadeloupe, St. Barthelemy and St. Martin) have been registered thanks to missions in the museums, the storage of the Ministry of Culture, and by extracting some collections to study them in continental France. The detailed methodology is described in the case studies articles (Queffelec et al. 2018, 2020) and includes mainly photography, classic measurements with digital caliper, technological study, and mineralogical determination by eye and systematically confirmed by Raman spectroscopy. The literature review, which accounts for the most part of the dataset, has been conducted as a long-term job. As for every literature review, it includes the reading of the major works on the subject and the literature cited by these major works. In the case of our specific study, one of the major sources of information has been the proceedings of the twenty-eight International Association for Caribbean Archaeology (IACA) congresses, in which the words *bead*, *pendant*, *perle*, *pendentif*, *cuenta*, *pendiente*, *perla*, have been systematically searched for. Some unpublished information has also been recovered by directly contacting the archaeologists currently excavating sites, as well as diving into the reports from French commercial archaeology. Numeric literature was the main source of documentation and the search for specific words was thus done thanks to the pdf reading software. For less recent literature or scanned documents, Optical Character Recognition (OCR) was first applied to the documents. In physical books, we read the text, looked at figures and tables, and we used the index to find the information we were looking for.

### 2.2 Sampling strategy

The logo for Peer Community In Archaeology features a circular arrangement of various archaeological icons such as a microscope, a hammer, a trowel, a scale, a map, a book, a globe, and a person. The text 'Peer Community In Archaeology' is positioned to the right of the icons.

# Peer Community In Archaeology

The artifacts integrated in this database relates to the lapidary production *chaîne opératoire* from the raw material until the finished object. From sites located on French islands, they were exhaustively studied, measured, and analyzed. There was no sampling either as for the findable literature data.

## 2.3 Quality control

The data that entered in the database is of heterogeneous quality. It goes from high resolution macro photos to no image at all, from Raman spectroscopy and X-Ray diffraction mineralogical studies to nakedeye *greenstone* determination, from recent excavations with complete sieving to surface collection. The authors made their best to find the best data about each artifact, including dissecting fieldwork reports, but the quality of the literature is very diverse. Data cleaning and consistency have been realized thanks to the use of standardized thesaurus with dropdown menus to avoid typos for most of the fields. For other fields, we created lists of values for each variable to spot the discrepancies. For numeric variable, graphics based on the measurements were explored in order to spot any outlier and check on its values. The mapping of the sites helped in checking the geographical coordinates values, since any typo would have probably set the archaeological site in the sea.

## 2.4 Constraints

Most of the constraints relate to the literature-based part of the database, since the French artifacts have all been photographed, measured and analyzed during the project. The quality of the information in the literature is very heterogeneous, because of the seniority and/or the lack of exhaustiveness of the publications. The quality of information has been problematic for several topics of the database, including:

- the mineralogical determination of the raw material used by the Amerindians, mostly done by naked eye by untrained archaeologists
- the quality of the reproduction of ancient photographs in scanned or photocopied documents
- the lack of complete description of lapidary assemblages in most of the sites. The table or text of the articles may list tens of artifacts, while the figures only depict 5 of them.
- the difficulty of assessing the origin of the artifacts in multicomponents archaeological sites
- the difficulty of cultural attribution for ancient excavations

Beyond these constraints related to the existing artifacts' collections, the major issue related to the completeness of the archaeological record is of course very significant. An important part of the artifacts registered in this database come from ancient excavations or surface collections by amateur archaeologists or collectors. Therefore, even if the quality of the archaeological literature would be excellent, and we could have a perfect recording in the database of the artifacts recovered since the beginning of the 20<sup>th</sup> century, it would still lack much information for technological studies of the *chaînes opératoires* due to the lack of sieving, the picking of nice and complete artifacts by collectors etc. It is also necessary to underline the differences in comprehension of the

archaeological stratigraphy between ancient and modern excavations, with or without radiocarbon dating, etc.

### 3 Dataset description

The database created in this project is made of four related tables (fig. 2), in which the Source table is still a work in progress. Each table exists in French and English. For the sake of simplicity we will describe here only the English version.

#### 3.1 Islands table (ISLANDS and ILES)

*Island* is the name of the island.

*Country* is the country from which the island is part of.

*Region* is the large area in which the island is located (Lesser Antilles, Greater Antilles, Central America, South America, North America). It includes the continent surroundings the Caribbean because this table is also used for the database of potential sources of raw materials, which is a work in progress. *Index\_Island* is a combination of two letters used as short notation.

*ID\_Island* is an unique integer for each Island of the Caribbean, taken from the **Global Administrative** database (GADM) which gives a unique integer for each administrative subdivision in the world.

#### 3.2 Sites table (SITES\_EN and SITES\_FR)

This table is related to the Islands table by the *ID\_Island* field. It therefore automatically integrates the *Island* parameter from this table.

*Index\_Site* is the unique chain of characters identifying the site. It is composed of the *Index\_Island*, a dash, and two digits for the number of the site on this island. For example, GD-01 is the first recorded site for Guadeloupe.

*Site* is the name of the archaeological site.

*ID\_Island* is an unique integer for each Island of the Caribbean, taken from the **Global Administrative** database (GADM) which gives a unique integer for each administrative subdivision in the world.

*City* is the name of the city in which the archaeological site is situated.

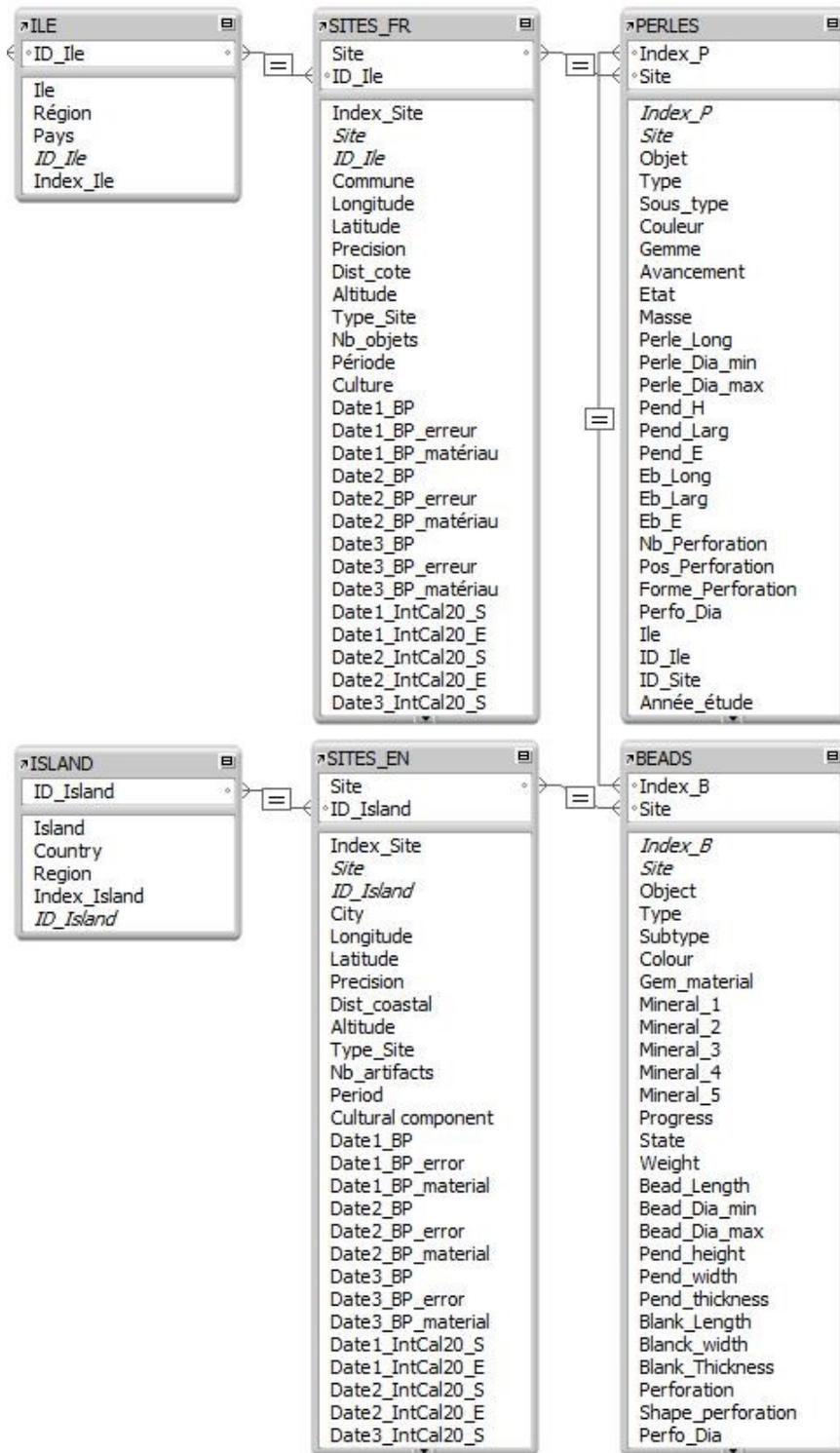
*Longitude* and *Latitude* are the geographic coordinates of the site. They are expressed in WGS84 decimal degrees.

*Precision* explains the origin of the geographic coordinates, whether from a GPS tracker, the reported data from a map or from an address given in a publication, the centroid of the city or of the island.

*Dist\_coast* is the shortest calculated distance from the geographic coordinates to the coast.

*Altitude* is the altitude of the geographical coordinates taken from the SRTM Digital Elevation Model.





**Figure 2.** Relational map of the database.

## 3.3 Beads table (BEADS and PERLES)

This table is related to the Sites table using the *Site* field. Some fields are thus used directly in the BEADS table thanks to the relation between both tables, so that the final user does not have to relate both tables himself. This is the case for *Island*, *Longitude*, *Latitude*, *Period*, and *Culture*. *Index\_B* is the unique character chain composed of the *Index\_Site*, a dash, and the number of the artifact in the site.

*Site* is the name of the archaeological site.

*Object* is the kind of object that the artifact is, for example bead, pendant, raw material.

*Type* and *Subtype* specifies the shape of the object, for example a pendant can be from type zoomorphic and from subtype frog.

*Colour* relates to the visible main color of the artifact.

*Gem\_material* is the gem material used to produce the artifact, it is based on the *Mineral\_1, 2, 3, 4, 5* and uses a list of values coming from the gemological vocabulary.

*Progress* states the advancement in the production of the artifact, it can be a finished object or a blank for example.

*State* specifies if the object is complete or broken.

*Weight*, *Bead\_length*, *Bead\_dia\_min*, *Bead\_dia\_max*, *Pend\_Height*, *Pend\_width*, *Pend\_thickness*, *Blank\_length*, *Blank\_width*, *Blank\_thickness* are the measurement of the artifacts, expressed in millimeters, of beads, pendant and blanks respectively.

*Nb\_perforation*, *Pos\_Perforation* and *Shape\_Perforation* specify the number, position and shape of the perforation(s).

*Perfo\_Dia* is the smallest diameter of the perforation thus usable to hang the artifact.

*Structure* is the type of archaeological structure in which the artifact was unearthed, for example, a midden, a pot-hole, a burial etc.

*US* is the stratigraphical unit which the artifact comes from.

*Square*, *Level* and *Z* are the coordinates of origin of the object in the excavators' system.

*Year\_excavation* is the year of excavation of the site when this artifact was discovered.

*Excavator* contains the name of the archaeologist responsible for the excavation at the time of the discovery of this artifact.

*Ref\_storage* and *Inv\_site* are the references of the artifact in the curating location and the excavators' system respectively.

*Storage\_Island*, *Storage\_City*, and *Storage\_Location* resume the actual curating location of the artifact.

*Year\_study* is the year of study for the artifacts that have been investigated by the PAAF project.

*Method\_carac* is the analytical method used to determine the composition of the artifact.

*RawMat\_estim* is the raw material estimated in the literature, or before the use of analytical techniques.

*Notes* contains remarks about the artifact that was noted during the literature screening.

*Ref\_biblio\_1, 2, 3, 4, 5, 6* specifies the publications where the artifact has been described.

Some general information are summarized in the Table 2.

**Table 2.** Summary of the Site dataset

Island	Site	Nb_artifacts	Period	Culture	ref_biblio_1
Antigua	Elliot's (PH-03)	64	(Middle?) Ceramic	Middle Cedrosan Saladoid	Murphy-etal_2000
Antigua	Mill Reef (PH-01)	2	Late Ceramic	Mamorán Troumassoid (Mill Reef)	Hoffman_1970
Antigua	Royall's (JO-11)	199	(Middle?) Ceramic	Middle Cedrosan Saladoid	Murphy-etal_2000
Antigua	Doig's (PA-15)	43	Early/Middle Ceramic	Early/Middle Cedrosan Saladoid	Gent&deMille_2003
Antigua	Winthorpe Bay	1	(Middle?) Ceramic	Middle/Late Cedrosan Saladoid	deMille-etal_1999
Aruba	Tanki Flip	2	Late Ceramic	Dabajuroid	Rostain_1995
Barbuda	Seaview	18	Early/Middle Ceramic	Early/Middle Cedrosan Saladoid	Kendall-etal_2011
Bahamas	Minnis-Ward	1	Late/Final Ceramic	Lucayan	Blick-etal_2010
Bonaire	Wanapa	3	Ceramic		Haviser_1990
Carriacou	Grand Bay	17	(Middle?) Ceramic	Late Cedrosan Saladoid	Sutty_1990
Curacao	De Savaan	4	Ceramic		Haviser_1990
Dominique	Soufrière	1	Early Ceramic	Early Cedrosan Saladoid	Bérard_2009
Guadeloupe	Gare maritime	59	Early Ceramic	Huecan Saladoid	Romon-etal_2013
Guadeloupe	Morel	61	Early/Middle Ceramic	Cedrosan Saladoid/huecan	Delpuech-etal_1996
Guadeloupe	Anse à la Gourde	28	Late Ceramic	Troumassoid	Delpuech-etal_1997
Guadeloupe	24 rue Schoelcher	1	Early Ceramic	Early Cedrosan Saladoid	Etrich_2003a
Guadeloupe	Allée Dumanoir	2	Early/Middle Ceramic	Early/Middle Cedrosan Saladoid	Etrich_2003b
Guadeloupe	Anse à la Barque	1	Undertermined	Undertermined	Turpin_2015
Guadeloupe	Anse Bertrand	2	Undertermined	Undertermined	Turpin_2015
Guadeloupe	Anse Ste Marguerite	4			Delpuech_2007
Guadeloupe	Cathédrale	6	Early/Middle Ceramic	Saladoid	Bonnissent&Romon_2004
Guadeloupe	Butel	1	Undertermined	Undertermined	
Guadeloupe	Grand Carbet	1	Early Ceramic	Early Cedrosan Saladoid	ToledoIMur_2003
Guadeloupe	Ilet Gosier	1	Late/Final Ceramic	Troumassoid	Romon-etal_2003
Guadeloupe	Les Mineurs	3	Undertermined	Undertermined	



Guadeloupe	Plage de Roseau	1	Contact	Cayo	LeLay_2013
Guadeloupe	Anse Vinaigri	3	Undertermined	Undertermined	
Guadeloupe	La Ramée	3	Early/Middle Ceramic	Saladoid	Casagrande_2013
Grenada	Pearls	1412	Early/Middle Ceramic	Saladoid	Murphy-et-al_2000
Grenada	Grand Anse Beach	3	Early/Middle Ceramic	Saladoid	Cody_1993
Grenada	Caliviny Island	3	Early/Middle Ceramic	Undertermined	Bullen&Bullen_1968
Grand Turk	Governor's Beach	5	Final Ceramic	Ostionoid meillacan	Carlson_1995
Jamaica	C12 Logie Green	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	C7 Harmony Hall	3	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	C8 Wallman Town	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	E2 Fort Charles	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	E5 Alligator Pond	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	K13 Bellevue	6	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	Y19 Pepper	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	Runaway Bay	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	S12 Naggo Head	2	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	S8 Marlie Mount	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	T1 New Forest	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	Y19 Coleraine	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
Jamaica	Y21 Fort Haldane	1	Early/Middle Ceramic	Saladoid	Roobol&Lee_1976
La Désirade	Morne Cybèle 1	1	Final Ceramic	Suazan Troumassoid	Hofman_1995
La Désirade	Petite Rivière	4	Late/Final Ceramic	Troumassoid	deWaal_2006
Martinique	Anse Trabaud	2	Late/Final Ceramic	Troumassoid	Mattioni_1983
Martinique	Vivé	40	Early Ceramic	Early Cedrosan Saladoid	Mattioni_1979
Martinique	Moulin l'Etang	1	Early Ceramic	Early Cedrosan Saladoid	Bérard_2004
Martinique	Macabou	1	Final Ceramic	Suazan Troumassoid	Allaire_1977
Martinique	Diamant	1	(Middle?) Ceramic	Middle Cedrosan Saladoid	Vidal_1995
Martinique	Pory-Papy	3	(Middle?) Ceramic/final	Cedrosan Saladoid - Troumassoid	
Martinique	Perrinon-Doume	1	(Middle?) Ceramic/final	Cedrosan Saladoid - Troumassoid	



Marie Galante	Cocoyer St Charles	1	Early Ceramic	Early Cedrosan Saladoid	Stouvenot_1999
Marie Galante	Grotte Cadet 2	1	Late/Final Ceramic	Troumassoid	Courtaud-etal_2005
Marie Galante	Stade J. Bade	4	Late Ceramic	Troumassoid	Serrand-etal_2016
Marie Galante	Taliseronde	1	Early/Middle Ceramic	Early/Middle Cedrosan Saladoid	Durand&Petitjean-Roget_1991
Montserrat	Trants	602	Early/Middle Ceramic	Saladoid	Crock&Bartone_1998
Nevis	Hichmans	1	Ceramic	Saladoid - Post-Saladoid	Wilson_1989
Puerto Rico	Hacienda Grande	16	Early Ceramic	Huecan Saladoid	Crock&Bartone_1998
Puerto Rico	Tecla	72	Early Ceramic	Huecan Saladoid	NarganesStorde_1995
Puerto Rico	Punta Candelero	592	Early Ceramic	Huecan Saladoid	Rodriguez_1991
Puerto Rico	Punta Mameyes	4	Early Ceramic/récent	Cedrosan Saladoid - Ostionoid elenan	Ortiz-Montanez-etal_2019
Sainte Croix	Prosperity	26	Early/Middle Ceramic	Cedrosan Saladoid	Hardy_2009
Sainte Croix	Cane Bay	2	Late Ceramic	Ostionoid	Hardy_2008
Sainte Croix	Jolly Hill	2	Late Ceramic	Early Ostionoid	Hardy_2008
Sainte Croix	O30. Krause	9	Early Ceramic	Cedrosan Saladoid/huécan	Toftgaard_2019
Sainte Croix	O18. Spratt Hall	2	Early Ceramic	Cedrosan Saladoid/huécan	Toftgaard_2019
Sint Eustatius	Golden Rock	81	Early/Middle Ceramic	Saladoid	Versteeg_1999
Saint Lucia	Lavoutte	1	Final Ceramic	Suazan Troumassoid	Hofman_2012
Saint Martin	Baie Orientale 2	17	Late/Final Ceramic	Troumassoid marmoran (Mill Reef)	Bonnissent_2008
Saint Martin	Hope Estate	115	Early Ceramic	Cedrosan Saladoid/huecan	Bonnissent_2008





### 3.9.2 Filemaker server

The database, including photos and drawings, is accessible as a Filemaker server application managed by the Huma-Num service, an institutional repository of the Centre National de la Recherche Scientifique (CNRS) (Fig. 3). Users can use the database in reading mode only or, if interested in participating in improving the quality of the database, can have more advanced rights by directly asking the authors. The database is located here: [https://fm02.db.humanum.fr/fmi/webd/PACEA\\_PAAF](https://fm02.db.humanum.fr/fmi/webd/PACEA_PAAF) (click on “*se connecter en tant qu’invité*” if you just want to be in reading mode). Database is available in French and English, by changing the model (arrow in the top left corner).

### 3.9.3 GIS Availability (ArkeoGIS)

An online, free and multilingual GIS application allows to visualize the database with a cartographic projection (Fig. 4). A simplified version of the dataset is indeed accessible via the ArkeoGIS platform (<https://arkeogis.org/en/>). Users must register first to access this geographical application, since it is controlled in order to prevent archaeological looting.

Trouvés 61 / 5017

Site:  Ile:  Date\_calibrée:  Date\_BP:

Period:  Cultural component:

Type\_site:  Ref\_biblio\_1:  Longitu:

Structure:  Ref\_biblio\_2:  Latitud:

Général | **Avancé** | Iles/Site

INDEX

Object:  Sous\_type:

Type:

Progress:

State:

Weight:

Bead\_Length:

Bead\_Dia\_max:

Bead\_Dia\_min:

Pend\_height:

Pend\_width:

Pend\_thickness:

Blank\_Length:

Blank\_width:

Blank\_Thickness:

Nb\_Perforation:

Pos\_Perforation:

Shape\_perforation:

Perfo\_Dia:

**STRATI**

US:

Square:

Level:

Z:

Gem\_material:

Colour:

Mineral\_1:

Mineral\_2:

Mineral\_3:

Other\_RawMat:

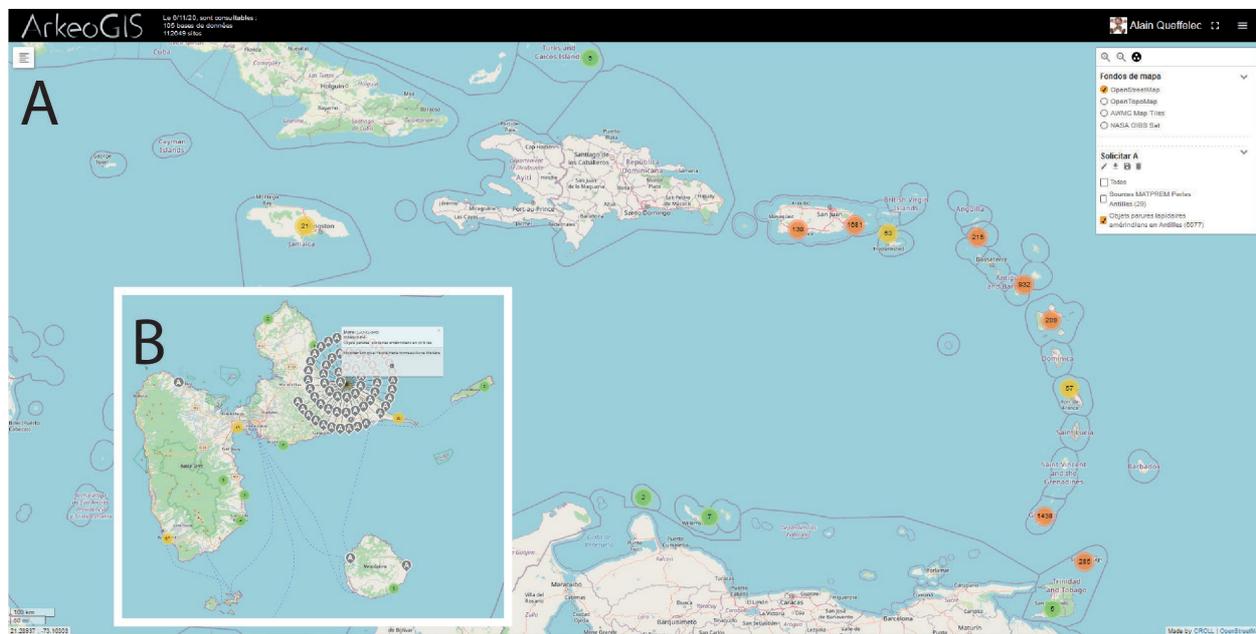
Method\_carac:

Provenance\_proposed:

RawMat\_estim:




Figure 3. Screenshot of the online application.



**Figure 4.** A. Screenshot of the ArkeoGIS application, a simplified GIS online system. B. Zoom on Guadeloupe, showing the potential of the ArkeoGIS visualization tool.

### 3.10 Publication date

This version of the manuscript has been compiled on the 28 février, 2021.

### 3.11 Reuse potential

This database will be very helpful for spatial and temporal analysis research in the Caribbean, including GIS and social networks studies. It provides information on the evolution and distribution of the raw materials, types of personal ornaments, stylistic evolution and distribution, for one of the major kind of personal ornaments for this region of the world.

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### 3.13 Competing interests

The authors of this preprint declare that they have no financial conflict of interest with the content of this article. Alain Queffelec is one of the co-founders of PCI Archaeology.

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